FINAL

WOODARD &CURRAN

Human Health Risk Assessment and Ecological Risk Refinement

Caneel Bay Resort Site

Virgin Island National Park
Caneel Bay Resort Site
St. John Island, U.S. Virgin Islands

EDL Number: 5SER3346

woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

0230405.01
VHB
September 16, 2021

Table of Contents

Tables

Figures

Appendices

List of Abbreviations and Acronyms

ABSgi	Gastrointestinal absorption fraction
ADAF	Age-dependent adjustment factor
ARAR	Applicable or relevant and appropriate requirements
AST	Above ground storage tank
AUF	Area use factor
bgs	Below ground surface
CEC	Contaminants of ecological concern
COPC	Contaminant of potential concern
COPEC	Contaminant of potential ecological concern
CSF	Cancer slope factor
CSM	Conceptual site model
CT	Central tendency
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DU	Decision Unit
EE/CA	Engineering Evaluation/Cost Analysis
EPC	Exposure point concentration
ESV	Ecological Screening Value
ESV-HQ	Ecological screening value hazard quotient
Ft-bgs	Feet below ground surface
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard Quotient
IA	Investigation Area
IRIS	Integrated Risk Information System
ISM	Incremental sampling methodology
ITRC	Interstate Technology & Regulatory Council
IUR	Inhalation unit risk
LANL	Los Alamos National Laboratory
LOEL	Lowest observed effects level

LRL	Laboratory reporting limit
µg/m^3	Micrograms per cubic meter
mg/kg	Milligrams per kilogram
mg/m^3	Milligrams per cubic meter
mg/kg-day	Milligrams per kilogram body weight per day
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (aka, National Contingency Plan)
NPS	National Park Service
NOEL	No observed effect level
ORNL	Oak Ridge National Laboratory
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyls
PCOPEC	Preliminary contaminant of potential ecological concern
PPRTV	Provisional Peer-Reviewed Toxicity Value
RAGS	Risk Assessment Guidance for Superfund
RBCG	Risk-based cleanup goals
RfC	Reference concentration
RfD	Reference dose
RME	Reasonable maximum exposure
RSE	Removal Site Evaluation
RSSL	Refined Soil Screening Level
RSSL-HQ	Refined soil screening level hazard quotient
RUE	Retained Use Estate Indenture Agreement
SAP	Sampling analysis plan
SLERA	Screening Level Ecological Risk Assessment
SSL	Soil Screening Level
SVOC	Semi-volatile organic compound
TBC	To be considered
TRV	Toxicity Reference Value
UCL	Upper confidence limit of mean concentration
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WWTP	Wastewater treatment plant

1 Introduction

This human health and ecological risk assessment report was prepared in support of the Engineering Evaluation/Cost Analysis (EE/CA) Report for the Caneel Bay Resort investigated areas ("Site") within the Virgin Island National Park ("Park") on the northwest side of the island of St. John, U.S. Virgin Islands. The risk assessments were conducted in accordance with the Engineering Evaluation/Cost Analysis (EE/CA) Risk Assessment Work Plan dated November 18, 2016 (Woodard & Curran, 2016) and subsequent communications with Vanasse Hangen Brustlin, Inc. (VHB) and the National Park Service (NPS). These risk assessments used analytical results and information generated from the Sampling and Analysis Plan (SAP) for the EE/CA Investigation Report dated February 5, 2021 (VHB, 2021a). Readers should refer to the EE/CA Report, to which this document is appended, for additional information regarding the EE/CA objectives, investigation activities, analytical results, and Conceptual Site Model (CSM).

Risk assessment provides risk managers the information needed to understand existing or potential threats by identifying the pertinent exposure pathways of contamination migration, and the human and/or ecological receptors that may be exposed to the contamination. A baseline Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA), with Refinement, were performed as part of the EE/CA to evaluate potential risks to both human and ecological receptors associated with exposure to chemical contamination at the Site under current and potential future use scenarios.

The following subsections of this chapter provide a brief summary of the Site characteristics and history, and a synopsis of the 2021 analytical results. The HHRA and the SLERA Refinement are provided in Sections 2 and 3, respectively, of this report. Section 4 provides an overall summary of the conclusions of the risk assessments and Section 5 presents a list of references used in support of the risk assessments.

Key findings of this report are as follows:

- The HHRA estimated total cancer risks that exceeded the National Contingency Plan (NCP) cancer risk Point of Departure of one in one-million (1E-06) for a Park/Resort Worker and Construction Worker in Area 2, and a Future Resident in Areas 1, 2, and 3; cancer risk was mainly associated with exposure to dieldrin, aldrin and arsenic in soil. There were no identified unacceptable noncancer risks.
- The SLERA indicated that a potential risk to ecological receptors may exist due to exposure to pesticides and metals, primarily in Area 2. Elevated ecological risks were also identified in Area 3. From the analysis, seven constituents were identified as contaminants of ecological concern (CECs) because they had a hazard quotient (HQ) greater than 1.0. These CECs consisted of barium, copper, zinc, aldrin, chlordane, dieldrin, and dichlorodiphenyltrichloroethane (DDT) and its metabolites.
- Arsenic, barium, copper, zinc, aldrin, chlordane, dieldrin, and DDT and its metabolites are the eight contaminants of concern for the Site.

1.1 Site History, Use and Description

The Site is located on the northwestern shore of the island of St. John and occupies a peninsula on the Atlantic Ocean. This approximately 150-acre vacation resort (currently closed, due to damage from past hurricanes) is located approximately one mile northeast of the major port town of Cruz Bay. The Site is surrounded by water to the west and north and by the Park forest to the south and east, which is crossed by hiking trails and public roads. The popular and publicly accessible Honeymoon Beach is in the southwest part of the resort and is open to the public year-round. Hawksnest Bay is located east of resort and hosts multiple public beaches. The location of the Site is presented on Figure 1-1. The resort operated from at least 1956 through 2017, when, in September 2017, Hurricanes Irma and Maria inflicted severe damage on the Site. Historically, the Site was open to overnight guests from November through August, and employees stayed at the Site through the year. The Site did not reopen after the 2017 hurricane season and is currently closed, at least through 2021. NPS is considering how the area will be operated after the expiration of the Retained Use Estate on September 30, 2023. For purposes of this risk assessment, it is assumed that operations will resume as an overnight resort and that any of the three areas could potentially be redeveloped for residential use, or the Site could be redeveloped with residential housing.

Based on historical investigations and recent Site reconnaissance completed for the EE/CA on September 15, 2016, the Site has been divided into three areas of concern that comprise a total of approximately 8 acres of the 150-acre resort. These areas, depicted on Figure 1-2, include:

- Area 1: approximately 0.8 acres in the vicinity of the wastewater treatment plant (WWTP) structures, located on the southeastern side of the Site. A WWTP building is included in this area but there are no offices or other occupied spaces. Currently, the WWTP is not operational.
- Area 2: approximately 5.4 acres that encompass the engineering, maintenance, landscaping, and fuel buildings and facilities located to the southwest of the WWTP. Former office and maintenance buildings are located within this area.
- Area 3: approximately 1.5 acres of land (undeveloped except for a donkey shelter) that will be referred to in this document as the landfill to reflect historical usage, located immediately east of Honeymoon Beach.

Currently there are two canteens (Bikinis on the Beach and Zozo's) located near the Investigation Areas that serve food and drink. Bikinis on the Beach is operating on Honeymoon Beach and located immediately to the west of Area 3. Zozo's is a fine dining restaurant located closer to and west of Area 2.

The Site is a gated property with a security office. Areas 1 and 2 are not included on the Site guest map and roads to these areas are marked with "Employee Only" signs. Therefore, access to these areas is limited primarily to employees. Area 3 has a gravel surface and is not generally accessible to the public by car. However, there are no physical barriers to prevent guest access to Area 3. Due to the presence of landfilled materials, this risk assessment assumes that the landfill will remain covered for the foreseeable future.

These risk assessments evaluated potential risks associated with contaminants detected in soil samples collected from the three investigation Areas (described below) during the EE/CA investigation. However, it is worth noting that Hurricanes Irma and Maria inflicted severe damage on the island, resulting in the generation of building debris scattered across the Site. This building debris is suspected to contain asbestos, and soil sampling indicates the presence of lead-based paint on some buildings. However, risks from these contaminants were not evaluated in the risk assessments.

1.2 Site History

This section focuses on the historical operations at the three areas that comprise the Site. For further discussion on the history of the Site, see the EE/CA Report.

Area 1:

The existing WWTP was constructed in 1968 and the gravel staging area above the WWTP building may have been constructed around the same time. A material re-use staging area is located in a gravel clearing north of the WWTP building. The Removal Site Evaluation (RSE) reported multiple unmarked and unlabeled 55-gallon drums in the northeastern corner of the staging area within a wooded area; the drums were partially buried, covered with shade cloth, and reported to contain unknown liquid (3E Consultants, 2017). VHB (then known as The Johnson Company) noted that they did not observe these drums during their 2016 Site visit. However, during the 2021 field activities, VHB observed at least 12 partially buried and rusted drums in the eastern portion of the gravel staging area in the same area identified in the 2017 RSE report. Some of the drums appeared to contain washed pebbles at the time of the 2021 field work.

Area 2:

The majority of buildings in Area 2 were constructed around 1956 to 1960. The existing gasoline and diesel aboveground storage tanks (ASTs) were installed after the 1960s; however, the exact date is not known. This area also hosts the grounds and landscaping buildings and chemical (including pesticide) storage sheds that were used at the Site when it was operational.

A concrete drainage channel extends through the Site and conveys surface runoff following precipitation events and discharges from the laundry and desalinization plant, although it does not flow naturally between events. Areas of accumulated sediment material in this channel, which passes behind Area 2, were evaluated in 2014 and the potential for sediment conveyance to the ocean was determined to be minimal. As described in the EE/CA Report, this channel will be cleaned as part of the final remediation of the site and accumulated material will be removed. Thus, sediment from this channel is not quantitatively evaluated in this risk assessment.

Area 3:

The landfill appears to be a historical quarry and is located east of Honeymoon Beach and next to a more recently developed quarry. The landfill has reportedly been used for more than 50 years to dispose of a variety of domestic wastes associated with the Site, including sewage sludge from the Site's WWTP, which was disposed every ten years for an unknown period of time before 2014 (Barksdale & Associates, 2012; 2014). Currently the area is used for disposal of compostable materials such as trees and brush, and non-compostable materials such as plastic pots.

1.3 Summary of 2021 EE/CA Investigation Analytical Results

The EE/CA investigation was completed February 2021 in accordance with the SAP (VHB, 2021a) and included collection of one groundwater sample and Incremental Sampling Methodology (ISM) samples from surface soil (0-0.5 feet below ground surface [ft-bgs]) from the Site as well as reference areas. In addition, VHB collected discrete soil samples between zero and six ft-bgs in Area 3. Target analytes in all media included metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides. These data were used in both the HHRA and SLERA.

Analytical results for the environmental media at the Site, including reference locations, are provided in Tables 1.1 through 1.3 for ISM soil analytical data for Areas 1, 2, and 3 respectively; Table 1.4 for discrete subsurface soil samples collected between 0-6 ft-bgs from only Area 3; Table 1.5 for ISM and discrete soil samples collected from reference locations; and Table 1.6 for the groundwater sample. Figure 1-2 shows soil and groundwater sample locations.

Data validation and usability are discussed in the EE/CA Investigation Summary Report. All analytical data generated from the EE/CA field effort that were not rejected as a result of the data validation process, including results qualified as estimated ("J"-flagged[1]), were considered usable in the HHRA and SLERA. Refer to Appendix B of the EE/CA Report for the data validation reports.

The following subsections summarize analytical results for soil and groundwater samples.

1.3.1 Soil

Soil samples were collected using both ISM and discrete sampling techniques, as discussed in the EE/CA Investigation Summary Report. ISM sampling was conducted in all three Areas, while discrete sampling was conducted at only Area 3. The following subsections provide a brief discussion of the data available for each Area.

ISM Shallow Soil Sampling

For ISM sampling, three replicate samples were collected from each of the decision units (DU), which were approximately 0.25 acres or smaller. In total, there were 13 Site DUs and 2 reference DUs. (Reference DUs were intended to represent "typical" contaminant concentrations in the region that are not related to any distinct or known source of release; these concentrations could result from local geochemistry and/or non-specific anthropogenic sources such as car emissions.) Specific DU samples included the following:

- Area 1 included DUs IA-1-01 through IA-1-04
- Area 2 included DUs IA-2-01 through IA-2-05

[1] In the data tables, some results are noted with letters, also known as validation "flags." The flag indicates that something in the sampling or analytical process, or in the sample itself, may have affected the result. These flagged results are usable and valid.

- Area 3 included IA-3-01 through IA-3-04
- Reference locations include IA-REF-01 and IA-REF-02.

Each ISM DU was composed of approximately 40 equal column increments of the upper zero to 0.5 feet below ground surface (ft-bgs). ISM Soil samples were analyzed for the following analyte groups in each Area:

- Area 1: Metals, pesticides, and SVOCs
- Area 2: Metals, PCBs (DU IA-2-03 and IA-2-04 only), pesticides, SVOCs, and VOCs (VOCs were only analyzed for DU IA-2-05, in the vicinity of above ground storage tanks [ASTs])
- Area 3: Metals, PCBs, pesticides, and SVOCs.
- Reference Area: Metals, PCBs, pesticides, VOCs, and SVOCs

Figure 1-2 presents the soil sample locations. Tables 1.1 through 1.3 present the soil analytical data for constituents that had at least one detection in Areas 1 through 3, respectively. ISM soil samples collected from reference locations are presented on Table 1.5.

As discussed, three replicate samples were collected for each ISM DU. Results from these three replicate samples were combined to calculate a 95% upper confidence limit (UCL) of the mean concentration[2]. This 95% UCL was then used as the representative concentration for each DU. The 95% UCLs are also provided on Tables 1.1 through 1.3.

The following constituents were detected within each Area:

- <u>Area 1:</u> Fourteen metals and 17 SVOCs, which included PAHs, were detected. Of the pesticides analyzed, 4,4- dichlorodiphenyldichloroethane (DDD), 4,4- dichlorodiphenyldichloroethylene (DDE), 4,4- dichlorodiphenyltrichloroethane (DDT), and dieldrin were detected.
- <u>Area 2:</u> Thirteen metals, 10 pesticides, 17 SVOCs, which included PAHs, and one VOC (methyl acetate). This area housed chemical/pesticide storage sheds and had elevated levels of pesticides in soil relative to other Areas.
- <u>Area 3:</u> Thirteen metals and 17 SVOCs, which included PAHs, were detected. Of the pesticides analyzed, 4,4- DDD, 4,4-DDE, 4,4-DDT, aldrin, dieldrin, and trans-chlordane were detected.
- <u>Reference Area:</u> Thirteen metals, 11 SVOCs, which include PAHs, and three pesticides which included 4,4-DDE, 4,4-DDT, and dieldrin were detected in ISM samples collected from IA-REF-01 and IA-REF-02.

<u>*Discrete Sampling*</u>

[2] 95% UCLs were calculated using the Interstate Technology & Regulatory Council (ITRC) online calculator (ITRC, 2020). This calculator can be used to calculate a 95% UCL using ISM data from either a single DU (based on replicates) or from multiple DUs. In accordance with ITRC guidance, one half the reporting limit was used for non-detect values when calculating the 95% UCL. For further discussion on the derivation of the 95% UCL refer to Section 2.2.2.1.

Area 3 makes up the landfill area. The contents of the landfill are reportedly much deeper than 0.5 feet; VHB reported visual evidence of waste at a maximum depth of 26 ft bgs, and maximum refusal was 27 ft bgs. Samples collected from the landfill subsurface were collected using discrete sampling techniques. Eleven soil borings (SC-3-01 through SC-3-11) were advanced to either six feet or refusal in Area 3. Samples were collected at 10 of the soil boring locations. Shallow refusal was encountered at approximately 1.5 ft-bgs at sample location SC-3-05 and samples were not collected. Samples were collected from shallow (near ground surface to approximately 3 ft-bgs) and deep intervals (3 ft-bgs to 6 ft-bgs or refusal) and analyzed for metals, PCBs, pesticides, SVOCs, and VOCs. Figure 1-2 presents the locations of the soil samples and Table 1.4 presents the soil analytical data for constituents that had at least one detection.

Discrete sample results from Area 3 indicated detections of 14 metals, nine pesticides, PCB Aroclor 1260, 17 SVOCs, and three VOCs (2-butanone, acetone, and carbon disulfide). Metals were detected in all samples, whereas VOCs, Aroclor 1260, and the majority of the pesticides were detected at a relatively low frequency, with the exception of 4,4-DDE and 4,4-DDT.

Three discrete samples (SC-REF-01 through SC-REF-03) were also collected from reference areas. Data for these three samples are presented on Table 1.5 and show that metals were detected in all three samples; 4,4-DDE and PAHs were detected in only the Area 3 sample (0-3 ft-bgs).

1.3.2 Groundwater

One groundwater sample was collected via low flow sampling from monitoring well MW-1, which is located in Area 2. VHB observed that the well screen extended to the surface and that the well may collect rainwater from the surrounding concrete pad. The water level was sufficient only to collect samples for analysis of VOCs, metals, and PAHs; there was insufficient water for the pesticides or quality control samples. (VHB, 2021b). Table 1.6 presents the groundwater analytical data from MW-1.

Nineteen constituents were detected in groundwater, including nine metals, four VOCs, and six SVOCs. Although there were constituents detected in groundwater, the analytical results collected from MW-1 most likely do not represent true groundwater conditions, because MW-1 most likely collected rainwater from the surrounding concrete pad. Additionally, there was no evidence of soil moisture suggesting the presence of groundwater at any of the boring locations. For confirmation, VHB installed temporary piezometers at three locations in Area 2 (SC-2-01, SC-2-02, and SC-2-03) but found all to be dry. Additionally, NPS installed one monitoring well MW-3-01 near the seeps/wash in the Area 3. However, this well could not be sampled as it was also found to be dry, although it may yield water in a wetter season. See the EE/CA Report for further discussion on groundwater.

During drilling in 2021, VHB did not observe wet soil in any of the soil cores. Also, the soil did not contain other indications of groundwater, such as the mottled coloring that occurs when the water table rises and falls. The lack of such evidence, coupled with the dense and fine-grained soils that limit the amount of water that soaks into the ground, indicate that groundwater should be ruled out as a transport mechanism for contaminants. Due to the absence of true groundwater and the lack of representative groundwater data, groundwater was not retained as a medium of concern in the quantitative risk assessment. Uncertainties regarding potential risk from groundwater are addressed in Section 2.5.

2 Human Health Risk Assessment

The purpose of the HHRA is to understand potential health risks associated with constituents at or migrating from a site in order to evaluate the need for a removal action. This HHRA for the EE/CA Report was conducted for the Site based on NPS and USEPA risk assessment guidance, cited in this report where relevant. The HHRA consists of five components:

- Hazard Identification, which describes the available data to be used in the risk assessment, evaluates the data with respect to its usability, and presents the selection of the Chemicals of Potential Concern (COPCs);
- Exposure Assessment, which presents a detailed description of the relevant receptors, exposure pathways, and exposure scenarios;
- Dose-Response Assessment, which provides the toxicity information used to evaluate potential non-cancer hazard and cancer risk;
- Risk Characterization, in which cancer risk estimates and non-cancer hazard indices are quantified for each identified receptor; and
- Uncertainty Analysis, which identifies and, where possible, quantifies the uncertainties associated with the risk assessment.

Supporting tables for the HHRA follow the general format recommended by USEPA Risk Assessment Guidance for Superfund (RAGS), Part D ("Planning Tables"; USEPA, 2001a)[3].

2.1 Hazard Identification

The objective of the Hazard Identification is to present the relevant sampling data, evaluate its usability, and select the COPCs for each medium. Data used in the risk assessment was discussed in Section 1.3. The 2021 SAP (VHB, 2021a) provides more detailed discussion regarding sample collection and analysis. As discussed above (Section 1.3), soil was the only medium of concern carried through the HHRA. Statistical summaries (frequency of detection and range of detected concentrations) for ISM surface soil samples are provided in Tables 2.1 through 2.3 for ISM surface soil results in Areas 1 through 3, respectively, and in Table 2.4 for discrete subsoil samples in Area 3.

COPCs are those constituents detected at the Site that are carried through the quantitative risk assessment process. Criteria considered in the COPC screening process may include frequency of detection, laboratory blank contamination, essential nutrient status, and concentrations relative to risk-based screening criteria.

- ***Frequency of Detection:*** Per USEPA guidance (1989), constituents that were not detected at least once in a medium were not retained as COPCs. Consideration of reporting limits with

[3] Note that while the HHRA table format follows the RAGS Part D guidelines, the HHRA table numbering does not, and tables in the HHRA are presented in the order they are referenced within this text.

respect to project action limits, and exclusion of these non-detect constituents in estimation of total risk, are discussed in the Uncertainty Analysis (Section 2.5).

- ***Elimination of Essential Nutrients:*** Some elements (such as calcium, potassium, sodium, iron and magnesium) that are essential human nutrients need not be considered as COPCs when present at low concentrations and/or are toxic at only very high doses (USEPA, 1989). However, none of the detected constituents were considered essential nutrients.
- ***Comparison to Risk-Based Screening Levels:*** A comparison of constituent concentrations to medium-specific risk-based screening levels was used to focus on the constituents that are most likely to contribute significantly to risks: the COPCs. The screening levels selected in the HHRA are the USEPA Regional Screening Levels (RSLs) based on a target cancer risk of one in one million (1E-06) and target hazard quotient of 0.1 for soil (USEPA, 2021a).

For contaminants lacking screening values, the screening value for a surrogate compound of similar chemical structure was used where appropriate. Table 2.5 provides a list of the surrogates used in the COPC selection process. Constituents eliminated from the COPC selection process are addressed further in the Uncertainty Analysis (Section 2.5).

Due to differences in exposure potential and means by which soil samples were collected, soil was subdivided into two categories: surface soil (0-0.5 ft-bgs) collected via ISM and surface/subsurface soil (0-6 ft-bgs) collected via discrete sampling (Area 3 only). For the ISM sample results, a 95% UCL concentration was calculated for each DU, based on the three replicates collected at each DU (as discussed in Section 1.3.1). The highest 95% UCL concentration among all DUs within each Area was compared to the RSL. The maximum detected concentration among discrete samples in Area 3 was compared to the applicable RSL. Where the screening concentration (either the 95% UCL for ISM samples or maximum for discrete samples) exceeded the RSL, the constituent was retained as a COPC. Contaminants with screening concentrations below the RSL were eliminated as COPCs, under the assumption that low concentrations of these constituents pose a negligible health risk. COPCs are summarized below.

- Area 1 (ISM): arsenic, thallium, and benzo(a)pyrene;
- Area 2 (ISM): arsenic, 4,4-DDD, 4,4-DDE, DDT, aldrin, chlordane, dieldrin, and benzo(a)pyrene
- Area 3 (ISM): arsenic and benzo(a)pyrene
- Area 3 (Discrete): arsenic and thallium

The COPC selection process is summarized on Tables 2.1 through 2.3 for ISM surface soil results in Areas 1 through 3, respectively, and in Table 2.4 for discrete subsoil samples in Area 3.

2.2 Exposure Assessment

The exposure assessment identifies the human receptors who may be present at a site, and the relevant exposure media and routes by which a receptor may be exposed. The objective of the exposure assessment is to estimate the type and magnitude of potential exposure of a receptor to COPCs present at or migrating from a site. The following sections discuss the human receptors and relevant exposure routes and the estimation of COPC intake for each receptor scenario. These routes and pathways are illustrated in Figure 2-1.

2.2.1 Potential Human Receptors and Exposure Pathways

The risk assessment evaluated both current and future potential health risks to human receptors, as described below. Table 2.6 and Figure 2-1 summarize the receptor scenarios evaluated in the HHRA.

The selection of human receptors and exposure pathways was based on assumptions about current and future land use at the Site, and the selected receptor scenarios were designed to address a range of exposure levels. As previously mentioned, the Site has not been fully operational since Hurricanes Irma and Maria inflicted severe damage on the resort in September 2017. However, for purposes of this risk assessment, it is assumed the Site will reopen and resume operations as a vacation resort. The Site is a gated property with a security office. Access to Areas 1, 2 and 3 are limited primarily to Resort/NPS employees. It is assumed the landfill will be and remain covered for the foreseeable future. Additionally, the HHRA assumed that any of the three areas could potentially be redeveloped for residential use. Thus, receptors and exposure pathways evaluated in the HHRA included:

NPS Park/Resort Worker: This receptor is someone who works for the NPS or the Resort full-time and may potentially access any of the three areas, assuming that recreational use of the Site is restored. This receptor is expected to perform routine maintenance, surveillance, and cleanup within the three areas. This receptor is anticipated to encounter COPCs in surface soil[4] under current/future conditions in all three areas. Exposure pathways to be evaluated include incidental ingestion of and dermal contact with soil, and inhalation of fugitive dust.

Site Visitor. This receptor is a visitor or tourist who may access the Site. This receptor is anticipated to encounter COPCs in surface soil under current/future conditions in all three areas, via incidental ingestion of and dermal contact with soil and inhalation of fugitive dust. However, these occasional or one-time exposures are expected to be much lower than those of either the Park/Resort Worker or Future Resident (see below). Therefore, risk for this receptor is only *qualitatively* evaluated in the HHRA and is represented by either the Park/Resort Worker or future Resident.[5]

Construction Worker. This receptor is an individual who is expected to be involved in excavation-related activities in the three areas. This receptor may be exposed to COPCs in surface soil in Areas 1, 2, and 3.

---

[4] Per NPS/VHB communications, the EE/CA focus is primarily on surface soils, assuming that excavation/digging of Areas 1 and 2 is not likely to occur. While subsurface samples were collected in Area 3 (the landfill), it is assumed that any excavation into the subsurface would be on a very limited, occasional basis; extensive relocation of subsurface soils is not expected to occur, such as under a redevelopment scenario. However, for informational purposes, this HHRA evaluated risk for a Construction Worker's exposure to subsurface soil in this Area.

[5] The Risk Assessment Workplan indicated quantitative evaluation of the visitor receptor; however, per communications with VHB and NPS, a quantitative risk evaluation for a hypothetical resident receptor was added into the HHRA, and the visitor scenario was instead evaluated qualitatively. While other potential receptors (such as an agricultural worker) could be possible, the three receptors evaluated in the HHRA are assumed to cover a broad range of potential exposures.

Additionally, it is assumed that there is potential for this receptor to encounter COPCs in subsurface soil in Area 3. Exposure pathways for this receptor include incidental ingestion of and dermal contact with soil, and inhalation of fugitive dust.

Hypothetical Resident. The Site was historically used for agricultural and residential purposes, but in the last century has been used for commercial/recreational purposes; however, it was assumed for purposes of this report that the property could eventually be redeveloped for residential use. In accordance with USEPA exposure assessment guidelines (USEPA, 2014a), a residential tenure of 26 years was used, and includes a child (ages 0-6 years) and adult (6-26 years). The scenario assumes that a resident lives on the Site property for the entirety of the 26-year duration and may be exposed to COPCs in surface soil in Areas 1, 2, or 3 during day-to-day activities such as playing or gardening. Exposure pathways include incidental ingestion of and dermal contact with soil, and inhalation of fugitive dust.

Produce Exposure Pathways: Some of the COPCs in soil (metals, pesticides) may potentially accumulate in plants. Based on the historical use of the Site, there is potential for the Site to be used for agricultural purposes, which may grow and sell produce. Additionally, if the Site is used as a residence in the future, there is potential for home-grown produce to be consumed by a future Resident. Although it is possible that COPCs (metals and pesticides) could accumulate in produce grown at the Site that is consumed by locals, visitors, or a future Resident, there is considerable uncertainty in estimation of exposure from this pathway, given the many factors that influence uptake/accumulation of contaminants from soil by plants, as well as uncertainties associated with the types and amount of produce consumed by an individual. Therefore, risk from this pathway is evaluated qualitatively in the uncertainty analysis (Section 2.5).

Groundwater Exposure Pathways: As discussed, a representative set of groundwater samples was unable to be collected during the EE/CA investigation. However, groundwater-related exposures to COPCs are not expected for any of the above scenarios. The Site water sources include a private desalinization plant operated by the Site and a 1.5-million -gallon catchment basin for rainwater. However, only a small percentage of the Caneel cistern is filled from the catchment basin rainwater. The vast majority is sea water that is piped to the reverse osmosis desalinization plant, then pumped to the cistern for storage and gravity fed to a day use holding tank after further treatment. The reverse osmosis desalinization plant pulls water from the sea between Honeymoon Beach and Caneel Beach and has two wells for backup; however, there is no known recent use of these two wells as a source of drinking water use. Based on this information, Site groundwater is not currently considered to be a potential drinking water source at the Resort.

While several volatile COPCs were detected at low concentrations (near the reporting limit) in MW-1, shallow groundwater was not encountered and VOCs were not identified as COPCs in Site soil; therefore, potential risk from the vapor intrusion pathway (migration of VOCs from the subsurface into indoor air of a building) is considered to be negligible.

2.2.2 Estimation of Intake

The USEPA defines exposure as "the contact with a chemical or physical agent," and defines the magnitude of exposure as "the amount of an agent available at [human] exchange boundaries (i.e., lungs, gut, skin) during a specified time period" (USEPA, 1989). Exposure assessments are designed to determine the degree of contact a person has with a COPC. Estimates of human intake are a function of the concentrations of COPCs as well as receptor-specific exposure parameters such as duration, frequency, and contact rates.

Intake is estimated using equations and assumptions to develop the intake factors used in the calculation of the risk. The approaches adopted by the USEPA's *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Part A* (USEPA, 1989), *Part E Supplemental Guidance for Dermal Risk Assessment* (USEPA, 2004), *Part F Supplemental Guidance for Inhalation of Risk Assessment* (USEPA, 2009), and other relevant risk assessment guidance documents were used to estimate intakes in this assessment.

An upper-bound estimate (i.e., "reasonable maximum exposure" or RME) of the theoretical intake for each of the potentially exposed human populations via each of the (quantified) exposure routes (shown on Table 2.6) was calculated for each identified receptor. RME is defined as the highest exposure that could *reasonably* be expected to occur for a given exposure pathway at a contaminated site and is intended to account for both uncertainties in the contaminant concentration (exposure point concentration; see following section) and variability in exposure parameters (e.g., exposure frequency, averaging time). While USEPA also recommends evaluating a less-conservative central tendency (CT) estimate of intake, response decisions are often made on the results of the RME scenario, which is the more protective of the two scenarios. Therefore, no CT scenarios were evaluated for this HHRA, per the Risk Assessment Work Plan (2016).

The intake and exposure equations are presented in Table 2.7 for the current/future Park/Resort Worker, Table 2.8 for the future Construction Worker, and Table 2.9 for the future Resident scenarios. These tables also present the exposure parameters and assumptions used in estimation of intake and the basis of each exposure assumption. Physiological/anatomical parameters such as body weight and skin surface area were obtained from USEPA guidance (e.g., USEPA, 2014a), as noted on these tables. Summaries of additional values used in the calculation of the intake and exposure equations are presented on Table 2.10 (dermal absorption fraction from soil) and Table 2.11 (particulate emission factors). The following subsections discuss the calculation of exposure point concentrations, selection of exposure parameters, and other information relevant to calculation of intake.

2.2.2.1 Exposure Points and Calculation of Exposure Point Concentrations

Exposure points are the locations where a receptor is exposed to a COPC. Exposure point concentrations (EPCs) are estimates of the chemical concentrations to which a potential receptor is likely to be exposed; thus, EPCs are both receptor- and time-specific and dependent upon the exposure period and pathway.

Exposure Points: Each Area (Areas 1, 2 and 3) was considered a separate exposure point for each scenario. While a receptor may encounter any of these areas on a daily basis, this division of the three separate Investigation Areas was used in EE/CA based on historical/future uses and different sources of contaminants in each of the three areas. As previously discussed, ISM samples were obtained from surface soils (0-0.5 ft-bgs) in Areas 1, 2 and 3. This depth interval is applicable to all receptor scenarios. Discrete samples were obtained from surface/subsurface soils (0-6 ft-bgs) in only Area 3, and this depth interval is applicable to only the Construction Worker scenario. Thus, there are four separate exposure points:

- Area 1 surface soil (Park/Resort Worker, Construction Worker, child and adult Resident)
- Area 2 surface soil (Park/Resort Worker, Construction Worker, child and adult Resident)
- Area 3 surface soil (Park/Resort Worker, Construction Worker, child and adult Resident)
- Area 3 subsurface soil (Construction Worker)

Exposure Point Concentrations: The HHRA generally used the 95% UCL of the mean concentration as the EPC in soil for each exposure point, in accordance with USEPA guidance. Soil EPCs for surface soils in Areas 1, 2, and 3, and for subsurface soil in Area 3 are summarized on Tables 2.12 through 2.15, respectively. Depending on the sampling technique (ISM or discrete), calculation of the 95% UCL was conducted using either the Interstate Technical and Regulatory Council (ITRC) online calculator (for ISM samples) or the USEPA Pro UCL software, Version 5.1 (for discrete samples), as described below.

ISM Sample EPCs: Pro UCL does not currently include the statistical algorithms for handling ISM data, which generally include a relatively low number of replicate samples per decision unit (DU) (each individual ISM sample is comprised of 40 increments). Areas 1 and 3 had four separate DUs, and Area 2 had five DUs; each DU had three replicates. A 95% UCL concentration was calculated for each of the three Investigation Areas using all of the individual ISM replicate samples across all DUs within each area, using the ITRC online calculator (ITRC, 2020); where results from multiple DUs are used, the calculator area-weights the 95% UCL. The calculation methods for ISM data sets using the ITRC calculator includes Student's t-test (representing the low end of the range) and Chebyshev UCLs (representing the high end of the range); these are expected to "bracket" the range of UCLs that may be calculated from a data set (ITRC 2020). In accordance with ITRC guidance, one half the reporting limit was used for non-detect values when calculating the 95% UCL. Appendix A presents the ITRC calculator used to derive 95% UCLs for each area. Area 1, 2 and 3 surface soil EPCs are summarized on Tables 2.12, 2.13, and 2.14, respectively.

Discrete Soil EPCs: For discrete soil results in Area 3, the USEPA ProUCL software (version 5.1) was used to calculate 95% UCLs using both parametric methods and nonparametric methods. Parametric methods are based on the assumption that the data are consistent with a standard statistical distribution, such as normal, log-normal, or gamma, whereas nonparametric methods do not require any assumptions about the distribution (USEPA, 2015). In general, the software-recommended 95% UCL, when identified, was selected as the EPC. The ProUCL output files are included as Appendix B. Area 3 subsurface soil EPCs are summarized in Table 2.15. As shown on Table 2.15, ProUCL produced a valid 95% UCL for COPCs in subsurface soil in Area 3.

2.2.2.2 Receptor-Specific Exposure Parameters

Receptor-specific exposure parameters are values that describe various attributes of a receptor group. Such attributes include anatomical and physiological parameters, such as skin surface area, body weight, inhalation rate and ingestion rates, as well as exposure frequency, time, and duration over which a receptor comes into contact with a COPC. Exposure assumptions unique to each exposure scenario are discussed in the following paragraphs. Exposure assumptions used in this HHRA are discussed below.

NPS Park /Resort Worker

The NPS Park/Resort Worker is an adult individual who performs routine maintenance, surveillance, and cleanup. This receptor is assumed to be at the Site five days per week, eight hours per day, for 50 weeks (i.e., 250 days/year), which is the USEPA default value (USEPA, 2014a), for a 10-year occupational tenure at the Site (based on communications with NPS). See Table 2.7 for a summary of exposure parameters for the Park/Resort Worker scenario.

Construction Worker

The Construction Worker is an adult involved in future construction activities for 250 days/year (five days per week for 50 weeks year), eight hours per day, over a one-year period, which reflects default USEPA assumptions. See Table 2.8 for a summary of exposure parameters for the Construction Worker scenario.

Resident

A residential scenario is based on the USEPA default total residential tenure of 26 years. This age range encompasses both a child (0-6 years) and an adult (6-26 years). Both adult and child residents are assumed to reside at the Site for 24-hours per day for 350 day/year (year-round), which are the recommended USEPA default values for a residential scenario (USEPA, 2014a). Physiological and behavioral parameters unique to each age group were used to estimate exposure to the adult and child receptors, since adults and children each have different attributes (for example, children ingest more soil on a daily basis and have a higher skin surface area to body weight ratio than do adults and may have enhanced risk from mutagenic chemicals). See Table 2.9 for a summary of exposure parameters for the future residential scenario.

2.3 Dose-Response Assessment

The toxicity (or dose-response) assessment describes the relationship between the level of exposure and the likelihood and/or severity of an adverse effect. In other words, the dose-response assessment quantifies the toxicity of each COPC using information obtained from published literature describing epidemiologic or toxicological studies. The products of the dose-response assessment are the toxicity values used to predict the likelihood of adverse health effects in identified receptors at Site-specific exposure levels.

Toxicity information for chemical COPCs was obtained using the USEPA's recommended hierarchy of toxicity values (USEPA, 2003):

- Tier 1: USEPA Integrated Risk Information System (IRIS) database (USEPA, 2021b)
- Tier 2: USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs), as provided on the Oak Ridge National Laboratory (ORNL) PPRTV website (ORNL, 2021)
- Tier 3: Other sources, including the USEPA Health Effects Assessment Summary Tables (USEPA, 1997a), California Environmental Protection Agency, Agency for Toxic Substance Disease Registry, and other sources.

Sources of toxicological information for each COPC are documented in the toxicity summary tables (Tables 2.16 through 2.19).

Dose-response information is divided into three major categories: (1) toxicity data associated with threshold (non-carcinogenic) effects; (2) toxicity data concerning carcinogenicity; and (3) the absorption adjustment factors used to relate toxicity information identified from the literature to the exposure pathways evaluated for the Site. These categories are described in the following sections.

2.3.1 Dose-Response Criteria for Non-Carcinogenic Effects

Non-carcinogenic effects, such as organ damage or reproductive effects, are evaluated by reference doses (RfDs) or reference concentrations (RfCs). RfDs and RfCs are developed based upon the assumption that there exists a threshold dose or concentration below which there will be minimal risk, if any, for adverse health effects. These values provide a benchmark for the daily dose to which humans may be subjected without an appreciable risk of deleterious effects during a given period of exposure. These values incorporate modifying and/or uncertainty factors to ensure they are protective even for sensitive subpopulations. RfDs for oral and dermal exposure are presented in milligrams per kilogram body weight-day (mg/kg-day) and RfCs for inhalation exposure are typically presented in milligrams per cubic meter (mg/m^3). Table 2.16 provides a summary of the non-cancer oral toxicity values for each COPC at the Site. Non-cancer inhalation toxicity values are provided in Table 2.17.

Toxicity values are typically based on an administered (e.g., oral) dose. For the dermal exposure pathway, the absorbed dose is most relevant; however, the use of oral toxicity values without modification may potentially underestimate the potential risk. Therefore, USEPA recommends that oral toxicity values are adjusted where adequate information is available on gastrointestinal absorption efficiency, so that the dermal toxicity values reflect toxicity related to an absorbed dose, rather than administered dose (USEPA, 2004). Dermal RfDs were calculated from oral RfDs using the gastrointestinal absorption fraction (ABSgi) values and adjustment equations recommended by USEPA (USEPA, 2004). Where no ABSgi was recommended for a particular COPC, no adjustment to the oral RfD was made. ABSgi values, equations for the adjustment of oral RfDs, and resultant dermal toxicity values for non-cancer effects are presented on Table 2.16.

2.3.2 Dose-Response Criteria for Carcinogenic Effects

USEPA has identified a method for classifying carcinogens by a weight-of-evidence narrative (USEPA, 2005a), using the following descriptors:

- Carcinogenic to Humans
- Likely to Be Carcinogenic to Humans
- Suggestive Evidence of Carcinogenic Potential
- Inadequate Information to Assess Carcinogenic Potential
- Not Likely to Be Carcinogenic to Humans

The USEPA's Carcinogen Assessment Group reviews human, animal, and in vitro data regarding chemical carcinogenicity and derives oral cancer slope factors (CSFs) and inhalation unit risks (IURs) for those chemicals determined to be known, probable, or possible carcinogens. CSFs are upper-bound estimates of the excess risk of developing cancer as a result of a period of continuous exposure to a chemical, averaged throughout the course of a 70-year lifetime, and are developed based on the assumption that there is no threshold level of exposure below which adverse effects will not be seen. CSFs are generally derived using data from animal bioassays, although human data are used when available. The excess carcinogenic risk for an experimental animal is then extrapolated to an expected excess carcinogenic risk for humans. The resulting cancer toxicity values are more likely to overestimate than to underestimate the potential risk.

The CSF has units of the inverse of milligrams of chemical per kilogram of body weight per day [1/(mg chemical/kg body weight-day)] or 1/(mg/kg-day). Dermal CSFs were derived from oral CSFs using the ABSgi as recommended by USEPA (USEPA, 2004) and previously discussed in Section 2.3.1. Table 2.18 summarizes the oral and dermal CSFs for COPCs.

The IUR is the 95% UCL of the mean incremental lifetime cancer risk estimated to result from lifetime exposure to an agent if it is in the air at a concentration of 1 microgram per cubic meter ($\mu g/m^3$). Carcinogenic inhalation toxicity values for COPCs are summarized in Table 2.19.

2.3.3 Evaluation of Mutagenic COPCs

USEPA’s guidance on cancer risks (2005a; 2005b) indicate that carcinogens that act via a mutagenic mode of action may have a greater toxicity during early versus later life stages. Because of this, USEPA specifies the use of age-dependent adjustment factors (ADAFs) for mutagenic constituents when estimating cancer risk (USEPA, 2005b). Of the COPCs, benzo(a)pyrene was the only COPC identified as a carcinogen with a mutagenic mode of action (USEPA, 2005b). ADAF adjustments were thus made for this COPC.

ADAFs are combined with age-specific exposure estimates when assessing cancer risks. USEPA guidance (2005b) recommends the following default adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment is made.
- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment is made.
- For exposures after turning 16 years of age, no adjustment is made.

The ADAF adjustment was necessary for only the future Resident scenario, which encompasses the age range of 0-26 years and for which mutagenic COPCs were identified in soil. Calculation of the ADAF-adjusted cancer risks for this scenario is provided in Appendix C, Tables C-1 through C-3.

2.4 Risk Characterization

Risk characterization is the process of quantifying the significance of residual chemicals in the environment in terms of their potential to cause adverse health effects. The quantitative estimates are expressed in terms of a probability statement for the potential theoretical incremental cancer risks and as a hazard index (HI) for the likelihood of adverse non-cancer health effects. The general methodologies used for estimating risk for carcinogens and non-carcinogens are presented below.

2.4.1 Methodology Used to Calculate Cancer Risk

Incremental lifetime cancer risks associated with exposure to COPCs classified by the USEPA as carcinogens are characterized as an estimate of the probability (risk) that an individual will develop cancer over a lifetime (USEPA, 1989). This estimated theoretical lifetime risk ("cancer risk") is expressed as a unitless probability. For example, a cancer risk of one in one million (expressed in scientific notation as 1E-06) indicates an individual has a one-in-one million chance of developing cancer during a 70-year lifetime as a result of the assumed exposure conditions.

Cancer risks associated with direct contact with soil are estimated using the methods prescribed in USEPA's human health risk assessment guidance (1989). In the first step, cancer risk is calculated for each carcinogenic COPC within the exposure pathway, using the following equation:

Chemical-specific cancer risk (unitless)	=	Intake factor x EPC x CSF
Where: EPC	=	exposure point concentration
CSF	=	cancer slope factor

Cancer risk from inhalation of fugitive dust exposures is calculated by multiplying the exposure concentration by the IUR.

Following these initial calculations, the cancer risk associated with exposure to multiple carcinogens for a single exposure pathway is calculated by summing the individual chemical-specific cancer risks as follows:

Pathway-specific cancer risk (unitless) = Σ (Chemical-specific cancer risk [unitless])

Multiple pathway-specific risks are then summed to estimate the total cancer risk for each human receptor evaluated:

Receptor-specific Total cancer risk (unitless) = Σ (Pathway-specific cancer risk [unitless])

Within Appendix C, Tables C-4 through C-6 present the intake and cancer risk estimates for the Park/Resort Worker in Areas 1, 2, and 3, respectively, Tables C-7 through C-10 for the future Construction Worker for Areas 1, 2, and 3, respectively, and Table C-11 through C-13 for the future Resident in Areas 1, 2, and 3, respectively.

2.4.2 Methodology Used to Calculate Hazard Indices

Estimation of chronic non-cancer HIs is conducted in a process similar to that used in estimating cancer risks. The methods prescribed in USEPA (1989) are used for the estimation of non-cancer hazards associated with the direct contact with soil. In the first step, a hazard quotient (HQ) is calculated for each COPC within exposure route, using the following equation:

Hazard quotient (unitless)	=	Intake Factor x EPC / RfD
Where: EPC	=	exposure point concentration
RfD	=	oral or dermal reference dose

The HQ from inhalation of fugitive dust exposures is calculated by dividing the exposure concentration by the inhalation RfC. In the second step, the HQs from individual COPCs within each exposure route are summed to derive a hazard index (HI) for each exposure pathway:

Exposure pathway-specific HI (unitless) = Σ (Chemical-specific HQs [unitless])

In the third step, any pathway specific HIs are summed across all relevant exposure pathways and media to estimate the total HI for each receptor:

Receptor-specific Total HI (unitless) = Σ (Pathway-specific HIs [unitless])

The estimation of intake and non-cancer hazard are presented in Appendix C: Tables C-4 through C-6 for the Park/Resort Worker in Areas 1, 2, and 3, respectively, Tables C-7 through C-10 for the future Construction Worker for Areas 1, 2, and 3, respectively, and Table C-11 through C-13 for the future Resident in Areas 1, 2, and 3, respectively.

2.4.3 Points of Departure for Hazard and Cancer Risk

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is commonly cited as the basis for target risk and hazard levels. According to the NCP, total cancer risks posed by a site should not exceed one in one million (1E-06) to one in ten thousand (1E-04), and non-carcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., HI greater than 1). As a risk management policy, the NPS considers a total cancer risk of 1E-06 and a total non-cancer HI of 1 to be the risk thresholds used to make risk management decisions.

2.4.4 Risk Characterization Results

This section presents the results of the risk characterization for each receptor scenario quantitatively evaluated in the HHRA. Appendix C[6] Tables C-4 through C-13 present calculation of intake, cancer risk, and non-cancer hazard for each COPC and exposure pathway. Appendix C Tables C-14 through C-23 present a summary of non-cancer hazard/cancer risk by COPC and exposure pathway. Tables 2.20 through 2.22 present a detailed summary of total cancer risks, hazards, and risk drivers (i.e., COPCs with

[6] In Appendix C, Tables C-4 through C-8 correspond to RAGS-D Table 7s; Tables C-9 through C-13 correspond to RAGS-D Table 9s.

total cancer risk greater than 1E-06 and non-cancer HI greater than 1) for all receptor scenarios in Areas 1, 2, and 3, respectively. Results for individual exposure scenarios are summarized below.

The total cancer risk and HI associated with exposure to COPCs identified in Areas 1, 2, and 3 were calculated for all receptor scenarios; these are shown in Charts 1 through 6 below. The horizontal red line on Charts 1 through 6 identifies the NPS risk threshold for each risk type, cancer or non-cancer. Calculated risks below these thresholds indicate that COPCs are not present at levels expected to cause adverse health effects to receptors.

Park/Resort Worker

Chart 1 summarizes total cancer risk for the Park/Resort Worker scenario in each of the three Investigation Areas. As shown in this chart, the total cancer risk in Areas 1 and 3 are below the NPS risk limit of 1E-06; however, the total risk of 8E-06 in Area 2 exceeds this limit. Nearly all of the total cancer risk in Area 2 is due to dieldrin in soil.

Dieldrin was also detected in reference samples collected from the reference area decision unit IA-REF-02 at a concentration of 0.0065 mg/kg. The EPC for dieldrin in Area 2 (2.42 mg/kg), however, is far greater than the reference concentration. Therefore, risk associated with dieldrin concentrations in Area 2 is most likely related to impacts within the Investigation Areas.

Chart 1 Total Cancer Risk for Park/Resort Worker

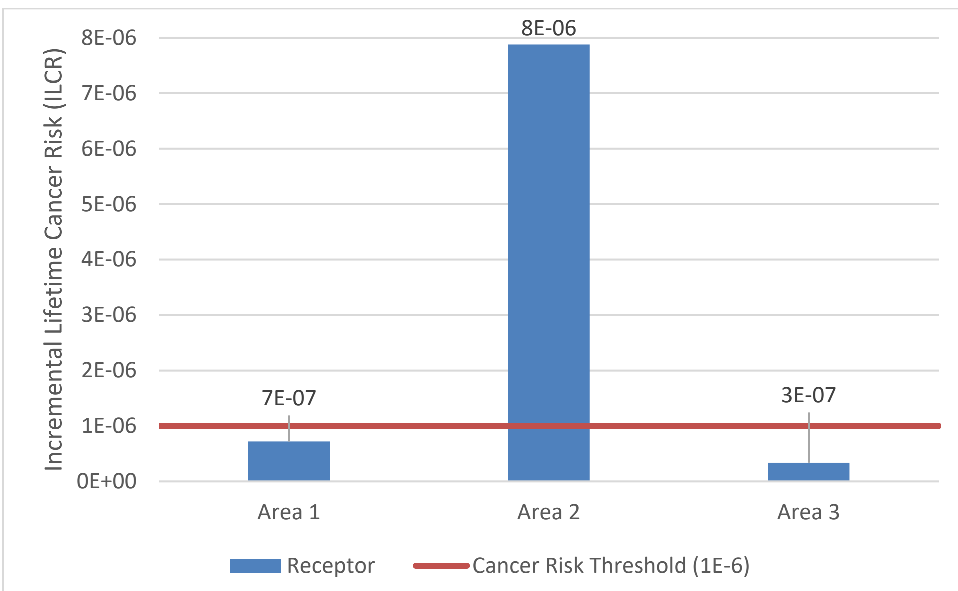
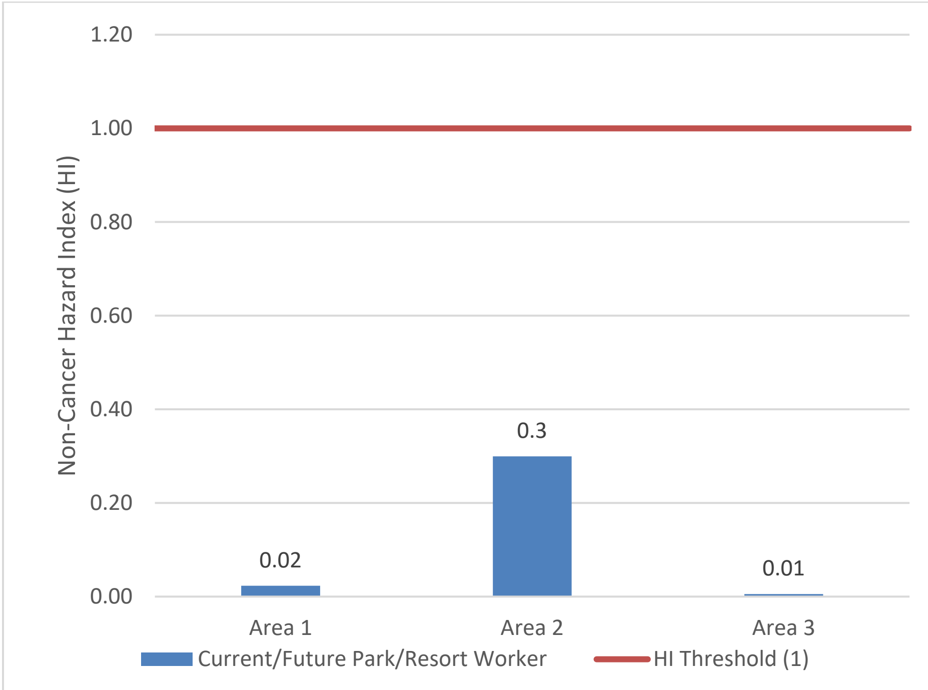


Chart 2 presents the total HI for the Park/Resort Worker by Investigation Area; all noncancer HI values are below the NPS threshold of one (1).

Chart 2: Total Non-Cancer HI for Park/Resort Worker



Construction Worker

Chart 3 summarizes total cancer risk for the Construction Worker scenario in each of the three Investigation Areas. As shown in this chart, the total cancer risk in Areas 1 and 3 are below the NPS risk limit of 1E-06; however, the total risk of 2E-06 in Area 2 exceeds this limit. Nearly all of the total cancer risk in Area 2 is due to dieldrin in soil.

As previously mentioned, the EPC for dieldrin in Area 2 is greater than reference concentration detected in reference areas. Therefore, risk from dieldrin is most likely related to impacts within Area 2.

Chart 3 Total Cancer Risk for Future Construction Worker

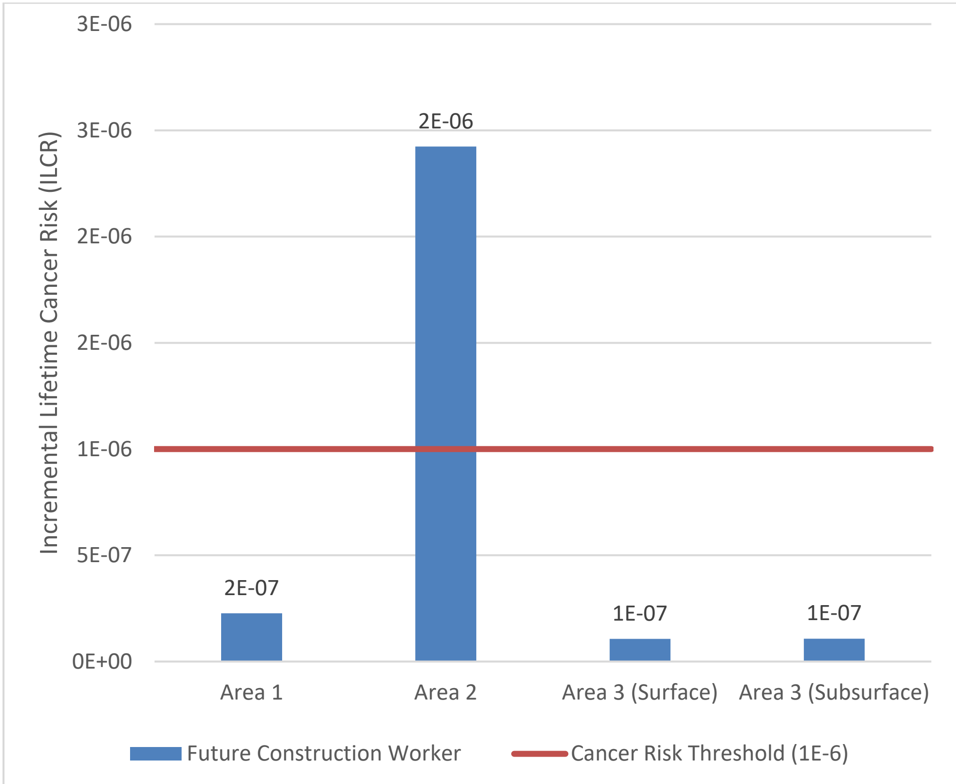
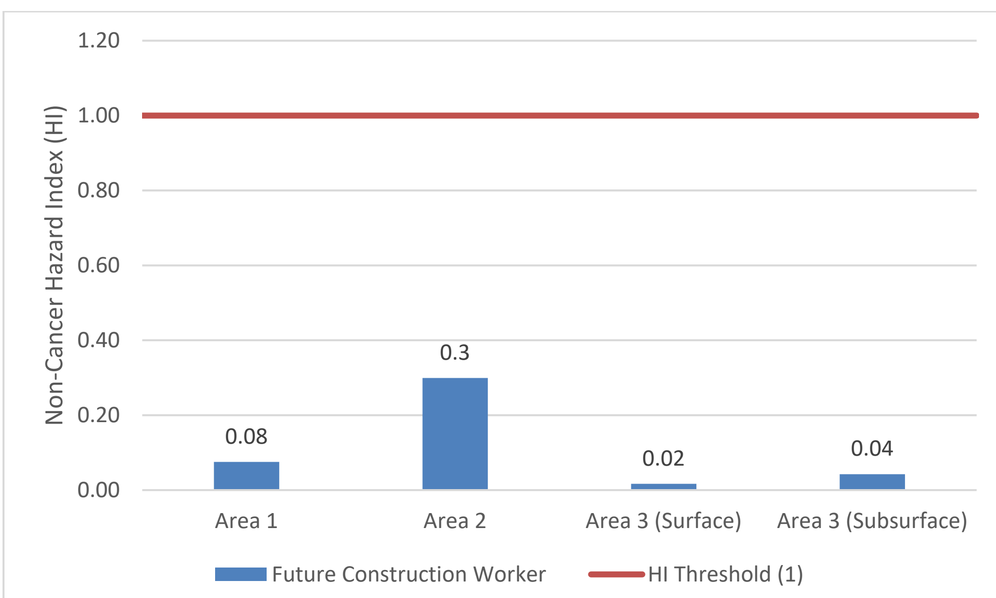


Chart 4 presents the total HI for the Construction Worker by Investigation Area; all noncancer HI values are below the NPS threshold of one (1).

Chart 4 Total Non-Cancer HI for Future Construction Worker



Future Resident

Chart 5 summarizes total cancer risk for the residential scenario in each of the three Investigation Areas. As shown in this chart, the total cancer risk in Areas 1 (8E-06), Area 2 (8E-05), and Area 3 (4E-06) exceed the NPS risk limit of 1E-06. Nearly all of the total cancer risk in Areas 1 and 3 is due to arsenic in soil. For Area 2, the total cancer risk is due to arsenic, aldrin, and dieldrin.

Arsenic was detected in reference samples collected from IA-REF-01 and IA-REF-02 at concentrations ranging from 1.2 mg/kg to 2.0 mg/kg. The EPCs for arsenic in Area 1 (5.30 mg/kg), Area 2 (6.61 mg/kg), and Area 3 (2.43 mg/kg) are higher than the background concentrations and account for at least half of the risk related to arsenic. Aldrin was not detected in reference samples collected from IA-REF-01 and IA-REF-02. As previously mentioned, the EPC for dieldrin in Area 2 is greater than reference concentrations. Therefore, the risks related to arsenic, aldrin, and dieldrin are most likely related to impacts within the Investigation Areas.

Chart 5 Total Cancer Risk for Future Resident

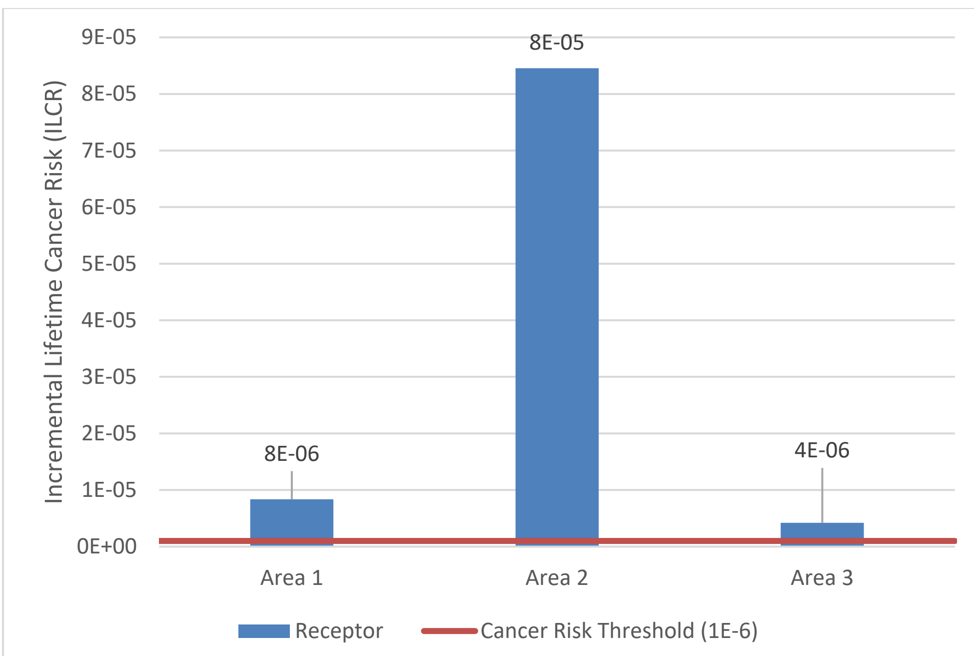
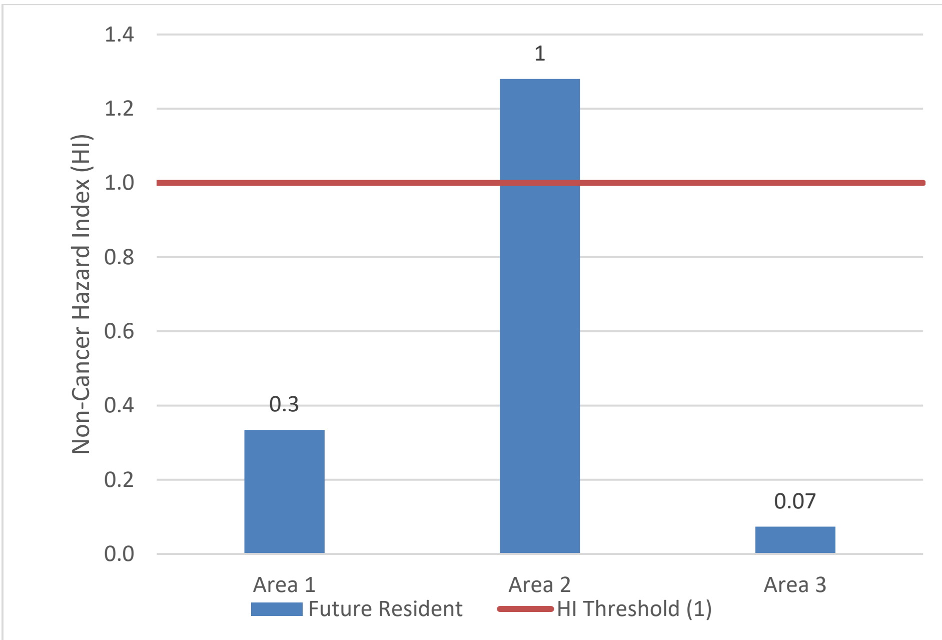


Chart 6 presents the total HI for the future Resident by Investigation Area. For Areas 1 and 3, the total noncancer HIs are below the NPS threshold of one (1), whereas the total HI (1.3) in Area 2 is slightly above 1.

Chart 6 Total Non-Cancer HI for Future Resident



Nearly all of the HI is attributed to exposure to pesticides in Area 2. When the HI is segregated by target organ (in other words, the HI for individual COPCs with a shared target organ or system, such as the liver, are added together), there are no target organs with a cumulative HI greater than one (see Appendix C, Table C-22), except for liver effects, for which a HI of 1.1 was calculated- just marginally above the NPS noncancer risk threshold. No individual COPC had a HI exceeding one. Rounded to one significant figure, the total HI in Area 2 is equivalent to the NPS noncancer risk threshold of 1, suggesting minimal potential for risk for a hypothetical future Resident scenario.

2.5 Uncertainty Analysis

Uncertainty analysis is an important component of all risk assessments. The uncertainty analysis identifies and evaluates the uncertainties typically associated with key parameters in the risk characterization, including the environmental concentrations, screening criteria, toxicity values, and exposure assumptions used to estimate the magnitude of exposure and to quantify health risks. Two main types of uncertainty are inherent in a risk assessment: measurement uncertainty and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements such as the uncertainties associated with sampling and measurement variability. Informational uncertainties are those that stem from assumptions related to chemical toxicity or human activity patterns for predicting human exposure.

Analytical Data

Soil analytical data used in this HHRA were collected during the 2021 investigation activities and represent current Site conditions. Soil samples were collected using both ISM and discrete techniques. For ISM sampling, three replicate samples were collected from each of the DUs located within Area 1 (IA-1-01 through IA-1-04), Area 2 (IA-2-01 through IA-2-05), and Area 3 (IA-3-01 through IA-3-04). Each ISM DU was composed of approximately 40 equal column increments of the upper zero to 0.5 ft-bgs. ISM sampling represents a composite of multiple soil samples collected across a sampling unit and is conducted to provide an average concentration of constituents in that area that is presumed representative of area-wide exposures, and is appropriate for evaluating risk for long-term, chronic durations where exposure is not expected to be limited to a discrete area. However, ISM sampling could potentially underestimate the risk by potentially diluting out “hot spots” or discrete areas of elevated concentrations, or overestimate Site risk by biasing sample results to a single or few localized areas of contamination. Based on the relatively small size of each DU (0.25 acres or smaller) and because the DUs were located in areas of suspected impacts (i.e., ASTs, chemical storage area, landfill, etc.), the potential for underestimating EPCs and risk is assumed to be relatively low.

Additionally, the ITRC calculator was used to calculate a 95% UCL for each detected constituent within each DU. The ISM sampling represents an upper-bound average concentration of COPCs detected in each Investigation Area and could potentially either overestimate or underestimate the risk.

Discrete subsurface samples were collected between zero and 6 ft-bgs within Area 3 to characterize contaminants related to buried debris within the landfill. A total of 20 samples were collected from 10 soil borings located across Area 3 and are intended to represent vertical and lateral extent of impacts in this Investigation Area. Given the landfilling that has occurred in Area 3, there could be localized elevated areas of impacts that have not been characterized.

As discussed, groundwater was not included as a medium of concern in this HHRA, due to the lack of representative data collected (one sample from monitoring well MW-1 located within Area 2). Because of this, risks associated with groundwater were not assessed. The uncertainty associated with exclusion of this medium in the HHRA is assumed to be low, however, since there is limited to no potential for exposure to occur to groundwater: depth to groundwater, while seasonably variable, is generally not above bedrock and unlikely to be encountered by receptors on a routine basis, if at all. Off-property wells are not expected to be affected by migration of contaminants in groundwater because groundwater is likely to flow west toward the ocean.

Selection of COPCs

COPCs were selected for each of the three areas. Soil data were compared to risk-based screening criteria for residential scenarios (RSLs), as directed in USEPA guidance. These criteria are typically designed to be conservative, such that the HHRA can be focused on the constituents that are most likely to present risk, while not significantly underestimating risk. For example, soil analytical data were screened against the USEPA residential soil RSLs to select soil COPCs for the Park/Resort Worker and Construction Worker scenarios, which are expected to have an overall lower level of exposure compared to a Resident, given that a Park/Resort Worker and Construction Worker are expected to spend less time at the Site than a Resident. Exclusion of contaminants that are present below the RSL will underestimate the total risk for a receptor; however, this underestimation is not expected to be significant.

As previously mentioned, constituents that were never detected in any samples were eliminated as COPCs from the risk assessment. Overall, most of the analytical results met project action limits, which are generally based on conservative risk-based screening levels (such as RSLs), so there is a high degree of confidence that any risk from the exclusion of these non-detect results would be negligible. However, for constituents that do not meet PALs, if these constituents are truly present at the Site but at undetectable levels, their exclusion may underestimate cumulative risks.

There were eight pesticides and three SVOCs detected in soil that did not have residential soil RSLs available. As shown on Table 2.1, screening criteria for other constituents that were structurally similar to these constituents were used as surrogate benchmarks. While this approach allows evaluation of constituents that might otherwise be excluded from the COPC selection process (due to a lack of screening criteria), there is some uncertainty in whether the surrogate constituent benchmark will over- or under- estimate the risk.

Exposure Assessment

In general, estimation of EPCs, characterization of current and reasonably foreseeable Site activities and uses, and calculation of average daily doses contribute most to the uncertainty in the exposure assessment component of the risk characterization. To counter this uncertainty, conservative exposure assumptions, based on either Site-specific information or conservative default values provided in USEPA and other guidance were used to quantitatively evaluate potential risks at the Site. This risk analysis includes evaluation of the RME for each receptor. The RME exposure assumptions generally are designed to reflect upper-bound values and thus likely overestimate risks. Some additional sources of uncertainty in the exposure assessment are described below.

For all receptors, it was conservatively assumed that 100% of the soil daily intake is from each of the three Investigation Areas at the Site. However, the Site (the three areas) comprises only a portion of the entire Site property. On-Site receptors, particularly a worker, may spend all day at the resort but only a few hours at the Site. Therefore, this is a highly conservative assumption that may overestimate the risk for certain receptors. This assumption may be less conservative for receptors like the Construction Worker, however, who may be conducting work within a relatively small area.

For the Resident, it was assumed that this receptor would come into contact with soil 24 hours/day, 350 days/year, for their full residential tenure of 26, years. However, it is more likely that a Resident will spend time inside their home or off-site at school, work, or other locations. Therefore, the residential exposure assumptions used in this HHRA most likely overestimate the total risk. Similarly, the HHRA assumed that a worker would receive the full daily soil intake from each Area of the Site. Since a worker is expected to spend a portion of his/her time off-Site, thus reducing Site-related soil intake, this assumption likely overestimates total risk.

As discussed, some of the COPCs in soil (metals, pesticides) may potentially accumulate in plants, and it is possible that in the future, portions of the Site could be used to grow produce that could be consumed by island residents. The HHRA did not include a quantitative evaluation of risk from the hypothetical future produce ingestion pathway due to several factors. There is considerable uncertainty in the estimation of uptake/accumulation of contaminants from soil by plants because the level of uptake is influenced by soil concentrations of the contaminant, speciation of the contaminant in the soil, chemical/physical characteristics of the soil (such as pH, saturation, organic carbon content), and the type of plant. Once a contaminant is taken up into a plant, the distribution of that contaminant within the various components of the plant, such as roots, leaves and fruit, may also vary considerably. Further uncertainties with estimating risk from hypothetical produce ingestion include determining the amount of produce grown at the Site, the types of produce grown, the parts of the plant consumed, and the amount of Site-grown produce routinely consumed. Collectively, these uncertainties make accurate estimation of produce exposure and risk challenging without data from actual plant samples as well as information on local produce consumption patterns; exclusion of the produce ingestion pathway underestimates cumulative risk. Acknowledging these uncertainties, USEPA recommends that management practices be employed to manage potential health risks at sites with soil and groundwater contamination where produce is or could be grown (USEPA, 2011). These management practices include, but are not limited to, addition of soil amendments that reduce plant uptake of contaminants, placement of barriers on the contaminated soil, and use of raised garden beds or containers (USEPA, 2011; USEPA, 2014b).

Currently, Area 3 is used as an uncapped landfill. In the future, it is likely that either the landfill will be capped and covered, or the landfill waste will be excavated and disposed off-Site (VHB, personal communication). However, the HHRA conservatively evaluated risk for a future Construction Worker performing excavation activities in Area 3 assuming no capping or excavation occurs, which may overestimate the risk for this receptor.

Lastly, a representative groundwater dataset was not obtained during the EE/CA investigation, mainly due to the absence of true groundwater. Thus, the HHRA did not address risks associated with groundwater-related exposure pathways, which could potentially underestimate risks. However, the level of underestimation is considered very low because Site groundwater above bedrock (where shallow impacts are most likely) is not currently used as a potable source of water, and the seasonal absence of shallow groundwater and minor detections of VOCs in soil (and the one groundwater sample) do not suggest that vapor intrusion is a significant pathway of concern.

Toxicity

The primary sources of uncertainty in the dose-response assessment are associated with the toxicity values used to quantify risks. These uncertainties include:

- The extrapolation of toxicity information from effects observed at high doses to predict effects at low/environmental concentrations;
- Use of toxicity information compiled from short-term exposure studies to predict the effects associated with long-term exposures (and vice-versa);
- Use of toxicity information from animal studies to predict effects in humans; and
- Use of toxicity information based on homogeneous animal populations or healthy human populations to predict the effects that are likely to be observed in the general population (including sensitive subgroups).

Human variability in response to chemical exposures may be dependent on numerous factors, and risks estimated for one population may not necessarily be protective or indicative of risks in a different population. Specific sources of uncertainty and bias are as follows:

- The CSFs used to estimate cancer risk are considered conservative values that provide high confidence that the actual cancer risk is not likely to exceed the estimated cancer risk (in other words, the HHRA intentionally overestimates risk). CSFs, generally based on linear low-dose extrapolation, assume that there is no level of exposure that does not pose some corresponding level of risk. This assumption thus is intentionally biased to overestimate risk. However, this no-threshold approach may not be applicable to all carcinogens since some chemicals do exhibit a threshold level for cancer.

- RfDs and RfCs are estimates of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It is more likely that these toxicity values overestimate rather than underestimate potential health hazards, particularly because many of the values incorporate uncertainty/modification factors spanning up to several orders of magnitude. Uncertainty factors (UFs) are used to compensate for a deficiency in available information concerning the accuracy of test results and the difficulty in estimating the health effects in a different species or exposure conditions. UFs for oral and dermal RfDs ranged from 3 (arsenic) to 3,000 (4,4-DDE) and ranged from 30 (arsenic) to 3,000 (benzo(a)pyrene) for RfCs. Higher UFs reflect a higher level of uncertainty in the toxicological data available for a constituent but are used to provide a conservative estimate of risk to offset this uncertainty.

- Oral toxicity values were converted to dermal toxicity values for several COPCs (primarily metals). For other COPCs, the HHRA used the oral toxicity values to evaluate dermal risks. Use of oral values may potentially over- or underestimate potential risks via dermal exposure routes.

Risk Characterization

Total risk and hazard were calculated as the sum of risk from individual COPCs and exposure routes. This assumption of simple additivity may not necessarily take into account synergistic or antagonistic effects of chemical mixtures and consequently may potentially over- or under-estimate total risk. Additionally, total cancer risk and HI calculated in this HHRA do not include risk related to chemicals excluded from the COPC selection process, thus potentially underestimating total risks. However, these constituents (either not detected or detected at concentrations below conservative RSLs) are assumed to pose negligible risk in general, such that this underestimation is not expected to appreciably affect the conclusions of the HHRA.

In summary, each section of the risk characterization is based on a number of assumptions intended to be protective of human health. Uncertainties in this risk characterization may bias the risk result to either overestimate or underestimate risk. Many assumptions incorporated into this risk characterization are inherently conservative (i.e., protective), however, and therefore, the risk estimates presented in this report are typically more likely to overestimate rather than underestimate the potential risk for the Site.

It is important to emphasize that the risks calculated in this HHRA are *estimated* risks; and are hypothetical and should not be construed to represent actual cancer risk or non-cancer hazard to an individual. Consequently, these estimates should be used to target areas of the Site that may require additional information, sampling and/or response action, and to provide practical risk management information to Site managers.

2.6 HHRA Summary

The purpose of this HHRA was to characterize the nature and magnitude of total non-cancer hazards and cancer risks associated with exposure to COPCs in soil at the Site, to determine the need for removal in support of the EE/CA Report. The HHRA used the soil data collected in 2021 from Areas 1, 2, and 3 of the Site to estimate exposure and total cancer risk and hazard for a Park/Resort Worker, Construction Worker, and future Resident who may be exposed to COPCs in soil. The results of the HHRA indicate the following estimated risks associated with exposure to COPCs identified in each of the three Investigation Areas at the Site.

Area 1:

- Total cancer risk for the Park/Resort Worker scenario (7E-07) and future Construction Worker scenario (2E-07) are below the NPS threshold.
- Total cancer risk for the future Resident (8E-06) scenario exceeded the NPS threshold of 1E-06. The primary risk driver identified for this receptor is arsenic in soil.
- Non-cancer hazards for all scenarios in Area 1 are below the NPS threshold of 1.

Area 2:

- Total cancer risk for the Park/Resort Worker (8E-06) scenario exceeded the NPS threshold of 1E-06. The primary risk driver identified for this receptor is dieldrin in soil.
- Total cancer risk for the future Construction Worker (2E-06) scenario exceeded the NPS threshold of 1E-06. The primary risk driver identified for this receptor is dieldrin in soil.
- Total cancer risk for the future Resident (8E-05) scenario exceeded the NPS threshold of 1E-06. The primary risk drivers identified for this receptor are arsenic, aldrin, and dieldrin in soil.
- Non-cancer hazards for Park/Resort Worker and future Construction Worker are below the NPS threshold of 1. The total noncancer hazard for a future Resident (1.3) slightly exceeded this threshold (although when rounded to one significant figure, is equivalent to the threshold of 1), and segregation of the HI by target organ indicated an HI of 1.1 related to pesticides (primarily dieldrin).

Area 3:

- Total cancer risk for the Park/Resort Worker scenario (3E-07) is below the NPS threshold.
- Total cancer risks for the future Construction Worker scenario for surface soil (1E-07) and subsurface soil (1E-07) are below the NPS threshold.

- Total cancer risk for the future Resident (4E-06) scenario exceeded the NPS threshold of 1E-06. The primary risk driver identified for this receptor is arsenic for the incidental ingestion of soil exposure pathway.
- Non-cancer hazards for all scenarios are below the NPS threshold of 1.

As discussed in Section 2.5, there are a number of uncertainties inherent in the analytical data, exposure assumptions, and toxicity values used to quantify human health risks. However, many of the assumptions and parameters used in this HHRA are intended to be conservative and therefore overestimate potential human health risk.

In summary, arsenic concentrations in Areas 1 and 3 result in an unacceptable cancer risk for a future residential Resident scenario, and arsenic, aldrin and dieldrin concentrations in Area 2 result in unacceptable cancer risks for the Park/Resort Worker, Construction Worker, and future Resident scenarios. Because significant risk is identified, human health risk-based cleanup goals (RBCGs) were developed for arsenic, aldrin and dieldrin.

3 Ecological Risk Assessment Refinement

3.1 Introduction

This section presents a Screening Level Ecological Risk Assessment (SLERA) and Refinement for the Site. This SLERA was conducted in accordance with the November 16, 2016 EE/CA Risk Assessment Workplan for the Site and follows USEPA and NPS ecological risk assessment methodology as presented in the following guidance documents:

- *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997b);
- *NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Rev. 3*. (NPS, 2018); and
- *ECO Update: The Role of Screening Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments*. EPA 540/F-01/014 (USEPA, 2001).

The primary purpose of a SLERA is to eliminate from further consideration Site contaminants considered to present negligible risk to ecological receptors. Site contaminants retained in the screening process may have the potential to present a risk to ecological receptors but require further study to confirm whether adverse effects are in fact occurring. For this reason, this study also includes a "Refinement" step, in which additional exposure and evaluation measures are used to more completely characterize the origin and potential effect of Site contaminants identified by the SLERA screening. While typically considered as the initial stage of a site-specific "Baseline" ecological risk assessment, the Refinement is included in this report as a separate section that follows the SLERA Risk Calculation in Section 3.5.

An overview of the report organization is presented below.

Assessment Scope and Organization

This SLERA generally follows the standard ecological risk assessment protocol recommended by USEPA 1997b, modified to address the soil environment that is the focus of this effort. Section 1 described the Site and briefly summarized the Site's history and investigative activities that were conducted to provide the data for this risk assessment. Subsequent sections of the SLERA consist of the following:

Section 3.2. Habitat Assessment: This section describes the ecological characteristics of the terrestrial environments at and around the Site as a means of identifying receptors potentially exposed to Site contaminants. This effort includes the results of a public records review of the area for the presence of rare, threatened, or endangered species.

Section 3.3. Problem Formulation: This section outlines the overall approach of the SLERA. As a first step, "Study Constituents" are listed; these are the chemical analytes detected in Site soil samples (see Section 1.3). Potential exposure pathways by which Study Constituents may reach plants and animals (referred to as ecological receptors) in surrounding habitats are then identified. Based on these pathways, potentially exposed ecological receptors are identified and measures of the effect, which are contaminant concentrations used to estimate the potential for effect on Site receptors, are selected. Receptors, relevant exposure pathways, and assessment endpoints are depicted in an ecological pathway-receptor diagram.

Section 3.4. Analysis: This section presents the methods and data by which both exposure and effects are quantified for each receptor. Exposure is represented by maximum concentrations of Site contaminants in shallow soil. Screening values consist of literature-based Ecological Screening Values (ESVs) developed by NPS (NPS 2018), supplemented as necessary with values from the scientific literature.

Section 3.5. Risk Calculation: In this section, receptor exposure and effects data are compared to each other to evaluate whether the potential for adverse ecological effects exists at the Site. Constituents with maximum exposure concentrations in excess of screening values are retained for further evaluation, while those with concentrations below screening values are considered to present negligible risk and are not evaluated further.

Section 3.6. Summary of Screening Level Risk Assessment. This section summarizes and concludes the SLERA.

Section 3.7 Refinement: This section comprises the "Refinement" analysis, where Site contaminants that exceed screening levels are subject to further analysis through comparison with additional toxicity values and environmental media characteristics to obtain a more accurate understanding of the potential for adverse effects.

Section 3.8. SLERA and Refinement Summary and Conclusions: This section summarizes the findings of the ecological risk assessment.

Section 3.9. Uncertainty Analysis: Assumptions and uncertainties associated with the methodology of the risk assessment are listed and evaluated in this section.

A brief description of the Site and sampling program was presented in Section 1 of this report. The Site covers 150 acres and consisted of numerous guest and maintenance-related building surrounded by both native vegetation and lawns and landscaped areas. As noted in Section 1.2, areas of accumulated sediment material in the paved drainage channel, which passes behind Area 2, were evaluated in 2014 and the potential for sediment conveyance to the ocean was determined to be minimal. As described in the EE/CA, cleaning sediment from the drainage channel is considered part of a removal action. Because the channel contains little, if any, aquatic habitat and will be cleaned of residuals, it was not evaluated in this risk assessment.

The remainder of the Site is described from an ecological perspective in the section below.

3.2 Habitat Assessment

The property that comprises the Site lies within the border of the Virgin Islands National Park, which covers much of the island. The Park was founded in 1956 and includes over half of the island's land area, particularly on the north shore, central, and southeast areas. The vegetation and ecology around the Site, other than that associated with facility landscaping or related human use, is expected to be similar to that within the nearby park boundaries and across the island generally. Since the resort is located within Park boundaries, species typically found within the Park may be expected to be present at the Site. Thus, the well-documented ecological resources of Virgin Islands National Park are considered representative of potential Site resources and characteristics.

The vegetation of the Virgin Islands is diverse and affected by a variety of factors, including topography, soil types, exposure to drying tradewinds and the effects of human development and introduced species. The subtropical climate supports a forest cover that is transitional between dry and moist evergreen forests and thickets. (Rogers and Teytaud 1988). Forest and thickets predominate in the vicinity of the former resort, forming a dense cover that provides habitat for a variety of species. Over 800 species of plants in 116 families have been identified in the area of St. John (Rogers and Teytaud 1988). However, most of the vegetation on the island is regenerative, since over 90% of the island was subject to historical clearing for pasture and agricultural use, leading to the loss of some native species and the widespread presence of invasive species, especially around current and former areas of development and human land use (NPCA 2008). Invasive species are well-distributed and are present within most vegetative communities on the island. Two federally listed endangered species of plants, the St. Thomas prickly-ash (*Zanthoxylum thomasianum*) and Thomas' lidflower (*Calyptranthes thomasiana*), occur within the Park (USFWS 2017).

Bird life on the Virgin Islands is robust and includes many common North American species as winter residents. Over 59 winter migrants use the islands' mature intact forest and other habitats as overwintering grounds (NPCA 2008). One hundred and seventy-four species, including shorebirds and marine species, have been identified within the Virgin Islands. The most abundant native forest birds that are present within the Park and are likely to be at the Site consist of the following (NPS 2021; Appendix D):

- Bananaquit (*Coereba flaveola*),
- Zenaida Dove (*Zenaida aurita*)
- Common Ground-Dove (*Columbina passerina*)
- Gray Kingbird (*Tyrannus dominicensis*)
- Pearly-eyed Thrasher (*Margarops fuscatus*)

Twelve birds have been designated as rare, threatened, or endangered in the US Virgin Islands (USFWS 2020). These are identified in Appendix D. Seven are forest species, while the others are raptors, shorebirds, or marine species. The only species associated with St. John is the threatened roseate tern, which lives in coastal areas and offshore cays (small, low-elevation, sandy islands on the surface of a coral reef). The brown pelican, listed for many years, has been delisted due to population recovery (USFWS, 2017). No records of the presence of state or federally listed species at the CBR were identified.

Native terrestrial mammals of the Virgin Islands consist only of various species of bats; all other resident mammals are present as the result of human activities and development, and most are considered nuisance species. While nine bat species potentially exist in the Park, only five species have a documented presence, specifically on St. John. These are as follows (NPS 2021, NPCA 2008):

- Pallas' free-tailed bat (Molossus molossus)

- Greater bulldog bat (*Noctilio leporinus*)
- Jamaican fruit-eating bat (*Artibeus jamaicensis*)
- Antillean fruit-eating bat (*Brachyphylla cavernarum*)
- Red fruit bat (Stenoderma rufum)

All of these species are considered in need of conservation (Platenburg and Valiulis 2018). The Jamaican fruit-eating bat is the most abundant species on St. John and St. Thomas, comprising approximately 70 - 73% of individuals captured in population studies (Lindsay et al. 2009), although numbers now may be declining. Populations of fruit-eating bats in particular were severely affected by hurricanes in 2017, which decimated the overstory of forests of fruit-bearing trees (Platenburg and Valiulis 2018).

None of these bat species is listed as federal rare, threatened, or endangered species (USFWS 2020; Appendix D), although the greater bulldog bat (which eats fish), the red fig-eating bat and Antillean fruit-eating bat are species of greatest concern under the Virgin Islands Endangered and Indigenous Species Act of 1990. Fruit-eating bats play an important role as pollinators for many plants and serve as seed dispersers for fruit-bearing trees and shrubs. They are considered to be keystone species (a species with a particularly high effect on the local ecology) within their local ranges (NPCA, 2008, Platenburg and Valiulis 2018).

Other mammals present on St John consist of non-native species such as wild goats, hogs, donkeys, rats, mice, mongoose, cats, deer, and other species introduced with human activities. Many present a threat to native species through browsing and grazing, and the mongoose in particular has had a significant detrimental effect on native amphibian and reptile species through direct predation (NPCA 2008, Platenburg and Valiulis 2018). Active reduction programs for many non-native species were initiated in 2002 (NPCA 2008).

Many amphibians and reptiles live in the Virgin Islands. In St. John, four native species belonging to two families, the Rain Frogs and the Ditch Frogs, are present. These consist of the Antillean frog (*Eleutherdactylus antillensis*), the whistling frog (*E. cochranae)*, the yellow-mottled coqui (*E. lentus)* (Rain frogs), and the Caribbean white-lipped frog (*Leptodactylus albilabris*), a ditch frog. Rain frogs are arboreal, living in trees and using rainwater for moisture, while the white-lipped frog is semi-aquatic, living near streams, ditches, marshes, and other freshwater sources. All play an important role in the control of insects, which form the bulk of their diet. The non-native Cane Toad (*Rhinella marina*) and Cuban Treefrog (*Osteopilus septentrionalis*) have also become established in the Virgin Islands and are implicated in the decline of native frogs through direct predation (Platenburg and Valiulis 2018).

Twenty-three species of reptiles, including lizards, snakes, terrapins and one tortoise, live in the Virgin Islands, although many of these species are not native. Most native species are highly endemic, being limited to specific islands and specific regions within the islands. They provide an important means of insect control as well as being a food source for birds and other species (NPCA 2008, Platenburg and Valiulis 2018). No terrestrial reptiles or amphibians are listed as territory-listed or federal rare, threatened, or endangered species on St. John (USFWS 2017). No terrestrial reptiles or amphibians are listed as territorial or federal rare, threatened, or endangered species on St. John (USFWS 2017).

Most forms of terrestrial life on the Virgin Islands consists of invertebrate fauna, consisting of a diverse array of tropical snails, slugs, crabs, spiders, scorpions, centipedes, millipedes, and insects. Over 232 species of invertebrates have been identified on the island. These provide an important role in the processing of soil detritus and provide a food source for many other species on the islands (NPCA 2008). Soil invertebrates are evaluated as a separate receptor group in subsequent sections of this report.

The Site itself currently consists of the former structures and landscaped grounds surrounded by dense forest on steep slopes. Former large expanses of maintained lawns are revegetating, as are areas around damaged structures. Use of the grounds by wildlife is thus expected to be increasing; however, future redevelopment of at least some of the property is anticipated and will prevent complete recolonization. Species acclimated to human use are expected to have a continued presence in the area.

3.3 Problem Formulation

Problem formulation is the first and most important step in ecological risk assessment. The purpose of the problem formulation is to determine the focus and scope of the SLERA by systematically identifying the stressors, the ecosystems potentially at risk, and the ecological effects to be evaluated. Components of the problem formulation consist of the identification of study constituents, a description of exposure pathways and potential receptors, an ecological pathway-receptor diagram, and, based on this diagram, the selection of specific assessment endpoints and measures of effects.

3.3.1 Selection of Study Constituents

As described previously, the Site has been subdivided into three areas of concern, based on the Level 2 Environmental Site Assessment Report (Barksdale & Associates 2014) and the Removal Site Evaluation (RSE) report (3E Consultants 2017). These areas collectively include approximately 8 acres of the 150-acre resort. Based on the operational history of the Site and findings from the 2021 Field Activities Report (VHB, 2021), cleaning chemicals, petroleum, pesticides, and landscaping products are known to have been stored and used at the Site. The landfill in Area 3 may have received other organic and inorganic contaminants. Therefore, soil samples were analyzed for metals, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), pesticides, and polycyclic aromatic hydrocarbons (PAHs), as described in Section 1.3. All constituents detected by these analyses were considered to be Study Constituents for evaluation in this SLERA.

3.3.2 Exposure Pathways and Potential Receptors

Exposure pathways are the linkage between the contaminant source and the receptor. Receptors are those organisms which, based on the characteristics and distribution of each constituent, are likely to be exposed to study constituents at a site. A review of potentially complete migration and exposure pathways and potential receptors is presented in this section and forms the basis for the development of the proposed assessment endpoints and ecological pathway-receptor diagram included in Figure 2-1.

At this Site, the exposure medium for ecological receptors is Site surface soil. Surface soils are where direct releases, such as spills and leaks, are most likely and hence concentrations are expected be highest. Soils are a growth medium and habitat for both plants and soil invertebrates, which inhabit the shallow soils. Birds and bats may be exposed to contaminants primarily through the ingestion of contaminated prey or vegetation growing in shallow soils. While some constituents may leach into deeper soils, highest concentrations are expected in shallow soil, which is thus considered to be the primary exposure medium. Site soil contains a variety of metals and pesticides, which have the potential to bioaccumulate in the food chain into higher trophic levels, such as birds and mammals.

As discussed in Section 3.2, the Site is located on an island in the subtropics, presenting unique characteristics for the selection of potential receptors. Common North American wildlife receptor species, such as the short-tailed shrew, cottontail rabbit, robin, and woodcock, are not present at the Site. An evaluation of Site characteristics and species present at the Site was conducted to identify feeding guilds likely to experience the highest exposure.

As an island, St. John is home to a limited array of both native and invasive flora and fauna. The only native mammals on the island are bats, none of which are listed as federal rare, threatened, or endangered species. Of the five native bat species known to be present on the island, one, the common bulldog bat, eats fish primarily, and another, the rare pallid bat, eats primarily mosquitos and other airborne insects (Appendix D). Due to the lack of surface water at the Site, exposure of these species to Site constituents in water is expected to be absent or minimal. The three remaining species are fruit-eating bats, which form the bulk of the bat population. Since soil constituents can accumulate in leaves, flowers, and nectar, which form the diet of these species, a complete exposure pathway exists to these mammalian herbivores.

Among the designated rare, threatened, or endangered birds in the US Virgin Islands, the only species associated with St. John (roseate tern) is a marine fish-eater and is therefore not expected to be exposed to Site Study Constituents, due to the lack of surface water. Terrestrial forest birds may be exposed to soil through the consumption of Site constituents that accumulate into invertebrate or mammalian prey or seeds and fruit of plants. A complete exposure pathway thus exists to avian invertivores, carnivores, and herbivores. Due to the tendency of many constituents to bioaccumulate in the tissue and lipids of soil invertivores, avian invertivores are likely to experience the highest exposure to Study Constituents through bioaccumulation in prey and direct soil consumption.

Amphibians and reptiles are present on the island, and reptiles and some adult amphibians may be present in upland areas. As detailed in Section 3.2, amphibians consist primarily of frogs. Rain frogs live primarily in trees and ditch frogs live near water; the native white-lipped frog is semi-aquatic. Exposure to Site Study Constituents is expected to be minimal for all types, due to habitat preferences. Although typically associated with specific areas, reptiles may also be present at and around the Site and may forage for invertebrates in the same areas as birds.

3.3.3 Pathway-Receptor Diagram

The ecological pathway-receptor diagram combines information about Study Constituents, exposure pathways, and potential receptors into an integrated model of the Site, and through visual depiction serves to simplify and illustrate risk pathways.

The pathway-receptor diagram for this Site is shown in Figure 2-1 and illustrates the potential movement of contaminants from their origin in various facility operations to ecological receptors in Site soil. The pathways presented reflect the exposure potential of Study Constituents through surface soil. Primary receptors are plants, terrestrial invertebrates, birds, and mammals.

3.3.4 Assessment Endpoints

As defined by USEPA, the assessment endpoint is "the explicit expression of the ecological value to be protected" (USEPA, 1997b). Assessment endpoints are the ultimate focus of the risk assessment and are evaluated by the measures of effects to develop a final risk characterization of the Site. An assessment endpoint most commonly consists of an ecological receptor and a characteristic of that receptor (e.g., survival and reproduction). In accord with the screening-level nature of this assessment, generic assessment endpoints, consisting generally of adverse effects on potential receptors, are used (USEPA, 1997b).

At this Site, the assessment endpoints consist of receptors considered to have the highest potential exposure to Study Constituents, as described above. Assessment endpoints for surface soils are thus as follows:

1. survival and growth of terrestrial plants
2. survival and growth of soil invertebrates
3. survival, growth, and reproduction of avian invertivores
4. survival, growth, and reproduction of mammalian herbivores

While the potential exists that some reptiles may be present in the vicinity of the Site, specific species information and toxicology data are lacking for most receptors. Exposure pathways of reptiles are similar to insectivorous birds, and potential effects on reptiles will be estimated by the evaluation of avian invertivores, who consume a similar diet. A correlation between avian and reptilian toxicology exists for many compounds, including pesticides (Weir 2015).

Measures used to evaluate these endpoints are described in the following section.

3.3.5 Measures of Exposure and Effect

Measures of exposure quantify or reflect the extent to which receptors are exposed to chemical stressors, in this case, the Study Constituents in soil. Measures of effect are values or characteristics that are used to estimate whether or to what degree a stressor may adversely affect a receptor. Effects on the receptors selected as assessment endpoints typically cannot be measured directly, so measures of effect often are based on literature data or surrogate species.

In this SLERA, the exposure of Site receptors to Site stressors is represented by the maximum measured concentrations of Study Constituents in soil, as determined from in the 2021 sampling results. For the ISM samples used in this analysis, the sample maximum is the highest concentrations detected from among the three ISM replicates.

Measures of effect for this SLERA consist of ecological benchmarks, referred to in this study as ESVs, or ecological screening values. The ESVs are generic, conservative, and chemical- and medium-specific screening concentrations associated with no or minimal potential for adverse effects. ESVs are intended to serve as conservative no-effect values, suitable for identifying constituents with negligible potential for risk. ESVs can be obtained from a variety of sources that differ in their approach and use of supporting data, and values from the same source are often not available for all compounds.

Specific sources of ESVs, the ESV values themselves, and the way in which they will be used to evaluate the potential for effects are presented in Section 3.4.

3.4 Analysis

This section describes the specific methods and values by which exposure and effects will be estimated.

3.4.1 Estimates of Exposure

As described in Section 1.2, surface soil concentrations are represented by ISM samples collected from three Investigation Areas: Area 1, located at the WWTP used equipment staging area; Area 2, the landscaping buildings and chemical storage sheds and gasoline and diesel ASTs and pump; and Area 3, the landfill. The location of each area is shown in Figure 1-2.

Each of the three Investigation Areas was broken into either four or five DUs, and each DU was sampled in triplicate. In accordance with the conservative intent of a SLERA, maximum detected values are used to identify preliminary contaminants of potential ecological concern (PCOPECs) for further evaluation in the Refinement. For ISM samples, the highest concentration detected among the three replicates is used as the maximum value to represent each DU. For all receptors, the highest value from among all the DUs within an Investigation Area is used to compare to ESVs and identify SLERA PCOPECs. Maximum detected surface soil sample results for each ISM are shown to the right of the summary statistics in Tables 3.2 through 3.4, for Areas 1, 2 and 3, respectively. Sample locations are shown in Figure 1-2.

3.4.2 Estimates of Effect

Measures of effect for this SLERA consist of ESVs. As discussed in Section 3.3.5, ESVs are generic, conservative, and chemical- and media-specific screening concentrations, below which effects are unlikely to occur. As such, they are suitable for identifying constituents with negligible potential for risk.

USEPA soil screening levels (SSLs) were the primary source of ESVs, when available. These values were developed by USEPA following a comprehensive literature acquisition and evaluation process and food chain modeling using conservative exposure parameters. If USEPA values were lacking, values were drawn from sources such as the Los Alamos National Laboratory (LANL), which uses USEPA SSLs and supplements with other primary literature to develop their screening values. These and other ESVs were obtained from NPS guidance (NPS 2018) where available and are receptor-specific values. Where USEPA, NPS, or LANL values are lacking, ESVs were drawn directly from a constituent-specific study. Sources for ESVs are listed below.

- USEPA 2005-2008, Ecological Soil Screening Levels, OSWER Directive 9285.7. Available at https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents

- Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.
- EPA Region 4, 2018, Ecological Risk Assessment Supplemental Guidance March 2018 Update.
- EPA Region 5, 2003. Ecological Screening Levels. Website version: https://www3.epa.gov/region5/waste/cars/pdfs/ecological-screening-levels-200308.pdf.
- Hulzebos, E.M. et al. 1993. Phytotoxicity studies with *Lactuca sativa* in soil and nutrient solution. Env. Tox . Chem. 12(6):1079-1094.
- Oak Ridge National Laboratory (ORNL), 1997. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. ES/ER/TM-126/R2. Oak Ridge, TN.
- Oak Ridge National Laboratory (ORNL) 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. ES/ER/TM-85/R3. Oak Ridge, TN.
- Beglinger J.M. and C.J. Ruffing, 1997. Effects of silver sulfide on the terrestrial earthworm. in Andren, Anders W.; Bober, Thomas W. (ed.) / The 5th international conference proceedings: transport, fate and effects of silver in the environment. Univ. of Wisconsin

Specific ESVs and sources are shown in Table 3.1.

To maximize the information obtained from the ESV screening in this SLERA, SSLs specific to each terrestrial receptor (plants, invertebrates, birds, and mammals) were used. No avian (bird) ESV for antimony was available.

3.5 Risk Calculation

The risk calculation is the final component of the SLERA process. In this step, the exposure information (media concentrations) and effects data (ESVs) described in Section 3.4 are compared to produce an estimate of the potential for risk to the receptors designated as assessment endpoints. Media concentrations relative to an ESV are represented by a hazard quotient (HQ), which quantifies the relationship between the exposure experienced by a receptor and the exposure levels documented in the literature as presenting negligible risk. The HQ is expressed as the following:

$$HQ = \frac{\text{Exposure concentration}}{\text{Chemical-specific ESV}}$$

For this screening calculation, maximum exposure is represented by the maximum detected concentration of each Study Constituent per Investigation Area, in accordance with USEPA guidance and the conservative screening goals of this SLERA. A maximum HQ of less than or equal to 1.0 indicates that all concentrations are below the threshold levels for potential toxic effects and that risks are likely to be negligible. These constituents are not retained for further evaluation. An HQ more than 1.0 for at least one receptor suggests that exposures may be associated with potential risk and that further evaluation of these constituents is thus warranted. Constituents with a maximum HQ greater than 1.0 are designated as PCOPECs and are retained for evaluation in Section 3.7, Refinement of PCOPECs.

As previously described, the assessment endpoints for this risk assessment target four different groups of terrestrial receptors: plants, soil invertebrates, birds, and mammals. Each is evaluated by a separate set of ESVs specific to that receptor. The results of this screening are shown by Investigation Area in Tables 3.2 through 3.4 for Area 1, Area 2 and Area 3, respectively. Each Investigation Area is discussed separately below.

SVOCs for plant receptors and DDT, DDE, and DDD for all receptors are evaluated in a manner different from other Study Constituents. As seen in Tables 3.2 through 3.4, the plant ESV for SVOCs is based on a combined concentration of PAH constituents, referred to as total PAH, or TPAH. Maximum concentrations per ISM sample, presented to the right of summary statistics in each table, are summed and used for comparison to the ESV for plant receptors. DDE and DDD are breakdown products of DDT that have similar chemical and physical properties. For all receptors, ESVs used for comparison are based on a summed concentration of DDT, DDE and DDD ("DDT and metabolites"). Therefore, the concentration of DDT and metabolites was summed for each triplicate ISM sample, and the maximum of these summed concentrations was selected and compared to the summed DDT and metabolites ESV for each area.

3.5.1 Risk Calculation for Investigation Area 1

The screening of IA-1 data (data from DUs IA-1-01 through IA-1-04) against ESVs is shown in Table 3.2. As shown, only metals exceeded ESVs in Area 1, and so are retained for further consideration. Study constituents with maximum detected concentrations that exceed ESVs are retained as PCOPECs for IA-1, and these are listed below, by receptor.

Investigation Area 1 Soil PCOPECs, by Receptor			
Plant	Invertebrates	Birds	Mammals
Copper Thallium	Copper Zinc	Chromium Copper Lead Mercury Zinc	Chromium Copper Zinc

Avian receptors have the most ESV exceedances (five metals), compared to plants, invertebrates, and mammals, which each have two or three exceedances each. The maximum copper concentration exceeded ESVs for all four receptors, and the avian HQ for copper (4.3) is the highest HQ in Area 1. The maximum zinc concentration poses the next highest potential for risk, with an HQ > 1.0 for all receptors except plants, and a maximum HQ of 3.3 for avian receptors. No VOCs were detected in Area 1, and no pesticide or SVOC concentrations exceeded ESVs.

3.5.2 Risk Calculation for Investigation Area 2

Compared to Areas 1 and 3, Area 2 contains both higher numbers of constituents with ESV exceedances and higher HQs, particularly for pesticides. Antimony was retained for birds because no ESV exists for this constituent. The constituents with maximum concentrations above ESVs are listed below by receptor. Study constituents with maximum concentrations that exceed ESVs or for which ESVs are lacking are retained as PCOPECs for IA-2, and these are listed below, by receptor.

Investigation Area 2 Soil PCOPECs, by Receptor			
Plant	Invertebrates	Birds	Mammals
Barium Copper Zinc DDT and metabolites Aldrin Chlordane (technical) [7]	Copper Mercury Zinc DDT and metabolites Chlordane (technical) Cis-Chlordane Dieldrin Endosulfan I Endosulfan II Endosulfan sulfate Trans-Chlordane	Antimony (no ESV) Chromium Copper Lead Mercury Zinc DDT and metabolites Chlordane (technical) Dieldrin	Cadmium Chromium Copper Zinc DDT and metabolites Aldrin Chlordane (technical) Dieldrin

Invertebrate receptors have the most exceedances in Area 2, including three metals and eight pesticides. Area 2 has higher pesticide concentrations relative to ESVs compared to metals, with an average pesticide HQ > 1.0 of 252, compared to an average detected metal HQ > 1.0 of 4.6. Notably, the dieldrin HQ for invertebrates is 1,862, and 1,102 for mammals, suggesting a high potential for risk.

Both chlordane (technical) and DDT and metabolites are detected above ESVs for all four receptors. As shown in Table 3.3, DDT ESVs for all receptors are in terms of the summed DDT and metabolites (DDD, DDE, and DDT). When compared to the total DDTs ESV, DDT and metabolites concentrations have HQs of 104, 132, and 586 for invertebrate, avian, and mammal receptors, respectively. While chlordane concentrations also exceed all four receptor ESVs, the magnitude of exceedance is comparatively less, with a maximum HQ of 39.4 for invertebrate receptors.

Among metals, both copper and zinc maximum concentrations are above ESVs for all four receptors, while mercury concentrations present the highest metal HQ of 9.2 No SVOCs were detected above ESVs in Area 2.

3.5.3 Risk Calculation for Investigation Area 3

Area 3 PCOPECS include a mix of metals and pesticides, as shown in Table 3.4 and the chart below. Antimony was retained for birds because no ESV exists for this constituent. Study constituents with

[7] Technical chlordane is a commercial grade of chlordane that may contain a mix of forms.

maximum concentrations that exceed ESVs or for which ESVs are lacking are retained as PCOPECs for IA-3, and these are listed below, by receptor.

Investigation Area 3 Soil PCOPECs, by Receptor			
Plant	Invertebrates	Birds	Mammals
Copper Aldrin	Copper Mercury DDT and metabolites Dieldrin	Antimony (no ESV) Cadmium Copper Lead Mercury Zinc DDT and metabolites	Antimony Cadmium Copper Zinc DDT and metabolites Dieldrin

Mammal and avian receptors have the most exceedances (six HQs >1.0), followed by invertebrates (four exceedances), and plants (two exceedances). As in the other two areas, the maximum copper concentration exceeds ESVs for all four receptors. The maximum HQs among metals are for mercury (4.8), lead (4.0), and copper (3.9) all for avian receptors. In contrast, all pesticide concentrations are below ESVs for avian receptors. The maximum HQ among pesticides and the maximum HQ in Area 3 is 8.9 for DDT and metabolites for mammal receptors. No VOCs were detected in Area 3, and no SVOCs were detected above ESVs.

In summary, some metals and pesticides exceeded ESVs in all three Investigation Areas, while PAHs did not exceed ESVs in any Investigation Area. All constituents highlighted in Tables 3.2 through 3.4 and listed in the summary tables above are designated as PCOPECs and retained for further analysis in the Refinement in Section 3.7.

3.6 Summary of Screening Level Risk Assessment

In this section, study constituents in soil were compared to ESVs to separate those constituents associated with negligible potential for risk from constituents for which further study is required. Those with maximum concentrations below the ESV were eliminated from further consideration, while those with concentrations exceeding benchmarks in at least one sample for at least one receptor were designated as PCOPECs and retained for further evaluation.

This study showed that within Investigation Area 1, six metals were detected at concentrations above one or more receptor ESV and will be retained for further analysis. All detected pesticide and SVOC concentrations were below ESVs, and therefore are eliminated from further evaluation. The highest HQ in Area 1 is 4.3 (copper and avian receptors) and the average HQ > 1.0 is 2.5.

Investigation Area 2 presents the highest potential for risk to ecological receptors, particularly for pesticides, which have an average HQ >1.0 of 252, with the highest HQs per pesticide constituent typically associated with invertebrate receptors. The highest HQ in Area 2 is 1,862 (dieldrin and invertebrate receptors). Metals pose comparatively less potential for risk, with an average HQ >1.0 of 4.6, slightly higher than that of Area 1. In total, seven metals and 12 pesticides are retained for further analysis in Area 2.

Investigation Area 3 includes six metals and three pesticides to be retained for further analysis. The highest HQ in Area 3 is 8.9 (DDT and metabolites for mammal receptors), and the average HQ >1.0 among pesticides is 5.0. The average HQ > 1.0 among metals is 3.0, similar to Area 1.

3.7 Refinement of Contaminants of Potential Concern

In this analysis, each constituent that exceeded ESVs in Section 3.6 and was designated as a PCOPEC is evaluated further by considering additional toxicity data and Site-specific information. The goal of this analysis is to reduce the uncertainty associated with the use of conservative exposure and screening-level toxicity assumptions so that the final risk conclusions are still conservative, but more relevant to Site-specific conditions and actual levels of effect. The refinement incorporates additional toxicity literature and Site-specific receptor information into the evaluation of soil data, and so expands the level of interpretation to beyond that of the screening-level approach. SLERA PCOPECs that exceed Refined SSLs in at least one location are designated as COPECs. The results of this analysis provide a more accurate understanding of potential Site-related risk than the screening analysis and are used to inform subsequent investigation or risk management decisions for COPECs identified in this section.

3.7.1 Overview of Refinement Approach

In this Refined Analysis, each SLERA PCOPEC is evaluated further by considering additional toxicity data and Site-specific information. Additional factors that are considered in this section are as follows:

- **Comparison to Refined Soil Screening Levels:** As noted earlier, ESVs are typically values associated with a low or negligible level of effect. Also useful are values associated with the onset or a low probability of effect. These refined values can be calculated using EPA methods and toxicological data for soil. Soil PCOPECs with concentrations that exceed ESVs are screened against these refined screening values to bracket the potential for risk.
- **Use of ISM DU-specific Exposure Estimates:** In the SLERA screening, Area-wide maximum detected concentrations of constituents were used as exposure point concentrations. In this Refinement, data are evaluated on an ISM DU-specific basis, and the 95% upper confidence limit from the three replicates at each DU is used as the exposure point concentration for plants, invertebrates, and wildlife instead of the area-wide maximum. For plant and invertebrate receptors, the use of ISM DU estimates more accurately reflects potential risk, as these receptors are either stationary or may live their entire life cycle in one small area. For wildlife (birds and mammals), however, the use of ISM DU estimates likely overestimates risk, since these receptors are mobile and forage throughout and beyond the Site.

Comparison to Background Concentrations: As a final step, PCOPECs concentrations are also evaluated in relation to reference/background concentrations. This evaluation helps put Site data in context relative to non-Site-related areas and is particularly useful for anthropogenic or naturally-occurring constituents like metals and legacy pesticides.

In the subsections that follow, the methods for obtaining Refined screening levels for both wildlife and soil biota (plants and invertebrates) are described. These values are then used in Section 3.7.3 along with the other factors described above to develop a final assessment of the potential for risk.

3.7.2 Development of Refined Soil Screening Levels

Refined soil screening levels (SSLs) for soil biota and wildlife were developed using methods that vary by receptor. The general approach is described below, followed by specific details for each receptor.

Soil ESVs used in the SLERA are generally derived from no-observed-effect-levels (NOELs) used in individual toxicological studies. NOELs are values at, or below which effects are unlikely or not observed. Also available in the toxicological literature are values where actual effects are observed. These "lowest observed effect levels" (LOELs) typically are the lowest test concentration in toxicological studies where statistically significant adverse effects are documented. The actual concentration where effects actually begin lies somewhere between the NOEL and the LOEL.

Refined SSLs used in this report are calculated to be midway (i.e., the average) between the SLERA ESV (the NOEL) and a calculated LOEL value derived from the literature. They are concentrations in soil that conservatively represent levels below the LOEL where the onset of effects may occur. Site soil concentrations are then screened against Refined SSLs in the same manner they are with ESVs in the SLERA.

Where available, LOELs were derived or obtained from the datasets used by USEPA to develop their published Ecological SSLs (Eco-SSLs), which are used as ESVs in this report. These datasets are provided in the technical documents prepared by USEPA for each Eco-SSL constituent (USEPA 2005 – 2008). For constituents without Eco-SSLs, LOEL data was drawn from the Los Alamos National Laboratory (LANL) Ecological Screening Level database (LANL 2020) or from other literature sources.

The methods used to select LOELs for each receptor are described below, and the Refined SSLs and sources are presented in Table 3.5 A through Table 3.5 D.

3.7.2.1 Refined Soil Screening Levels for Plants and Invertebrates

Plant and invertebrate LOELs and Refined SSLs are shown in Tables 3.5 A. and 3.5 B., respectively. For both receptors, LOEL values were obtained from the LANL EcoRisk database (Version 4.2), the EPA Eco-SSL databases, or directly from the scientific literature. Sources, values, and details about estimation methods are included in the table footnotes. The midpoint between the ESV (NOEL) and the selected LOEL value for each constituent was calculated as the Refined SSL for each constituent.

3.7.2.2 Refined Soil Screening Levels for Wildlife

As described previously, Refined wildlife SSLs were calculated as the midpoint between two soil values: the NOEL-based ESVs used in the SLERA, and site-specific LOEL-based SSLs developed using site-specific receptors and exposure parameters along with toxicity values from the same sources as the ESVs.

LOEL-based SSLs for wildlife were calculated using food chain models, which estimate the daily dose of a contaminant to a representative mammalian and avian receptor. Estimated receptor doses are compared to a toxicity reference value (TRV), which is a dose associated with adverse effects in a test species.

The relationship between the estimated dose and the TRV is quantified as a hazard quotient in the same manner as soil concentrations and ESVs in the SLERA, and hence an estimated dose that equals the TRV generates an HQ equal to one. The LOEL-based SSL is back-calculated from these food chain equations and is the concentration in soil that produces an exposure dose equal to the LOEL TRV, producing a dose-TRV HQ of 1.0. This is the same approach used by USEPA to develop the Eco-SSLs, except that the estimated dose is compared to a LOEL TRV rather than the NOEL TRV used for the Eco-SSLs. In addition, exposure parameters in this report are based on site-specific species rather than the North American species used for the Eco-SSLs. The Refined SSL is then calculated as the midpoint between the (NOEL-based) ESV and the LOEL-based SSL.

LOEL TRVs for constituents with Eco-SSLs are derived from the LOEL datasets provided in the Eco-SSL technical background documents prepared for each constituent by EPA (EPA 2005-2008). LOEL TRVs are chosen as either the geometric mean (geomean) or 20th percentile of LOEL data for growth and reproduction, depending on the relationship to the NOEL TRV used for the Eco-SSL. LOEL TRVs for constituents without EPA Eco-SSLs are obtained from the LANL EcoRisk database if available or from the scientific literature.

The model used to calculate the LOEL-SSLs for both birds and mammals is provided in Appendix E. Appendix E also includes the selected EPA LOEL TRVs and the source of those values, as well as bioaccumulation equations for calculating constituent concentrations in earthworms or plants. Bioaccumulation of many pesticides into plants is relatively low, a characteristic that generates relatively high Refined SSLs for herbivores.

For both birds and mammals, LOEL-based SSLs were calculated based on the feeding characteristics of species native to the Virgin Islands and St. John, specifically. Details of the process used to select representative site-specific species are presented separately for each receptor, below.

Representative Avian Invertivore Selection

USEPA derived Eco-SSLs for an array of surrogate receptors that represent different feeding guilds and trophic levels, specifically insectivores, carnivores, and herbivores or grainivores. The final Eco-SSLs were calculated using the receptor with the highest exposure, as indicated by the highest estimated dose. Surrogate receptors were not chosen based on habitat type, but rather on specific physiological and feeding characteristics, which were: 1) small body size (associated with a high metabolic rate); 2) direct link to soil through feeding and foraging; and 3) simple dietary composition, consisting primarily of a single food type (USEPA, 2005d). Receptors with these characteristics can be found on most sites, regardless of habitat. For almost all constituents, the receptors with the highest exposures were insectivores, represented by the American woodcock in USEPA SSL avian models.

However, the American woodcock is not present in the Virgin Islands, and its large body size is not representative of most forest species that are present. An alternative invertivore species was thus selected that met the additional criteria of being both native to St. John and resident year-round, since year-round residents have the highest potential for exposure. The species meeting these criteria and used as the basis for generating avian Refined SSLs was the pearly-eyed thrasher *Margarops fuscatus.*

The pearly-eyed thrasher is an abundant species throughout St. John and the Virgin Islands generally, living in mountain forests and thickets. While omnivorous, its diet consists primarily of large insects such as beetles, crickets, and other invertebrates, which it scavenges by probing into soil and leaf litter. As a successful breeder and nest predator with an aggressive manner and frequent calls, it is ubiquitous throughout the islands, often to the point of nuisance. It is often found in edge environments or in disturbance-prone areas, so is expected to be a common species at the Site (Arendt 2020, USFS undated).

Because of its presence on St. John and the relatively high potential exposure to soil contaminants that its diet and feeding practices incur, the pearly-eyed thrasher was selected as a representative species for the purpose of generating Refined SSLs. Characteristics of the pearly-eyed thrasher (body weight and estimated food ingestion rate) were used in the exposure modelling equations that generate the LOEL-SSL, one of the factors for calculating the Refined SSL (Appendix E). Body weight and food ingestion rates were obtained from the scientific literature, and values and sources are identified within the model spreadsheets.

Refined SSLs for wildlife are shown in Table 3.5 C and 3.5 D.

Representative Mammalian Herbivore Receptor Selection

As with avian SSLs, mammalian Refined SSLs were calculated using a representative receptor characteristic of the unique mammalian population of the Virgin Islands. As described in Section 3.2, the only mammals native to St. John are various species of bats, none of whom feed on ground-dwelling invertebrates in the manner typical of the northern short-tailed shrew, used by USEPA in the calculation of Eco-SSLs. No burrowing small mammals are native to St. John, and the only such species present are introduced vermin species such as rats and mice. While the Eco-SSLs based on exposures to the shrew were used as ESVs a conservative measure, Refined SSLSSLs were calculated from LOEL-SSLs reflective of exposures to a bat.

As described in Section 3.2., five species of bats have been confirmed as present on St. John (NPS 2020). As illustrated in the table below, diets are diverse, but three of these five species are fruit-eating bats.

Common Name	Diet	Diet Information Source
Pallas' free-tailed bat	Insectivores with a diet consisting primarily of mosquitoes and other airborne insects.	US Forest Service https://www.fs.usda.gov/detail/elyunque/learning/nature-science/?cid=fsbdev3_042947
Greater bulldog bat	Primarily fish. It will also eat aquatic crustaceans, stinkbugs, crickets, scarab beetles, moths, winged ants, and other insects, but primarily, it is a piscivore (fish-eater).	Univ. Michigan Animal Diversity Web https://animaldiversity.org/accounts/Noctilio_leporinus/

Jamaican fruit-eating bat	Majority of diet is brightly-colored, fragrant fruits like figs. They also eat leaves, flowers, pollen, and nectar.	National Wildlife Federation https://www.nwf.org/Educational-Resources/Wildlife-Guide/Mammals/Bats/Jamaican-Fruit-Eating-Bat.
Antillean fruit-eating bat	Opportunistic in feeding habits, consuming fruit, pollen, flowers, nectar and insects. They are considered primarily nectarivores	Univ. Michigan Animal Diversity Web https://animaldiversity.org/accounts/Brachyphylla_cavernarum/
Red fruit bat	Fruits of various trees	US Forest Service https://www.fs.usda.gov/detail/elyunque/learning/nature-science/?cid=fsbdev3_042897

As described in Section 3.2, fruit-eating bats play an important ecological role in island ecology, dispersing seeds of fig and other fruit trees and thus helping to maintain the unique community structure of the native forests. Of these, the Jamaican fruit-eating bat is expected to be the most common, comprising 73% of captured individuals in netting studies on St. John (Lindsay et al. 2009) and similarly high proportions elsewhere (Orgeta and Castro-Artella 2001). Because of the dominance and importance of fruit-eating bats in the mammalian community and the predominance of the Jamaican fruit-eating bat in particular, the Jamaican fruit-eating bat was selected as the representative mammalian receptor for the development of Refined SSLs.

The range of the Jamaican fruit-eating bat extends north to south from central Mexico to northern South America, with distribution throughout the Caribbean islands, and is common and abundant throughout most of its range. The species is primarily found in mature lowland rainforests but lives in a variety of habitats at varying elevations, including deciduous forests, seasonal dry forests, and plantations from sea level to 7500 feet (Morrison, 2011). Weighing from 40 to 60 grams, the Jamaican fruit-eating bat reaches 70 to 85 mm in length. They roost in hollowed trees, dense foliage, caves, or buildings and are common throughout most of their range, typically being the dominant species present (Orego and Castro-Artella 2001). The species is considered "least concern" on the IUCN Red List of Threatened Species. Little is known of their home range size, but they have been recorded to fly up to 8 kilometers each night to forage (Morrison, 2011).

The Jamaican fruit-eating bat is frugivorous, feeding primarily on *Ficus* figs, which have been determined to comprise more than 78% of their diet, although leaves are consumed as an additional protein source (Ortega and Castro-Arellano 2001). It will also consume nectar, pollen, flower parts, and insects when fruits are scarce (Morrison, 2011). Since this species is known to be present on the island and consumes fruits, which may bioaccumulate study constituents from surface soil, the Jamaican fruit-eating bat is an appropriate representative species for mammalian herbivore wildlife receptors.

3.7.3 Refined Analysis of Surface Soil

Using the approach and Refined SSLs described in Section 3.7.2, a refined analysis of soil PCOPECs for each receptor was conducted and is described in this section. Separate discussions are provided for invertebrates, plants, and wildlife. Refined SSL screening results for each receptor are shown in Tables 3.6 A through 3.6 D. 95% UCL concentrations for PCOPECs in each DU are compared to Refined SSLs, with the result quantified as a Refined SSL hazard quotient, or RSSL-HQ.

Tables 3.6 A through 3.6 D each present the results for all Investigation Areas for one receptor. Concentrations within each ISM DU are represented by the 95% UCL concentration from the three ISM replicates from that DU. In Section 3.7.3.4, these results are also discussed by Area, to facilitate an Area-specific understanding of potential risk.

The DU 95% UCL concentration is evaluated relative to three numbers: 1) the maximum reference/background concentration, which is the maximum detected concentration or minimum detection limit for non-detected constituents from the two Reference Area ISM DUs; 2) the ESVs used in the SLERA evaluation to identify PCOPECs to be carried forward to the Refinement; and 3) the Refined SSL used to identify COPECs in the Refinement analysis. The names of constituents with Refined SSL-HQs > 1.0 are shaded in each table to more easily identify those constituents that exceed Refined SSLs in at least one location.

As described in Section 1.3.1, the 95% UCLs were calculated using the ITRC online calculator, which uses one half of the reporting limit for non-detect values. This Refinement and the human health risk assessment used the same ITRC calculator results, which are presented in Appendix A. However, DDT and metabolites were evaluated differently for the Refinement. Since the SLERA and Refinement ESVs and RSSLs use a summed DDT and metabolites concentration, the DDD, DDE, and DDT concentrations in Site samples were also summed and presented as one concentration. The summed DDT and metabolites concentration used in the 95% UCL calculator used one half the reporting limit for non-detect values. For example, if all DDT metabolites were non-detect values for one ISM sample, the number used in the 95% UCL calculator was a sum of one half of all three reporting limits. This is a conservative approach, as it has the potential to overestimate risk related to non-detect DDT metabolite values. Only those constituents identified as PCOPECs in the SLERA are carried forward into the Refined analysis.

3.7.3.1 Refined Analysis of Terrestrial Plants

Several metals and pesticides exceeded plant ESVs in the SLERA and so were retained for further analysis in the Refinement. Table 3.6 A presents DU-specific 95% UCL concentrations compared to reference, ESV, and Refined SSL concentrations to evaluate PCOPEC concentrations relative to both the surrounding area and risk-based values. The table presents only constituents with one or more ESV-HQ > 1.0 per Investigation Area. While about half of the DU 95% UCL concentrations are above reference, only 20% of samples are at concentrations above Refined SSLs. Barium, copper, zinc, DDT and metabolites, and aldrin exceed RSSLs in one or more DUs and are therefore identified as COPECs.

Area 2 contains the most plant Refined SSL exceedances (three metals and two pesticides), while Areas 1 and 3 only contain one ISM DU with an exceedance for copper. All RSSL-HQs > 1.0 are between 1.1 and 2.9 except for aldrin, for which concentrations produce an RSSL-HQ of 3.3 in DU IA-2-01 and of 11.4

DU IA-2-02. The RSSL-HQ of 11.4 is the highest plant RSSL-HQ at the Site. These results suggest that Area 2 presents the highest potential for risk to plant receptors, specifically in DU IA-2-01 and IA-2-02.

3.7.3.2 Refined Analysis of Soil Invertebrates

Table 3.6 B presents 95% UCL concentrations for each ISM-DU relative to reference and invertebrate RSSLs. Eleven constituents were present at concentrations above invertebrate ESVs in the SLERA and are thus evaluated in this table. About half of the 95% UCL concentrations exceed reference level, while only 12% are above invertebrate RSSLs.

Most of the RSSL exceedances are located in Area 2, where copper, zinc, DDT and metabolites, and chlordane (technical) concentrations are above invertebrate Refined SSLs. Of these, all RSSL-HQs are below 3.0 except for DDT and metabolites, which are present at a concentration 41 times higher than the RSSL in DU IA-2-02, presenting the highest potential for risk to invertebrate receptors. Area 1 RSSL-HQs are above 1.0 for copper and zinc, though only in one ISM DU for each, and all RSSL-HQs in Area 1 are below 1.4, suggesting a relatively low potential for risk. Area 3 has only one Refined SSL exceedance for copper at IA-3-03. With an RSSL-HQ of 1.5, this sample presents relatively low potential for risk.

Copper, zinc, DDT and metabolites, and chlordane (technical) are present at concentrations above invertebrate RSSLs and are therefore identified as COPECs for invertebrate receptors. The potential for risk is generally low to moderate (RSSL-HQ < 3.0), except for DDT and metabolites in DU IA-2-02, where 14.5 mg/kg of DDT and metabolites in soil produced an invertebrate RSSL-HQ of 41. A potential for risk due to DDT and metabolites is considered to exist at that location.

3.7.3.3 Refined Analysis of Birds

Area 2 had SLERA ESV-HQs > 1.0 for nine constituents, and Areas 1 and 3 had SLERA ESV-HQs > 1.0 for six and seven constituents, respectively, all of which were carried forward for analysis in the Refinement. However, as shown in Table 3.6 C, only one metal and three pesticides exceeded Refined SSLs. Copper has concentrations above RSSLs in one DU in all three areas, producing a maximum RSSL-HQ of 2.8 in IA-2-02, reflecting a soil concentration of 290.4 mg/kg. No Refined SSL for birds could be developed for antimony, but antimony concentrations (where detected) in Site soils (0.29 mg/kg; Table 3.4) are below maximum concentrations detected in reference soils (0.54 mg/kg) so are unlikely to present a potential for risk.

DDT and metabolites were present at low concentrations in Area 3, where a 95% UCL concentration produced an RSSL-HQs of 1.9 in IA-3-02. In Area 2, however, DU IA-2-02 had a 95% UCL concentration of 14.5 mg/kg of DDT and metabolites, producing an RSSL-HQ of 84.7. Likewise, a concentration of dieldrin in the same sample produced an RSSL-HQ of 4.5, and chlordane produced an RSSL-HQ of 1.3. In IA-2-01, 8.4 mg/kg of dieldrin in Area 2 produced an RSSL-HQ of 164.3, the highest for this receptor. These RSSL-HQs for DDT and metabolites and dieldrin suggest a significant potential for risk to birds from these pesticides.

Copper, chlordane, DDT and metabolites, and dieldrin are present at concentrations above avian RSSLs and are identified as COPECs. Concentrations of dieldrin and DDT and metabolites, which produce

RSSL-HQs of 164.3 and 84.7, respectively, have a signification potential to present a risk of adverse effect to birds in Area 2.

3.7.3.4 Refined Analysis of Mammals

Table 3.6 D presents 95% UCL concentrations for each ISM-DU relative to reference and mammal Refined SSLs. While nine constituents had mammal ESV-HQs > 1.0 and were carried forward for analysis in the Refinement, only dieldrin is present at concentrations above mammal Refined SSLs, and only in two locations. ISM DU IA-2-02 has an RSSL-HQ of 1.5 for dieldrin, presenting a relatively low potential for risk. However, IA-2-01 contained 8.4 mg/kg of dieldrin, producing an RSSL-HQ of 55, which is the highest mammal RSSL-HQ across all Areas. A potential for risk may exist at this location. As noted previously, Refined SSLs for pesticides reflect the relatively low rate of biotransfer of pesticides into plant tissue, even at high soil concentrations.

Only dieldrin is identified as a COPEC for mammalian receptors, and the potential for risk is localized to IA-2-01.

3.7.3.5 Review of Refined Analysis by Area

Tables 3.7 A through C illustrate the distribution of RSSL-HQs by Investigation Area and help to illustrate the potential for risk across all receptors in each Area. As shown by these tables, Areas 1 and 3 show no or low exceedances in most DUs, with exceedances consisting primarily of copper and zinc, which had a maximum RSSL-HQ of 1.5. One DU in Area 3 had DDT and metabolites over the Refined SSL however, producing an RSSL-HQ of 1.9 in IA-3-02. This value suggests a slight potential for risk to birds from DDT and metabolites in Area 3.

As shown by Table 3.7 B, Area 2 has the highest number of COPECs and the highest RSSL-HQs across all receptors. With one exception, all exceedances were in DUs IA-2-01 or IA-2-02 and produced highest RSSL-HQs for pesticides. In these two DUs in Area 2, elevated RSSL-HQs were obtained for all receptors: 11.4 for aldrin effects to plants, 41 for DDT and metabolites effects to invertebrates, 84.7 and 164.3 for effects to birds from DDT and metabolites and dieldrin, respectively, and 55 for dieldrin effects on mammals. No exceedances occurred in IA-2-03 or -05, and only aldrin slightly exceeded the Refined SSL for plants in IA-2-04, producing an RSSL-HQ of 1.2. These results suggest that a significant potential for risk may exist to all receptors in IA-2-01 or IA-2-02, primarily from dieldrin, aldrin, and DDT and metabolites, for individuals that forage preferentially in those areas.

These analyses reflect the condition of each investigation Area as it currently exists. Areas 1 and 2 are flat with few erosional factors that may change exposure conditions. As described in Section 3.1, a concrete-lined drainage ditch exists behind (north of) Area 2, but the vegetated nature of the stretch between the conveyance and Area 2 would minimize the movement of soil particles, so the potential for constituent distribution from Area 2 is expected to be small. Although the conveyance is flushed with every storm event, accumulated residuals in the channel is considered as part of a removal action for Area 2, a step that will address historical depositions.

The former landfill that constitutes Area 3 lies near the ocean. The area could be affected by storm surges or flooding in future storm events.

3.7.4 Summary of Soil Refinement

In this section, a refined analysis of each of the PCOPECs identified in the SLERA was conducted to obtain additional information about the potential for risk to terrestrial receptors from Site constituents in soil. The analysis was conducted by comparing ISM DU 95% UCL concentrations to Refined SSLs developed from the USEPA SSL dataset, or from LANL or other literature sources when USEPA SSL data were not available. Refined SSLs for wildlife were calculated using exposure parameters for site-specific receptors (the pearly-eyed thrasher and the Jamaican fruit bat) and are based on the assumption that both birds and mammals feed exclusively at the Site.

Constituents that exceed Refined SSLs were identified as COPECs. Seven COPECs were identified for one or more receptors, and these are shown below, along with maximum RSSL-HQs for each.

Refinement COPECs and RSSL-HQs - All Areas			
Plant	Invertebrates	Birds	Mammals
Barium – 1.7 Copper – 2.7 Zinc – 1.7 Aldrin – 11.4	Copper – 2.9 Zinc – 2.3 DDT and metabolites - 41 Chlordane (technical) – 1.5	Copper – 2.8 DDT and metabolites – 84.7 Chlordane – 1.3 Dieldrin – 164.3	Dieldrin - 55

In general, the highest RSSL-HQs were associated with potential effects on birds, particularly from dieldrin and DDT and its metabolites, which produced RSSL-HQs of 164.3 and 84.7 respectively for effects on birds. The highest RSSL-HQs were generally associated with pesticides (specifically aldrin, dieldrin, and DDT and its metabolites) and were elevated for at least one pesticide in all receptor groups. This indicates a potential risk to each receptor at some locations from one or more pesticides, particularly for dieldrin and DDT and its metabolites.

Results were also evaluated on an Area-specific basis. These and other results are consolidated in Table 3.8, which shows all RSSL-HQ results segregated by Area and DU and colored to indicate a broad qualitative assessment of potential risk. As discussed in previous sections and shown in Table 3.8, the analysis shows the following:

- Each of the three Investigation Areas had two DUs with no exceedances. These were DUs 2 and 3 in Area 1, DUs 3 and 5 in Area 2, and DUs 1 and 4 in Area 3. This indicates that elevated concentrations are not consistently distributed in all Areas.
- Across all Areas, concentrations of copper, barium, and zinc in soils typically produced RSSL-HQs of 1.1 to 2.9, with most values below two. These are naturally-occurring constituents which may be associated with a low (for HQs below 2.0) to moderate potential for risk, since natural concentrations can vary widely and may constitute a significant fraction of the total measured concentration.

- Areas 1 and 3 had relatively low RSSL-HQs, for few constituents. COPECs in Areas 1 and 3 consist of copper and zinc, as well as DDT and metabolites for Area 3; however, all RSSL-HQs in these two areas are below 1.5 for copper and zinc, relative to effects on plants, invertebrates, and birds. No constituents were present at concentrations above mammal RSSLs in these two areas.
- DDT and metabolites are present at concentrations over Refined SSLs in one DU in Area 3. In Area 3, IA-3-04 produced an RSSL-HQ of 1.9, both for effects on birds from exposure to DDT and metabolites. This HQ suggests a moderate potential for risk in this specific DU in Area 3.
- Area 2 had the highest concentrations of most COPECs, and hence the highest potential for risk. However, most elevated concentrations were in two DUs only: IA-2-01 and IA-2-02. In these two DUs only, elevated levels of dieldrin, aldrin, and DDT and metabolites had concentrations producing RSSL-HQs ranging from 11.4 to 163.4, by analyte and receptor.
- DU IA-2-01 in Area 2 had concentrations of dieldrin that produced the highest RSSL-HQs for birds (163.4) and mammals (55) at the Site. Both HQs suggest a significant potential for risk for individuals who spend a majority of time foraging at this DU.
- DU IA-2-02 in Area 2 presents the highest potential for risk to plant and invertebrate receptors, which may spend their entire lifecycle in this one DU area. In this DU, the plant RSSL-HQ is 11.4 for aldrin and the invertebrate RSSL-HQ is 41.0 for DDT and metabolites. These HQs both suggest a significant potential for effect to these receptors that are non-mobile (plants) or have a relatively small range (invertebrates). Also, in this DU, DDT and metabolites produced an RSSL-HQ of 84.7 for the bird, also within the range of significant potential risk for individuals feeding primarily in this area.

In summary, a significant potential for adverse ecological effects is considered to exist at the Site, largely from the presence of pesticides in a portion of Area 2, and to a lesser extent in Area 3. For wildlife, this risk is in proportion to the amount of time they spend foraging in affected DUs directly. Seven constituents were identified as COCs: barium, copper, zinc, aldrin, chlordane, dieldrin and DDT + metabolites.

Because significant potential for risk is identified, ecological RBCGs were developed for these COCs in Section 4 of this report.

3.8 Uncertainty Analysis

Ecological risk assessments are subject to a wide variety of uncertainties as the result of both the assumptions used to describe Site conditions, receptor exposure, and the natural variability in receptor behavior and toxicological response. Ecological risk assessments must estimate or infer information about receptors, exposures, and effects to reach a conclusion about potential effects at both the individual and population level. While such assumptions do not negate the conclusions of the assessment, they influence how the conclusions are used when making risk management decisions.

This risk assessment was conducted in accordance with USEPA and NPS guidance and standard practice regarding the use of ESVs and food chain models. However, numerous assumptions underlie data collection, data evaluation, risk analysis, and risk characterization. These assumptions, and their tendency to lead to either an underestimation or overestimation of risk, are listed in Table 3.9.

While some assumptions made during a typical SLERA may clearly underestimate or overestimate effects, for many assumptions the relationship is unknown, since no data exist for the parameter of interest. These assumptions are different from natural variability, which is inherent in the modeling of any natural system. The evaluation of uncertainty conducted for this SLERA shows that the cumulative effect of the assumptions adds a level of conservatism consistent with the screening level approach of this document. However, no adjustment to the conclusions of this report is considered necessary as the result of the uncertainty evaluation.

4 Development of Risk-Based Cleanup Goals

Risk-based cleanup goals (RBCGs) for soil were developed based on potential human health and ecological risks identified in the Site-specific HHRA and SLERA (see Sections 2.4.4 and 3.4, respectively). These RBCGs were used to identify areas within the investigation Areas for removal action determination and to support estimations of areas and/or volumes of impacted soil at the Site.

4.1 Human Health Risk-Based Clean Up Goal

The HHRA determined that arsenic, aldrin, and dieldrin in surface soil (0-0.5 ft-bgs) posed an unacceptable carcinogenic risk for following receptors:

- Park/Resort Worker: dieldrin in Area 2
- Construction Worker: dieldrin in Area 2
- Resident: arsenic in Areas 1, 2, and 3 and aldrin and dieldrin in only Area 2

Arsenic, aldrin, and dieldrin were identified as the risk drivers that contributed to the majority of the total cancer risk. Therefore, a human health RBCG was calculated for these constituents to use in the development of cleanup goals for the Site that will be protective of Park/Resort Worker, Construction Worker, and future Resident.

The human health-based soil RBCGs for these constituents were calculated using a simple ratio approach. Because the HI and cancer risks are directly proportional to contaminant concentrations, a risk-based concentration may be calculated by comparing the ratio of the EPC in the medium of concern (in this case, soil) to the resultant hazard or risk to the ratio of the target contaminant concentration (i.e., the RBCG) to the target hazard/risk, or:

$$\frac{EPC}{HI\ or\ Cancer\ Risk} = \frac{RBCG}{Target\ HI\ or\ Cancer\ Risk}$$

This equation can then be rearranged to solve for the RBCG:

$$RBCG = (EPC * Target\ HI\ or\ Cancer\ Risk)/\ HI\ or\ Cancer\ Risk$$

Calculation of the cancer based RBCG is presented in Tables 4.1 through 4.3 for arsenic, aldrin, and dieldrin, respectively. Because no individual COPC concentration resulted in an HI greater than one, a noncancer-based RBCG was not warranted and therefore not calculated.

The cancer-based RBCG was based on a target cancer risk of 1E-06, the NPS point of departure for cancer risk. The identified Site-specific RBCG for each risk driver is listed below on Table 1, which is the lowest of the values derived for the Construction Worker, Park/Resort Worker, and Residential scenarios. This value was adjusted to also reflect target cancer risks of 1E-05 and 1E-04, as summarized in the following table.

Summary of Human Health[a] RBCGs

Contaminant	RBCG-Cancer Risk Level (mg/kg)		
	1E-06	1E-05	1E-04
Arsenic	0.677	6.77	67.7
Aldrin	0.039	0.39	3.9
Dieldrin	0.034	0.34	3.4

Notes:

[a]RBCGs are developed based on the residential receptor, which has the highest potential for exposure.

4.2 Ecological Risk-Based Clean Up Goals

Ecological RBCGs are risk-based soil concentrations protective of ecological receptors. They are typically developed for all constituents that present an ecological risk, and the lowest value from among all receptors for each constituent is chosen as the RBCG.

At this Site, receptor-specific soil RBCGs are developed for all constituents that exceed an RSSL and are designated as COPECs, since concentrations of identified COPECs have a potential to present some level of risk to at least one receptor. COPECs and receptors are identified in Section 3.7.4. Refined SSLs are used as RBCGs, since they are conservative estimators of the onset of risk.

Receptor-specific COPECs and their respective RSSLs are listed in the table below, along with the selected RBCG, which is the lowest concentration among the listed values and thus protective of all ecological receptors.

Summary Effect Level and Identified Ecological RBCGs in Soil

COPEC	Plant	Invertebrates	Birds	Mammals	Selected Eco RBCG
Barium	185	---	---	---	185
Copper	109	98.5	104	---	98.5
Zinc	205	147	---	---	147
Aldrin	0.018	---	---	---	0.018
Chlordane	---	1.2	1.4	---	1.2
DDT and metabolites	5.05	0.35	0.17	---	0.17
Dieldrin	---	---	0.051	0.2	0.051

All concentrations in mg/kg

---not a COPEC for this receptor

5 Conclusions

The HHRA and SLERA Refinement for the EE/CA Report used the analytical data collected in 2021 from the three Investigation Areas to evaluate the potential for human health and ecological risk from surface soil in Areas 1, 2, and 3 and subsurface soil in Area 3.

The HHRA identified estimated total cancer risks associated with exposure to COPCs in soil that exceeded the NCP Point of Departure of 1E-06 for Park/Resort Worker and Construction Worker in Area 2, and a future Resident in Areas 1, 2, and 3. These risks are as follows:

- The total cancer risk for the Park/Resort Worker in Area 2 was driven by the incidental ingestion of and dermal contact with dieldrin in soil.
- The total cancer risk for the Construction Worker in Area 2 was driven by the incidental ingestion of and dermal contact with dieldrin in soil.
- The total cancer risks for the future Resident (child and adult) in Areas 1 and 3 were driven by the incidental ingestion of arsenic in soil. For Area 2, the total risk was driven by the incidental ingestion of and dermal contact with arsenic, aldrin, and dieldrin in soil.

All total HI values are at or below the NCP Point of Departure of one (1), when rounded to one significant figure, for all receptors within the three Investigation Areas. The HHRA identified arsenic, dieldrin and aldrin as human health COCs.

The SLERA and Refinement evaluated potential risks to plants, terrestrial invertebrates, birds and mammals exposed to surface soils in each of the three investigation Areas through both a screening level and more detailed Refined Analysis. The comparison of Site soil concentrations to Refined soil screening levels was quantified in terms of a RSSL-HQ. Values over 1.0 indicated an exceedance of the Refined SSLs.

Results indicated that a potential risk to ecological receptors may exist due to exposure to pesticides in Area 2 and, to a lesser extent in Area 3. Highest potential for risk is in DUs 1 and 2 in Area 2, where concentrations of DDT and metabolites, aldrin, and dieldrin produced RSSL-HQs of from 11.4 to 163.4, by analyte and receptor. In DU IA-2- 01, concentrations of dieldrin produced the highest RSSL-HQs for birds (163.4) and mammals (55) at the Site. In DU IA-2-02 in Area 2, the plant RSSL-HQ is 11.4 for aldrin and the invertebrate RSSL-HQ is 41.0 for DDT and metabolites. Both of these HQs suggest a significant potential for adverse effects to these relatively non-mobile receptors, which may spend their entire lifecycle in this one DU area.

Also in Area 2, DDT and metabolites produced an RSSL-HQ of 84.7 for the bird, indicating significant potential for risk. The magnitude of wildlife RSSL-HQs, which are based on the assumption that receptors feed exclusively at the DU, indicates a risk may be present for birds and small mammals (bats) that feed frequently in the area.

Lower risks, reflected by lower RSSL-HQs of 2.6 or less, were obtained in Areas 1 and 3. However, RSSL exceedances were not consistent throughout Investigation Areas; two DUs in each of these Investigation Areas had no exceedances of RSSLs for any receptor.

Potential risks to ecological receptors are present in Area 3. DDT and metabolites are present at concentrations over Refined SSLs at one DU in Area 3, indicating a moderate potential risk for ecological receptors in these DUs. As noted above, Area 3 consists of a heterogenous mixture of commingled waste material, meaning that soil samples collected in Area 3 may not reflect the highest contaminant concentrations present in the landfill. Moreover, as noted in the EE/CA Report, NPS has identified a risk of landfill slope failure and continuing erosion, which increase the chances that hazardous substances that may be buried in the landfill will be exposed or released in the future. The results of the ecological risk assessment for Area 3 should be considered in light of this ongoing erosion and risk of slope failure.

From the ecological risk analysis, seven constituents were identified as contaminants of ecological concern: barium, copper, zinc, aldrin, chlordane, dieldrin and DDT + metabolites. These seven, plus arsenic, identified as a human health contaminant of concern, comprise the eight contaminants of concern for the Site.

6 References

3E Consultants, Inc. 2017. Removal Site Evaluation Report, Caneel Bay Resort, St John. U, S. Virgin Islands, January.

Arendt, W. 2020. Pearly-eyed thrasher (Margarops fuscatus). Retrieved April 14, 2021, from Cornell University https://birdsoftheworld.org/bow/species/peethr1/cur/introduction

Arendt, W. J. 2006. Adaptations of an Avian Supertramp: Distribution, Ecology, and Life History of the Pearly-Eyed Thrasher (Margarops fuscatus) (Publication). United States Department of Agriculture. doi:https://www.fs.fed.us/global/iitf/pubs/iitf-gtr27a.pdf

Barksdale & Associates. 2014 Level 2 Environmental Site Assessment Report, Caneel Bay Resort, St. John, U.S. Virgin Island. March 5

Barksdale & Associates. 2012. Level 1 Pre-Acquisition Environmental Site Assessment Survey, Various Tracts, Caneel Bay Resort. September 4

ITRC (Interstate Technology & Regulatory Council). 2020. Incremental Sampling Methodology. ISM-2. Washington, D.C.: ITRC Incremental Sampling Methodology Team. Calculator for the Weighted 95% UCL for a Combined DU from Several Smaller DUs, version 3 (August 2020) webpage URL: not known at this time - refer to ITRC's ISM web page

ITRC. 2020 Incremental Sampling Methodology. ISM Update. Washington, D.C: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. October 2020. www.itrcwb.org

Linsday et al. 2009. A bat conservation and management plan for St. Thomas and St John, US Virgin Islands. Island Resources Foundation, St. Thomas, VI.

Los Alamos National Laboratory (LANL), 2019. Ecorisk Database Release 4.2 (November 2020) and updates). Los Alamos National Laboratory, Los Alamos, New Mexico.

Morrison, P. 2011. "Artibeus jamaicensis" (On-line), University of Michigan Animal Diversity Web. Accessed April 14, 2021 at https://animaldiversity.org/accounts/Artibeus_jamaicensis/

National Park Service (NPS), 2018. NPS protocol for the selection and use of ecological screening values for non-radiological analytes. Rev. 3 NPS Contaminated Sites Program, Washington DC.

National Parks Conservation Association (NPCA), 2008. Virgin Islands National Park, Virgin Islands Coral Reef National Monument- A Resource Assessment. Center for State of the Parks, Ft. Collins, CO.

National Park Service (NPS) 2021. NPSpecies Database: Birds. Accessed via https://www.nps.gov/viis/learn/nature/index.htm

Ortega, J. and I. Castro-Arellano, 2001. Artibeus jamaicensis. Mammalian Species, No. 662, pp. 1-9. Published by the American Society of Mammologists, June 5, 2001.

Platenberg, R. J. and J. M. Valiulis (Eds). 2018. United States Virgin Islands Wildlife Action Plan, Vol. 2: Habitats and Species. Final report to the USVI Department of Planning and Natural Resources

Division of Fish and Wildlife. University of the Virgin Islands and St. Croix Environmental Association, US Virgin Islands.

Rogers C. and R. Taytaud 1988. Marine and terrestrial ecosystems of the Virgin Islands National Park and Biosphere Resereve. Biosphere Reserve Report No. 29, National Park Service and Virgin Islands Resource Management Cooperative.

USEPA, 2021a. Regional Screening Levels. May 2021. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

USEPA, 2021b. Integrated Risk Information System (IRIS). On-line database. Office of Emergency and Remedial Response: Washington, D.C., May.

USEPA, 2015. Statistical Software ProUCL Version 5.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations, EPA/600/R-07/041, https://www.epa.gov/land-research/proucl-software.

USEPAa, 2014. Memorandum: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February 6, 2014. Office of Solid Waste and Emergency Response. OSWER Directive 9200.1-120. USEPA. 2009a. National Primary Drinking Water Standards. EPA 816-F-09-004. May.

USEPA, 2014b. Technical Review Workgroup Recommendations Regarding Gardening and Reducing Exposure to Lead-Contaminated Soils. OSWER 9200.2-142, May.

USEPA, 2011. Brownfields and Urban Agriculture: Interim Guidelines for Safe Gardening Practices. Summer 2011. https://www.epa.gov/sites/default/files/2015-09/documents/bf_urban_ag.pdf

USEPA, 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), EPA-540-R-070-002, OSWER 9285.7-82. January.

USEPA, 2005a. Guidelines for Carcinogen Risk Assessment, Risk Assessment Forum, EPA/630/P-03/001F. March.

USEPA, 2005b. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, Risk Assessment Forum, EPA/630/R-03/003F. March.

USEPA, 2008. Ecological Soil Screening Level for Chromium. OSWER Directive 9285.7-66.

USEPA, 2007a. Ecological Soil Screening Level for Copper. OSWER Directive 9285.7-68.

USEPA, 2007b. Ecological Soil Screening Level for Dieldrin. OSWER Directive 9285.7-56.

USEPA, 2007c. Ecological Soil Screening Level for DDT & Metabolites. OSWER Directive 9285.7-57.

USEPA, 2005a. Ecological Soil Screening Level for Cadmium. OSWER Directive 9285.7-65.

USEPA, 2005b. Ecological Soil Screening Level for Lead. OSWER Directive 9285.7-70

USEPA, 2005c. Ecological Soil Screening Level for Antimony. OSWER Directive 9285.7-61.

USEPA, 2005d. Guidance for Developing Ecological Soil Screening Levels. OSWER Directive 9285.7-55.

USEPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.

USEPA, 2004. Risk Assessment Guidance for Superfund, Part E. Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/05, July.

USEPA, 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53.

USEPA, 2001a. Risk Assessment Guidance for Superfund/ Volume I/ Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Publication 9285.7-47. December.

USEPA, 2001b. ECO Update: The Role of Screening Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments. EPA 540/F-01/014.

USEPA, 1997a. Health Effects Assessment Summary Tables (HEAST). EPA 540/R-97-036. July.

USEPA, 1997b. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. EPA-540-R-97-006.

USEPA, 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187.

USEPA, 1989. Risk Assessment Guidance for Superfund/ Volume I/ Human Health Evaluation Manual (Part A), EPA/540/1-89-002. December.

US Fish and Wildlife Service (USFWS) 2020. Threatened and endangered species and critical habitats under the jurisdiction of the U. S. Fish and Wildlife Service, Puerto Rico and U. S. Virgin Islands. Caribbean Ecological Services Field Office, Puerto Rico.

US Fish and Wildlife Service (USFWS) 2017. Caribbean Endangered Species Map. Caribbean Ecological Services Field Office, Puerto Rico.

US Forest Service (USFS) no date. Species account, El Yunque National Forest. Accessed at https://www.fs.usda.gov/detail/elyunque/learning/nature-science/?cid=fsbdev3_042902

VHB, 2021a. Sampling and Analysis Plan for Engineering Evaluation/Cost Analysis Site Investigation. Virgin Island National Park. EDL # 5SER3346. Prepared by VHB. February 5, 2021

VHB, 2021b. NPS Engineering Evaluation/Cost Analysis Field Activities Report. Virgin Island National Park. EDL # 5SER3346. Prepared by VHB. March 12, 2021

Weir, S. et al. 2015. Improving reptile ecological risk assessment: Oral and dermal toxicity of pesticides to a common lizard species (Sceloporus occidentalis). Env. Tox. and Chem. 34: 1778 – 1786.

Woodard & Curran, 2016. Draft Engineering Evaluation/ Cost Analysis Risk Assessment Work Plan. Virgin Islands. Caneel Bay Resort Site. Prepared by Woodard & Curran. November 18, 2016.

Tables

TABLE 1.1
SUMMARY OF 2021 ISM SOIL ANALYTICAL RESULTS FOR AREA 1

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]		Decision Unit 1							Decision Unit 2							Decision Unit 3							Decision Unit 4						
	Medium:	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-1-01 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-1-02 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-1-03 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-1-04 95% UCL [2]
	Sample Name:	IA-1-01 A		IA-1-01 B		IA-1-01 C			IA-1-02 A		IA-1-02 B		IA-1-02 C			IA-1-03 A		IA-1-03 B		IA-1-03 C			IA-1-04 A		IA-1-04 B		IA-1-04 C		
	Sample Date:	2/24/2021		2/24/2021		2/24/2021			2/24/2021		2/24/2021		2/24/2021			2/24/2021		2/24/2021		2/24/2021			2/24/2021		2/24/2021		2/24/2021		
	Depth (ft-bgs):	0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'		
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	
Metals																													
Arsenic	7440-38-2	2.2		2.5		2.3		2.59	5.9		5.4		7.6		8.24	2		1.9		2.2		2.29	1.7		1.7		1.9		1.96
Barium	7440-39-3	64		66		62		67.4	72		64		71		76.3	64		64		63		64.6	69		68		72		73.2
Beryllium	7440-41-7	0.25	J	0.3		0.26	J	0.315	0.27		0.27		0.26	J	0.276	0.24	J	0.24	J	0.22	J	0.253	0.24	J	0.22	J	0.23	J	0.247
Cadmium	7440-43-9	0.11	J	0.18	J	0.24	J	0.340	0.13	J	0.12	J	0.15	J	0.159	0.086	J	0.097	J	0.11	J	0.118	0.11	J	0.09	J	0.099	J	0.117
Chromium	7440-47-3	45		47		45		47.6	59		54		58		61.5	48		47		45		49.2	56		58		55		58.9
Copper	7440-50-8	99	^1+ F1	120	^1+	120	^1+	133	96	^1+	83	^1+	87	^1+	99.9	85	^1+	84	^1+	85	^1+	85.6	77	^1+	78	^1+	79	^1+	79.7
Lead	7439-92-1	10		10		12		12.6	9		9.4		10		10.3	10		10		10		10	5.3		4.9		5.5		5.7
Mercury	7439-97-6	0.024	J	0.032	J	0.033	J	0.038	0.025	J	0.022	J	0.02	J	0.027	0.024	J	0.023	J	0.027	J	0.0282	0.024	J	0.02	J	0.022	J	0.0254
Nickel	7440-02-0	29		30		28		30.7	28		24		27		29.8	23		21		22		23.7	25		26		24		26.7
Selenium	7782-49-2	0.25	J	0.27	J	0.23	J	0.284	0.18	J	0.19	J	0.22	J	0.232	0.2	J	0.23	J	0.23	J	0.249	0.17	J	1.4	U	0.16	J	1.121
Silver	7440-22-4	0.055	J	0.06	J	0.066	J	0.07	0.041	J	0.036	J	0.047	J	0.051	0.054	J	0.061	J	0.061	J	0.065	0.039	J	0.033	J	0.036	J	0.041
Thallium	7440-28-0	0.07	J	0.08	J	0.27	U	0.183	0.27	U	0.27	U	0.27	U	ND	0.28	U	0.26	U	0.27	U	ND	0.27	U	0.27	U	0.27	U	ND
Zinc	7440-66-6	110		110		110		110	120		100		110		126.9	71		67		72		74.5	150		110		140		168.4
Pesticides																													
4,4'-DDD	72-54-8	0.0048	U	0.0047	U	0.0048	U	ND	0.0049	U	0.005	U	0.005	U	ND	0.0013	J p	0.0045	U	0.0043	U	0.0032	0.0045	U	0.005	U	0.005	U	ND
4,4'-DDE	72-55-9	0.01		0.0037	J p	0.0095		0.0165	0.01		0.0064		0.017		0.0247	0.0043	U	0.0045	U	0.0043	U	ND	0.0045	U	0.005	U	0.005	U	ND
4,4'-DDT	50-29-3	0.0024	J p	0.0046	J	0.0034	J p	0.0062	0.0049	U	0.005	U	0.0031	J p	0.0033	0.0043	U	0.0045	U	0.0016	J p	0.0026	0.0045	U	0.5	U	0.005	U	ND
Dieldrin	60-57-1	0.0048	U	0.0047	U	0.0048	U	ND	0.0049	U	0.005	U	0.0011	J p	0.004	0.0043	U	0.0045	U	0.0043	U	ND	0.0045	U	0.005	U	0.005	U	ND
Semivolatile Organic Compounds (SVOCs)																													
1-Methylnaphthalene	90-12-0	0.0049	J	0.0043	J	0.0037	J	0.0053	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.0041	J	0.0113
2-Methylnaphthalene	91-57-6	0.0059	J	0.0062	J	0.0055	J	0.0065	0.0041	J	0.0056	J	0.005	J	0.0062	0.0045	J	0.0056	J	0.0051	J	0.006	0.008	J	0.0051	J	0.0067	J	0.0103
Acenaphthene	83-32-9	0.01	J	0.0075	J	0.0087	J	0.0108	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.01	J	0.0108	0.0048	J	0.015	U	0.01	J	0.014
Anthracene	120-12-7	0.014	J	0.012	J	0.016		0.0174	0.015	U	0.0034	J	0.0044	J	0.0105	0.0072	J	0.0075	J	0.038		0.0621	0.0065	J	0.015	U	0.021		0.032
Benzo_a_anthracene	56-55-3	0.067		0.04		0.056		0.0885	0.015	U	0.017		0.027		0.0417	0.076		0.079		0.29		0.457	0.031		0.015	U	0.063		0.104
Benzo_a_pyrene	50-32-8	0.071		0.04		0.058		0.0955	0.015	U	0.016		0.031		0.0481	0.064		0.071		0.22		0.3401	0.034		0.015	U	0.063		0.1047
Benzo_b_fluoranthene	205-99-2	0.1		0.063		0.085		0.1295	0.012	J	0.027		0.044		0.068	0.088		0.12		0.31		0.4747	0.055		0.015	U	0.086		0.149
Benzo_g,h,i_perylene	191-24-2	0.02		0.015		0.023		0.0295	0.015	U	0.013	J	0.026		0.0394	0.029		0.027		0.06		0.0852	0.025		0.015	U	0.033		0.0547
Benzo_k_fluoranthene	207-08-9	0.036		0.021		0.024		0.047	0.015	U	0.015	U	0.018		0.0263	0.039		0.031		0.13		0.2051	0.015		0.015	U	0.036		0.0567
Chrysene	218-01-9	0.067		0.039		0.054		0.0886	0.0092	J	0.018		0.035		0.0537	0.075		0.078		0.27		0.422	0.037		0.0034	J	0.064		0.1112
Dibenz(a,h)anthracene	53-70-3	0.015	U	0.015	U	0.0076	J	0.0076	0.015	U	0.015	U	0.015	U	ND	0.01	J	0.012	J	0.032		0.0486	0.015	U	0.015	U	0.0071	J	0.0078
Fluoranthene	206-44-0	0.14		0.08		0.11		0.1855	0.013	J	0.037		0.071		0.1137	0.13		0.12		0.51		0.8129	0.07		0.0061	J	0.14		0.2406
Fluorene	86-73-7	0.0065	J	0.0058	J	0.0058	J	0.0067	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.0067	J	0.008	0.015	U	0.015	U	0.0077	J	0.0078
Indeno_1,2,3-cd_pyrene	193-39-5	0.022		0.016		0.024		0.0311	0.015	U	0.012	J	0.021		0.0308	0.029		0.029		0.071		0.104	0.022		0.015	U	0.034		0.0546
Naphthalene	91-20-3	0.0077	J	0.0073	J	0.0095	J	0.0101	0.007	J	0.0077	J	0.0083	J	0.0088	0.007	J	0.0081	J	0.0072	J	0.0084	0.011	J	0.007	J	0.0096	J	0.0143
Phenanthrene	85-01-8	0.081		0.054		0.067		0.1013	0.0086	J	0.026		0.039		0.0629	0.034		0.034		0.16		0.2591	0.035		0.0092	J	0.087		0.1435
Pyrene	129-00-0	0.097		0.057		0.083		0.1301	0.0087	J	0.026		0.05		0.0804	0.1		0.097		0.38		0.6014	0.047		0.0052	J	0.095		0.1622

Notes:
The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).
95% UCL = 95% upper confidence limit on mean concentration
Concentrations are presented in milligrams per kilograms (mg/kg)
ft-bgs = feet below ground surface
CASN = Chemical Abstracts Service Number
ND = Indicates the constituent was not detected in any of the replicate samples within that decision unit (DU).
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
p = The relative percent different (RPD) between the primary and confirmation column/detector is >40%. The lower value has been reported.
^1+ = ICV out of limts, high, bias.
F1 = Matrix spike and/or matrix spike duplicate recovery exceeds control limit
[1] This table presents only the constituents that were detected in at least one sample within Area 1.
[2] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020, refer to Attachment A.

TABLE 1.2

SUMMARY OF 2021 ISM SOIL ANALYTICAL RESULTS FOR AREA 2

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]		Decision Unit 1							Decision Unit 2						
	Medium:	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-2-01 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-2-02 95% UCL [2]
	Sample Name:	IA-2-01 A		IA-2-01 B		IA-2-01 C			IA-2-02 A		IA-2-02 B		IA-2-02 C		
	Sample Date:	2/20/2021		2/20/2021		2/20/2021			2/20/2021		2/20/2021		2/20/2021		
	Depth (ftbgs):	0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'		
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	
Metals															
Antimony	7440-36-0	0.27	J	0.27	J	0.24	J	0.289	0.17	J	0.2	J	0.2	J	0.219
Arsenic	7440-38-2	5.2		5.2		6.8		7.29	2.6		2.8		2.4		2.94
Barium	7440-39-3	96		90		220		320	61		66		64		67.9
Beryllium	7440-41-7	0.26	J	0.25	J	0.27		0.277	0.25	J	0.25	J	0.25	J	0.250
Cadmium	7440-43-9	0.25	J	0.29		0.31		0.335	0.34		0.39		0.37		0.410
Chromium	7440-47-3	41		40		41		41.6	30		34		34		36.6
Copper	7440-50-8	79		86		84		89.1	200		84		86		290
Lead	7439-92-1	23		27		24		28.2	26		27		32		33.8
Mercury	7439-97-6	0.044	J	0.048	J	0.055	J	0.0584	0.063	J	0.066	J	0.12		0.164
Nickel	7440-02-0	18		19		18		19.3	18		20		19		20.7
Selenium	7782-49-2	0.33	J	0.36	J	0.34	J	0.369	0.28	J	0.31	J	0.32	J	0.338
Silver	7440-22-4	0.069	J	0.082	J	0.071	J	0.086	0.1	J	0.08	J	0.1	J	0.113
Zinc	7440-66-6	300		320		330		342	130		170		140		182
Pesticides															
4,4'-DDD	72-54-8	0.1	U	0.05	U	0.05	U	ND	2.1		2.4		2.2		2.49
4,4'-DDE	72-55-9	0.031	J p	0.028	J p	0.16		0.263	2.7		3.1		3.9		4.26
4,4'-DDT	50-29-3	0.1	U	0.097		0.039	J	0.140	3.9		6.7		6.2		9.36
Aldrin	309-00-2	0.024	J	0.022	J	0.043	J	0.0588	0.23	U	0.097	U	0.25	U	ND
Chlordane (technical)	12789-03-6	1	U	0.5	U	0.5	U	ND	2.3	U	0.67	J p	2.5	U	1.80
cis-Chlordane	5103-71-9	0.1	U	0.05	U	0.05	U	ND	0.23	U	0.14		0.25	U	0.148
Dieldrin	60-57-1	2.3		1.3		5.4		8.38	0.23	U	0.021	J p	0.25	U	0.231
Endosulfan II	33213-65-9	0.1	U	0.05	U	0.05	U	ND	0.23	U	0.097	U	0.25	U	ND
Endosulfan sulfate	1031-07-8	0.1	U	0.05	U	0.05	U	ND	0.23	U	0.097	U	0.25	U	ND
trans-Chlordane	5103-74-2	0.1	U	0.05	U	0.05	U	ND	0.23	U	0.13	p	0.25	U	0.136
Semivolatile Organic Compounds (SVOC)															
1-Methylnaphthalene	90-12-0	0.0039	J	0.0051	J	0.005	J	0.0058	0.015	U	0.015	U	0.015	U	ND
2-Methylnaphthalene	91-57-6	0.0053	J	0.0079	J	0.0078	J	0.0107	0.0048	J	0.005	J	0.0047	J	0.0051
Acenaphthene	83-32-9	0.0037	J	0.0098	J	0.005	J	0.0143	0.0089	J	0.0059	J	0.011	J	0.0151
Anthracene	120-12-7	0.015	U	0.018		0.0091	J	0.0258	0.015		0.0095	J	0.021		0.0296
Benzo_a_anthracene	56-55-3	0.036		0.11		0.05		0.164	0.13		0.095		0.12		0.145
Benzo_a_pyrene	50-32-8	0.043		0.1		0.054		0.142	0.13		0.1		0.12		0.142
Benzo_b_fluoranthene	205-99-2	0.059		0.15		0.088		0.216	0.2		0.16		0.18		0.214
Benzo_g,h,i_perylene	191-24-2	0.031		0.057		0.023		0.082	0.089		0.069		0.06		0.11
Benzo_k_fluoranthene	207-08-9	0.026		0.067		0.028		0.099	0.077		0.057		0.053		0.095
Chrysene	218-01-9	0.046		0.12		0.053		0.176	0.15		0.12		0.13		0.159
Dibenz(a,h)anthracene	53-70-3	0.0073	J	0.015		0.015	U	0.021	0.02		0.016		0.02		0.0226
Fluoranthene	206-44-0	0.077		0.27		0.092		0.417	0.29		0.19		0.21		0.363
Fluorene	86-73-7	0.0066	J	0.0079	J	0.0081	J	0.0089	0.0071	J	0.0062	J	0.013	J	0.018
Indeno_1,2,3-cd_pyrene	193-39-5	0.026		0.055		0.024		0.0787	0.08		0.061		0.057		0.0867
Naphthalene	91-20-3	0.0071	J	0.0093	J	0.011	J	0.0141	0.0055	J	0.0069	J	0.0058	J	0.0073
Phenanthrene	85-01-8	0.043		0.15		0.055		0.230	0.12		0.073		0.11		0.163
Pyrene	129-00-0	0.069		0.2		0.076		0.301	0.23		0.16		0.18		0.251
Volatile Organic Compounds (VOC)															
Methyl acetate	79-20-9														

Constituent [1]	Decision Unit 3							Decision Unit 4							Decision Unit 5						
Medium:	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-2-03 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-2-04 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-2-05 95% UCL [2]
Sample Name:	IA-2-03 A		IA-2-03 B		IA-2-03 C			IA-2-04 A		IA-2-04 B		IA-2-04 C			IA-2-05A		IA-2-05B		IA-2-05C		
Sample Date:	2/18/2021		2/18/2021		2/18/2021			2/18/2021		2/18/2021		2/18/2021			2/16/2021		2/16/2021		2/16/2021		
Depth (ftbgs):	0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'		
	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	
Metals																					
Antimony	0.23	J	0.55	U	0.55	U	0.304	0.56	U	0.56	U	0.17	J	0.403	0.2	J F1	0.22	J	0.22	J	0.233
Arsenic	4.2		3.9		3.7		4.36	6.8		5.9		8.2		8.92	8.2	F1	11		10		12.1
Barium	56		54		56		57.3	49		50		47		51.2	67	F1	72		70		73.9
Beryllium	0.25	J	0.24	J	0.24	J	0.253	0.27	J	0.23	J	0.23	J	0.282	0.3	F1	0.25	J	0.25	J	0.315
Cadmium	0.17	J	0.16	J	0.15	J	0.18	0.26	J	0.22	J	0.72		1.10	0.16	J F1	0.31		0.15	J	0.432
Chromium	33		31		32		33.7	34		31		32		34.9	26	F1	28		26		28.6
Copper	75		72		75		76.9	83		91		85		93.4	76	F1	82		84		87.7
Lead	13		12		11		13.7	24		19		21		25.6	29	F1	33		33		35.6
Mercury	0.041	J	0.05	J	0.035	J	0.0547	0.042	J	0.052	J	0.05	J	0.0569	0.039	J	0.049	J	0.046	J	0.053
Nickel	17		17		18		18.3	19		18		19		19.6	19	F1	21		23		24.4
Selenium	0.27	J	0.27	J	0.27	J	0.27	0.26	J	0.27	J	0.27	J	0.276	0.32	J F1	0.31	J	0.28	J	0.338
Silver	0.059	J	0.054	J	0.054	J	0.061	0.096	J	0.082	J	0.11	J	0.120	0.052	J F1	0.054	J	0.086	J	0.112
Zinc	110		95		94		115	140		130		130		143	79	F1	96		98		108.6
Pesticides																					
4,4'-DDD	0.005	U	0.0048	U	0.005	U	ND	0.025	U	0.005	U	0.0049	U	ND	0.0048	U	0.0047	U	0.005	U	ND
4,4'-DDE	0.0075		0.013		0.0089		0.017	0.022	J p	0.02		0.048		0.0693	0.0029	J	0.0027	J	0.0034	J	0.0036
4,4'-DDT	0.0041	J p	0.0045	J p	0.0021	J p	0.0068	0.025	U	0.0048	J	0.0054		0.0183	0.0012	J	0.0015	J	0.0016	J	0.00178
Aldrin	0.005	U	0.0048	U	0.005	U	ND	0.025	U	0.005	U	0.0049	U	ND	0.0048	U	0.0047	U	0.005	U	ND
Chlordane (technical)	0.013	J p	0.048	U	0.05	U	0.037	0.25	U	0.017	J	0.034	J p	0.205	0.048	U	0.047	U	0.05	U	ND
cis-Chlordane	0.005	U	0.0048	U	0.005	U	ND	0.025	U	0.005	U	0.0066		0.0199	0.0048	U	0.0047	U	0.005	U	ND
Dieldrin	0.005	U	0.0048	U	0.005	U	ND	0.025	U	0.0021	J p	0.0067		0.0202	0.0048	U	0.0047	U	0.005	U	ND
Endosulfan II	0.005	U	0.0048	U	0.005	U	ND	0.027	p	0.0017	J p	0.0049	U	0.0466	0.0048	U	0.0047	U	0.005	U	ND
Endosulfan sulfate	0.005	U	0.0048	U	0.005	U	ND	0.012	J	0.005	U	0.0049	U	0.0195	0.0048	U	0.0047	U	0.005	U	ND
trans-Chlordane	0.005	U	0.0048	U	0.0037	J p	0.0047	0.0069	J	0.0024	J p	0.0063	p	0.0113	0.0048	U	0.0047	U	0.005	U	ND
Semivolatile Organic Compounds (SVOC)																					
1-Methylnaphthalene	0.015	U	0.015	U	0.015	U	ND	0.0086	J	0.0056	J	0.018		0.0270	0.015	U	0.015	U	0.039	U	ND
2-Methylnaphthalene	0.0058	J	0.0046	J	0.015	U	0.0096	0.0091	J	0.009	J	0.02		0.0286	0.015	U	0.015	U	0.039	U	ND
Acenaphthene	0.0052	J	0.0077	J	0.0053	J	0.0096	0.015	U	0.0064	J	0.015	U	0.0082	0.015	U	0.015	U	0.039	U	ND
Anthracene	0.0061	J	0.012	J	0.0067	J	0.0164	0.0054	J	0.0096	J	0.0091	J	0.014	0.015	U	0.015	U	0.016	J	0.023
Benzo_a_anthracene	0.029		0.062		0.04		0.086	0.014	J	0.027		0.026		0.0405	0.015	U	0.015	U	0.039	U	ND
Benzo_a_pyrene	0.03		0.064		0.045		0.0892	0.013	J	0.026		0.024		0.0386	0.015	U	0.015	U	0.026	J	0.041
Benzo_b_fluoranthene	0.043		0.1		0.055		0.142	0.025		0.038		0.031		0.0477	0.015	U	0.008	J	0.05		0.083
Benzo_g,h,i_perylene	0.016		0.017		0.031		0.0424	0.015	U	0.015		0.012	J	0.0210	0.015	U	0.015	U	0.039	U	ND
Benzo_k_fluoranthene	0.025		0.038		0.031		0.0477	0.015	U	0.018		0.019		0.0309	0.015	U	0.015	U	0.021	J	0.0316
Chrysene	0.031		0.066		0.046		0.0919	0.015		0.03		0.026		0.0432	0.0043	J	0.0058	J	0.035	J	0.0590
Dibenz(a,h)anthracene	0.015	U	0.015	U	0.015	U	0.0075	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.039	U	ND
Fluoranthene	0.051		0.12		0.083		0.172	0.023		0.054		0.053		0.0877	0.006	J	0.006	J	0.029	J	0.047
Fluorene	0.0054	J	0.0074	J	0.0054	J	0.008	0.0081	J	0.01	J	0.023		0.0341	0.015	U	0.015	U	0.039	U	ND
Indeno_1,2,3-cd_pyrene	0.013	J	0.018		0.027		0.0372	0.015	U	0.013	J	0.015	U	0.0173	0.015	U	0.015	U	0.039	U	ND
Naphthalene	0.0065	J	0.0049	J	0.0045	J	0.008	0.0071	J	0.0083	J	0.0091	J	0.010	0.015	U	0.015	U	0.039	U	ND
Phenanthrene	0.034		0.07		0.045		0.0961	0.034		0.065		0.071		0.107	0.0035	J	0.015	U	0.039	U	0.031
Pyrene	0.045		0.1		0.064		0.140	0.029		0.047		0.082		0.120	0.0057	J	0.0059	J	0.034	J	0.056
Volatile Organic Compounds (VOC)																					
Methyl acetate															1.1	J	0.95	J	1	J	1.10

Notes:

The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).

95% UCL = 95% upper confidence limit on mean concentration

Concentrations are presented in milligrams per kilograms (mg/kg)

ft-bgs = feet below ground surface

CASN = Chemical Abstracts Service Number

ND = Indicates the constituent was not detected in any of the replicate samples within that decision unit (DU).

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

p = The relative percent different (RPD) between the primary and confirmation column/detector is >40%. The lower value has been reported.

F1 = Matrix spike and/or matrix spike duplicate recovery exceeds control limit

[1] This table presents only the constituents that were detected in at least one sample collected within Area 2.

[2] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020, refer to Attachment A.

TABLE 1.3
SUMMARY OF 2021 ISM SOIL ANALYTICAL RESULTS FOR AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]		Decision Unit 1							Decision Unit 2							Decision Unit 3							Decision Unit 4						
	Medium:	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-3-01 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-3-02 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-3-03 95% UCL [2]	Soil (ISM)		Soil (ISM)		Soil (ISM)		IA-3-02 95% UCL [2]
	Sample Name:	IA-3-01 A		IA-3-01 B		IA-3-01 C			IA-3-02 A		IA-3-02 B		IA-3-02 C			IA-3-03 A		IA-3-03 B		IA-3-03 C			IA-3-04 A		IA-3-04 B		IA-3-04 C		
	Sample Date:	2/21/2021		2/21/2021		2/21/2021			2/21/2021		2/21/2021		2/21/2021			2/23/2021		2/23/2021		2/23/2021			2/23/2021		2/23/2021		2/23/2021		
	Depth (ftbgs):	0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'			0-0.5'		0-0.5'		0-0.5'		
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	
Metals																													
Antimony	7440-36-0	0.29	J	0.56	U	0.55	U	0.295	0.56	U	0.54	U	0.56	U	ND	0.56	U	0.55	U	0.56	U	ND	0.56	U	0.55	U	0.54	U	ND
Arsenic	7440-38-2	1.7		1.9		2.1		2.24	2.5		2.6		3		3.15	2.2		2		3.2		4.08	1.8		2.3		2.3		2.62
Barium	7440-39-3	66		65		72		74	64		58		55		66.7	85		77		74		88.3	67		64		63		68.2
Beryllium	7440-41-7	0.23	J	0.23	J	0.22	J	0.236	0.21	J	0.22	J	0.19	J	0.232	0.29		0.29		0.31		0.316	0.23	J	0.25	J	0.24	J	0.257
Cadmium	7440-43-9	0.1	J	0.094	J	0.11	J	0.115	0.093	J	0.097	J	0.09	J	0.099	0.28	U	0.066	J	0.28	U	0.223	0.44		0.36		0.9		1.3
Chromium	7440-47-3	24		24		26		26.6	26		25		23		27.2	20		18		22		23.4	20		21		20		21.3
Copper	7440-50-8	77		78		81		82.2	72		65	F1	65		74.1	62	^1+	60	^1+	110	^1+	148.6	67	^1+	61	^1+	60	^1+	69
Lead	7439-92-1	44		7.7		9.4		71.9	8		7.4		6		8.86	4		12		4.4		18.1	9.3		34		9.8		53.2
Mercury	7439-97-6	0.063	J	0.025	J	0.052	J	0.0959	0.026	J	0.022	J	0.036	J	0.0461	0.023	J	0.02	J	0.023	J	0.0249	0.039	J	0.041	J	0.036	J	0.0429
Nickel	7440-02-0	15		15		16		16.3	16		15		14		16.7	12		11		11		12.3	12		12		12		12
Selenium	7782-49-2	0.18	J	1.4	U	1.4	U	1.28	0.19	J	0.2	J	1.4	U	1.1	0.27	J	0.28	J	0.34	J	0.36	0.33	J	0.34	J	0.36	J	0.37
Silver	7440-22-4	0.044	J	0.048	J	0.055	J	0.058	0.035	J	0.036	J	0.033	J	0.037	0.28	U	0.27	U	0.28	U	0.143	0.031	J	0.032	J	0.032	J	0.033
Zinc	7440-66-6	74		72		76		77.4	64		65	F1	59		68.1	44		42		54		57.5	74		74		89		93.6
Pesticides																													
4,4'-DDD	72-54-8	0.0043	U	0.022	U	0.0049	U	ND	0.0047	J	0.0051	U	0.0049	U	0.00643	0.0047	U	0.005	U	0.005	U	ND	0.005	U	0.0049	U	0.0017	J p	0.0033
4,4'-DDE	72-55-9	0.0083		0.014	J p	0.0085		0.0184	0.012		0.0042	J	0.0041	J	0.0182	0.0047	U	0.005	U	0.005	U	ND	0.0091		0.0086		0.024		0.0359
4,4'-DDT	50-29-3	0.012		0.009	J	0.0032	J p	0.0193	0.17		0.0028	J p	0.0024	J p	0.3016	0.0047	U	0.005	U	0.005	U	ND	0.005	U	0.0029	J	0.0045	U	0.0031
Aldrin	309-00-2	0.0014	J	0.0073	J	0.0022	J	0.0117	0.005	U	0.0012	J	0.0049	U	0.0039	0.0047	U	0.005	U	0.005	U	ND	0.005	U	0.0049	U	0.0045	U	ND
Dieldrin	60-57-1	0.0087		0.0065	J p	0.011		0.0144	0.0028	J p	0.0025	J p	0.0049	U	0.0029	0.0047	U	0.005	U	0.005	U	ND	0.0019	J p	0.0049	U	0.0044	J	0.0062
trans-Chlordane	5103-74-2	0.0043	U	0.022	U	0.0049	U	ND	0.0018	J p	0.0051	U	0.0049	U	0.003	0.0047	U	0.0035	J	0.005	U	0.0044	0.005	U	0.0049	U	0.0045	U	ND
Semivolatile Organic Compounds (SVOC)																													
1-Methylnaphthalene	90-12-0	0.0099	J	0.004	J	0.015	U	0.0146	0.015	U	0.0037	J	0.015	U	0.0118	0.015	U	0.015	U	0.015	U	ND	0.0037	J	0.005	J	0.015	U	0.0103
2-Methylnaphthalene	91-57-6	0.011	J	0.0061	J	0.015	U	0.0146	0.0046	J	0.004	J	0.0053	J	0.0057	0.0061	J	0.005	J	0.0051	J	0.0064	0.0054	J	0.0066	J	0.0048	J	0.0071
Acenaphthene	83-32-9	0.033		0.014	J	0.0043	J	0.0538	0.015	U	0.0049	J	0.015	U	0.0104	0.015	U	0.015	U	0.015	U	ND	0.011	J	0.01	J	0.0068	J	0.0148
Anthracene	120-12-7	0.037		0.02		0.0038	J	0.062	0.015	U	0.0059	J	0.0038	J	0.0104	0.015	U	0.015	U	0.015	U	ND	0.021		0.013	J	0.015		0.0268
Benzo_a_anthracene	56-55-3	0.075		0.046		0.014	J	0.1218	0.01	J	0.028		0.012	J	0.0415	0.015	U	0.015	U	0.015	U	ND	0.071		0.055		0.1		0.1327
Benzo_a_pyrene	50-32-8	0.067		0.044		0.014	J	0.1086	0.011	J	0.028		0.013	J	0.0407	0.015	U	0.015	U	0.015	U	ND	0.064		0.055		0.1		0.1329
Benzo_b_fluoranthene	205-99-2	0.088		0.052		0.018		0.1408	0.016		0.04		0.018		0.0582	0.015	U	0.015	U	0.015	U	ND	0.084		0.086		0.13		0.1654
Benzo_g,h,i_perylene	191-24-2	0.02		0.026		0.011	J	0.038	0.015	U	0.011	J	0.015	U	0.0138	0.015	U	0.015	U	0.015	U	ND	0.03		0.035		0.046		0.0576
Benzo_k_fluoranthene	207-08-9	0.048		0.032		0.015	U	0.0805	0.015	U	0.015		0.0084	J	0.0206	0.015	U	0.015	U	0.015	U	ND	0.041		0.029		0.046		0.0607
Chrysene	218-01-9	0.08		0.045		0.0096	J	0.1335	0.011	J	0.028		0.012	J	0.041	0.015	U	0.015	U	0.0038	J	0.0116	0.067		0.057		0.094		0.1208
Dibenz(a,h)anthracene	53-70-3	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.015	U	ND	0.015	U	0.015	U	0.015	U	ND	0.0083	J	0.0097	J	0.016		0.0217
Fluoranthene	206-44-0	0.16		0.11		0.029		0.266	0.02		0.055		0.023		0.0815	0.0069	J	0.0067	J	0.0083	J	0.0088	0.14		0.12		0.16		0.1737
Fluorene	86-73-7	0.027		0.011	J	0.0034	J	0.0441	0.005	J	0.0061	J	0.0052	J	0.0064	0.015	U	0.015	U	0.015	U	ND	0.0051	J	0.0071	J	0.0052	J	0.0077
Indeno_1,2,3-cd_pyrene	193-39-5	0.022		0.024		0.015	U	0.0405	0.015	U	0.0094	J	0.015	U	0.01	0.015	U	0.015	U	0.015	U	ND	0.029		0.034		0.042		0.0461
Naphthalene	91-20-3	0.013	J	0.0061	J	0.015	U	0.018	0.0056	J	0.006	J	0.0062	J	0.0064	0.011	J	0.0088	J	0.0084	J	0.0118	0.0081	J	0.0094	J	0.0078	J	0.0099
Phenanthrene	85-01-8	0.17		0.089		0.025		0.2775	0.026		0.045		0.029		0.059	0.011	J	0.01	J	0.012	J	0.0127	0.093		0.065		0.058		0.1186
Pyrene	129-00-0	0.12		0.11		0.025		0.2164	0.017		0.045		0.02		0.066	0.0048	J	0.0041	J	0.0059	J	0.0065	0.1		0.082		0.13		0.165

Notes:
The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).
95% UCL = 95% upper confidence limit on mean concentration
Concentrations are presented in milligrams per kilograms (mg/kg)
ft-bgs = feet below ground surface
CASN = Chemical Abstracts Service Number
ND = Indicates the constituent was not detected in any of the replicate samples within that decision unit (DU).
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
p = The relative percent different (RPD) between the primary and confirmation column/detector is >40%. The lower value has been reported.
F1 = Matrix spike and/or matrix spike duplicate recovery exceeds control limit
[1] This table presents only the constituents that were detected in at least one sample collected within Area 3.
[2] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020, refer to Attachment A.

TABLE 1.4
SUMMARY OF 2021 DISCRETE SOIL ANALYTICAL RESULTS FOR AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]	Medium:	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
	Sample Name:	**SC-3-01**		**SC-3-01**		**SC-3-02**		**SC-3-02**		**SC-3-03**		**SC-3-03**		**SC-3-04**		**SC-3-04**		**SC-3-06**		**SC-3-06**	
	Sample Date:	**2/17/2021**		**2/17/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**		**2/19/2021**	
	Depth (ftbgs):	**0.5-2.5'**		**5-6'**		**0-3.0'**		**3-6'**		**0-3'**		**3-6'**		**0-3'**		**3-6'**		**0-3'**		**3-6'**	
	CASN	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Metals																					
Antimony	7440-36-0	0.38	U	0.12	J	0.29	U	0.46	U	0.41	U	0.38	U	0.39	U	0.4	U	0.53	U	0.33	U
Arsenic	7440-38-2	1		3.3		0.61	J	0.71	J	4.9		2.7		0.99		1.1		2		1.4	
Barium	7440-39-3	47		60		40		56		43		54		66		60		81		58	
Beryllium	7440-41-7	0.15	J	0.25		0.15		0.25		0.18	J	0.19		0.18	J	0.15	J	0.24	J	0.19	
Cadmium	7440-43-9	0.13	J	0.15	J	0.072	J	0.071	J	0.12	J	0.077	J	0.057	J	0.062	J	0.13	J	0.13	J
Chromium	7440-47-3	19		31		12		16		34		24		13		16		22		23	
Copper	7440-50-8	60		56		54		58		73		68		64		65		90		76	
Lead	7439-92-1	4.3		10		4.3		3.2		6.3		6.6		2		2.3		9.2		5.1	
Mercury	7439-97-6	0.1	U	0.04	J	0.09	U	0.13	U	0.031	J	0.033	J	0.13	U	0.11	U	0.1	J	0.028	J
Nickel	7440-02-0	11		16		8.6		11		16		14		9.8		11		16		14	
Selenium	7782-49-2	0.13	J	0.27	J	0.094	J	0.15	J	0.27	J	0.18	J	0.15	J	0.12	J	0.29	J	0.19	J
Silver	7440-22-4	0.028	J	0.049	J	0.018	J	0.23	U	0.035	J	0.031	J	0.2	U	0.2	U	0.039	J	0.025	J
Thallium	7440-28-0	0.052	J	0.1	J	0.053	J	0.23	U	0.2	U	0.19	U	0.2	U	0.2	U	0.26	U	0.17	U
Zinc	7440-66-6	51		69		46		48		65		62		43		50		74		63	
Polychlorinated Biphenyls (PCB)																					
Aroclor-1260	11096-82-5	0.057	U	0.054	U	0.05	U	0.057	U	0.055	U	0.058	U	0.057	U	0.06	U	0.071	U	0.059	U
Pesticides																					
4,4'-DDD	72-54-8	0.0057	U	0.0054	U	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.012	p	0.0059	U
4,4'-DDE	72-55-9	0.0076		0.0031	J p	0.005	U	0.0049	J	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0096		0.0034	J p
4,4'-DDT	50-29-3	0.0022	J p	0.0021	J	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.092		0.0059	U
Aldrin	309-00-2	0.0057	U	0.0054	U	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0071	U	0.0059	U
beta-BHC	319-85-7	0.0057	U	0.0054	U	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0071	U	0.0059	U
Dieldrin	60-57-1	0.0057	U	0.0054	U	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0071	U	0.0059	U
Endosulfan II	33213-65-9	0.0057	U	0.0054	U	0.005	U	0.0083	p	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0071	U	0.0059	U
Endrin aldehyde	7421-93-4	0.0057	U	0.0054	U	0.005	U	0.0057	U	0.0055	U	0.0058	U	0.0057	U	0.006	U	0.0071	U	0.0059	U
trans-Chlordane	5103-74-2	0.0057	U	0.0054	U	0.005	U	0.0028	J p	0.0055	U	0.0058	U	0.0057	U	0.0015	J p	0.0071	U	0.0059	U

TABLE 1.4
SUMMARY OF 2021 DISCRETE SOIL ANALYTICAL RESULTS FOR AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]	Medium:	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
	Sample Name:	SC-3-01		SC-3-01		SC-3-02		SC-3-02		SC-3-03		SC-3-03		SC-3-04		SC-3-04		SC-3-06		SC-3-06	
	Sample Date:	2/17/2021		2/17/2021		2/19/2021		2/19/2021		2/19/2021		2/19/2021		2/19/2021		2/19/2021		2/19/2021		2/19/2021	
	Depth (ftbgs):	0.5-2.5'		5-6'		0-3.0'		3-6'		0-3'		3-6'		0-3'		3-6'		0-3'		3-6'	
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Semivolatile Organic Compounds (SVOC)																					
1-Methylnaphthalene	90-12-0	0.046		0.14		0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.0051	J	0.018	U
2-Methylnaphthalene	91-57-6	0.097		0.29		0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.0075	J	0.018	U
Acenaphthene	83-32-9	0.0086	J	0.035		0.016	U	0.018	U	0.0043	J	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Anthracene	120-12-7	0.0042	J	0.017	U	0.016	U	0.018	U	0.0044	J	0.018	U	0.017	U	0.018	U	0.0072	J	0.018	U
Benzo_a_anthracene	56-55-3	0.024		0.013	J	0.016	U	0.0061	J	0.021		0.01	J	0.017	U	0.018	U	0.028		0.0043	J
Benzo_a_pyrene	50-32-8	0.026		0.015	J	0.016	U	0.018	U	0.018		0.011	J	0.017	U	0.018	U	0.022		0.018	U
Benzo_b_fluoranthene	205-99-2	0.038		0.021		0.016	U	0.0079	J	0.025		0.015	J	0.017	U	0.018	U	0.033		0.018	U
Benzo_g,h,i_perylene	191-24-2	0.015	J	0.017	U	0.016	U	0.018	U	0.0086	J	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Benzo_k_fluoranthene	207-08-9	0.013	J	0.017	U	0.016	U	0.018	U	0.0085	J	0.018	U	0.017	U	0.018	U	0.015	J	0.018	U
Chrysene	218-01-9	0.026		0.015	J	0.016	U	0.0094	J	0.022		0.011	J	0.017	U	0.018	U	0.028		0.0048	J
Dibenz(a,h)anthracene	53-70-3	0.017	U	0.017	U	0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Fluoranthene	206-44-0	0.042		0.026		0.016	U	0.0089	J	0.034		0.017	J	0.017	U	0.018	U	0.051		0.0074	J
Fluorene	86-73-7	0.0061	J	0.018		0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Indeno_1,2,3-cd_pyrene	193-39-5	0.011	J	0.017	U	0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Naphthalene	91-20-3	0.021		0.057		0.016	U	0.018	U	0.016	U	0.018	U	0.017	U	0.018	U	0.022	U	0.018	U
Phenanthrene	85-01-8	0.023		0.026		0.016	U	0.007	J	0.018		0.015	J	0.017	U	0.018	U	0.036		0.0066	J
Pyrene	129-00-0	0.035		0.023		0.016	U	0.0083	J	0.031		0.016	J	0.017	U	0.0043	J	0.043		0.0061	J
Volatile Organic Compounds (VOC)																					
2-Butanone (MEK)	78-93-3	0.032	U	0.029	U			0.02	H	0.028	U	0.01	J H H3	0.025	U	0.031	J H H3	0.0095	J H H3	0.0097	J H H3
Acetone	67-64-1	0.039	U	0.037	U			0.12	H	0.035	U	0.063	H H3	0.032	U	0.16	H H3	0.035	J H H3	0.073	H H3
Carbon disulfide	75-15-0	0.0079	U	0.0074	U			0.0014	J H	0.007	U	0.0061	U	0.0063	U	0.0019	J H H3	0.0072	U	0.0049	U

Notes:
The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).
Concentrations are presented in milligrams per kilograms (mg/kg)
ft-bgs = feet below ground surface
CASN = Chemical Abstracts Service Number
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
p = The relative percent different (RPD) between the primary and confirmation column/detector is >40%. The lower value has been reported.
F1 = Matrix spike and/or matrix spike duplicate recovery exceeds control limit
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
[1] This table presents only the constituents that were detected in at least one discrete soil sample collected within Area 3.
[2] Field duplicate was collected. Results presented are the highest detected value, or the lowest reporting limit for non-detects.

TABLE 1.4
SUMMARY OF 2021 DISCRETE SOIL ANALYTICAL RESULTS FOR AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]	Medium:	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
	Sample Name:	SC-3-07		SC-3-07		SC-3-08		SC-3-08		SC-3-09		SC-3-09		SC-3-10 [2]		SC-3-10 [2]		SC-3-11		SC-3-11	
	Sample Date:	2/19/2021		2/19/2021		2/21/2021		2/21/2021		2/21/2021		2/21/2021		2/22/2021		2/22/2021		2/21/2021		2/21/2021	
	Depth (ftbgs):	0-3'		3-6'		0-3'		3-6'		0-3'		3-6'		0-3'		3-6'		0-3'		3-6'	
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals																					
Antimony	7440-36-0	0.43	U	0.4	U	0.16	J	0.45	U	0.36	U	0.42	U	0.29	U	0.46	U	0.36	U	0.47	U
Arsenic	7440-38-2	5.7		0.76	J	2.6		1.1		1.9		2.3		1.7		1.9		1.3		2.6	
Barium	7440-39-3	66		52		60		66		51		46		38		56		35		51	
Beryllium	7440-41-7	0.23		0.17	J	0.19	J	0.29		0.16	J	0.15	J	0.19		0.2	J	0.2		0.17	J
Cadmium	7440-43-9	0.23		0.2	U	0.7		0.079	J	0.1	J	0.12	J	0.052	J	0.15	J	0.075	J	0.081	J
Chromium	7440-47-3	38		13		26		18		19		21		13		21		15		19	
Copper	7440-50-8	72		67		71		63		69		57		55		57		58	F1	47	
Lead	7439-92-1	12		0.91		13		3.5		6		8.9		2.1		5.9		4.5		5.4	
Mercury	7439-97-6	0.067	J	0.12	U	0.092	J	0.022	J	0.03	J	0.029	J	0.099	U	0.055	J	0.1	U	0.023	J
Nickel	7440-02-0	16		12		17		10		13		13		7.9		12		9.3		13	
Selenium	7782-49-2	0.29	J	1	U	0.29	J	0.42	J	0.17	J	0.19	J	0.14	J	0.21		0.14	J	0.16	J
Silver	7440-22-4	0.056	J	0.2	U	0.073	J	0.041	J	0.034	J	0.038	J	0.14	U	0.048		0.029	J	0.028	J
Thallium	7440-28-0	0.21	U	0.064	J	0.2	U	0.22	U	0.18	U	0.21	U	0.14	U	0.23	U	0.095	J	0.23	U
Zinc	7440-66-6	92		53		74		37		63		61		38		58		43		58	
Polychlorinated Biphenyls (PCB)																					
Aroclor-1260	11096-82-5	0.056	U	0.055	U	0.11		0.066	U	0.056	U	0.053	U	0.051	U	0.062	U	0.056	U	0.058	U
Pesticides																					
4,4'-DDD	72-54-8	0.0056	U	0.0055	U	0.015		0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.0062	U	0.0056	U	0.0058	U
4,4'-DDE	72-55-9	0.046		0.0055	U	0.049		0.0066	U	0.017		0.0079		0.0051	U	0.013		0.016		0.0044	J
4,4'-DDT	50-29-3	0.0037	J	0.0055	U	0.1		0.0066	U	0.0033	J	0.0052	J	0.0051	U	0.0062	U	0.0057		0.0058	U
Aldrin	309-00-2	0.0056	U	0.0055	U	0.0055	U	0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.0062	U	0.0056	U	0.002	J
beta-BHC	319-85-7	0.0056	U	0.0055	U	0.0055	U	0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.013	p	0.0056	U	0.0058	U
Dieldrin	60-57-1	0.0056	U	0.0055	U	0.0055	U	0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.0062	U	0.0033	J p	0.0058	U
Endosulfan II	33213-65-9	0.0056	U	0.0055	U	0.0055	U	0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.0062	U	0.0056	U	0.0058	U
Endrin aldehyde	7421-93-4	0.0056	U	0.0055	U	0.0032	J p	0.0066	U	0.0056	U	0.0053	U	0.0051	U	0.0062	U	0.0056	U	0.0058	U
trans-Chlordane	5103-74-2	0.0056	U	0.0055	U	0.0038	J p	0.0066	U	0.0014	J p	0.0053	U	0.0051	U	0.0062	U	0.0056	U	0.0058	U

TABLE 1.4
SUMMARY OF 2021 DISCRETE SOIL ANALYTICAL RESULTS FOR AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]	Medium:	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
	Sample Name:	SC-3-07		SC-3-07		SC-3-08		SC-3-08		SC-3-09		SC-3-09		SC-3-10 [2]		SC-3-10 [2]		SC-3-11		SC-3-11	
	Sample Date:	2/19/2021		2/19/2021		2/21/2021		2/21/2021		2/21/2021		2/21/2021		2/22/2021		2/22/2021		2/21/2021		2/21/2021	
	Depth (ftbgs):	0-3'		3-6'		0-3'		3-6'		0-3'		3-6'		0-3'		3-6'		0-3'		3-6'	
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals **Semivolatile Organic Compounds (SVOC)**																					
1-Methylnaphthalene	90-12-0	0.017	U	0.016	U	0.017	U	0.019	U	0.017	U	0.017	U	0.016	U	0.019	U	0.017	U	0.018	U
2-Methylnaphthalene	91-57-6	0.017	U	0.016	U	0.017	U	0.019	U	0.017	U	0.017	U	0.016	U	0.019	U	0.017	U	0.018	U
Acenaphthene	83-32-9	0.017	U	0.016	U	0.017	U	0.019	U	0.0075	J	0.017	U	0.016	U	0.019	U	0.021		0.018	U
Anthracene	120-12-7	0.0075	J	0.016	U	0.017	U	0.019	U	0.017		0.017	U	0.016	U	0.019	U	0.024		0.018	U
Benzo_a_anthracene	56-55-3	0.04		0.016	U	0.014	J	0.019	U	0.068		0.0061	J	0.016	U	0.011	J	0.066		0.026	
Benzo_a_pyrene	50-32-8	0.038		0.016	U	0.019		0.019	U	0.067		0.017	U	0.016	U	0.019	U	0.075		0.027	
Benzo_b_fluoranthene	205-99-2	0.056		0.016	U	0.027		0.019	U	0.098		0.011	J	0.016	U	0.017	J	0.099		0.046	
Benzo_g,h,i_perylene	191-24-2	0.013	J	0.016	U	0.014	J	0.019	U	0.034		0.017	U	0.016	U	0.019	U	0.042		0.016	J
Benzo_k_fluoranthene	207-08-9	0.022		0.016	U	0.012	J	0.019	U	0.033		0.017	U	0.016	U	0.019	U	0.04		0.015	J
Chrysene	218-01-9	0.037		0.016	U	0.02		0.019	U	0.074		0.0071	J	0.0039	J	0.012	J	0.072		0.031	
Dibenz(a,h)anthracene	53-70-3	0.017	U	0.016	U	0.017	U	0.019	U	0.0082	J	0.017	U	0.016	U	0.019	U	0.012	J	0.018	U
Fluoranthene	206-44-0	0.067		0.016	U	0.017		0.019	U	0.15		0.0094	J	0.01	J	0.026		0.17		0.054	
Fluorene	86-73-7	0.017	U	0.016	U	0.017	U	0.019	U	0.0068	J	0.017	U	0.016	U	0.019	U	0.014	J	0.018	U
Indeno_1,2,3-cd_pyrene	193-39-5	0.013	J	0.016	U	0.013	J	0.019	U	0.031		0.017	U	0.016	U	0.019	U	0.036		0.014	J
Naphthalene	91-20-3	0.017	U	0.016	U	0.017	U	0.019	U	0.017	U	0.017	U	0.016	U	0.019	U	0.017	U	0.018	U
Phenanthrene	85-01-8	0.039		0.016	U	0.0073	J	0.019	U	0.092		0.004	J	0.0078	J	0.0072	J	0.13		0.017	J
Pyrene	129-00-0	0.055		0.016	U	0.022		0.019	U	0.13		0.0085	J	0.007	J	0.0096	J	0.11		0.046	
Volatile Organic Compounds (VOC)																					
2-Butanone (MEK)	78-93-3	0.024	U	0.022	U	0.037	U	0.024	U	0.026	U	0.025	U	0.03	U	0.024	J H H3	0.026	U	0.02	J H H3
Acetone	67-64-1	0.03	U	0.028	U	0.047	U	0.03	U	0.033	U	0.031	U	0.037	U	0.14	H H3	0.033	U	0.12	H H3
Carbon disulfide	75-15-0	0.0059	U	0.0055	U	0.0094	U	0.006	U	0.0065	U	0.0063	U	0.0074	U	0.0053	U	0.0065	U	0.0016	J H H3

Notes:
The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).
Concentrations are presented in milligrams per kilogram (mg/kg)
ft-bgs = feet below ground surface
CASN = Chemical Abstracts Service Number
J = Result is less than the reporting limit but greater than or equal to the MDL and the concentration is an approximate values.
p = The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
F1 = MS and/or MSD recovery exceeds control limit
H = Sample was prepped or analyzed beyond the specified holding time.
H3 = Sample was received and analyzed past holding time.
[1] This table only presents constituents that were detected at least one discrete soil sample within Area 3.
[2] Field duplicate was collected. Results presented are the highest detected value, or the lowest LRL for non-detects.

TABLE 1.5

SUMMARY OF 2021 ISM AND DISCRETE SOIL ANALYTICAL RESULTS FROM REFERENCE AREAS

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent [1]	Medium:	Soil (ISM)		Soil (ISM)		Soil (ISM)		Soil (ISM)		Soil (ISM)		Soil (ISM)		Soil		Soil		Soil		Effective Background/Reference Concentrations [1]
	Sample Name:	IA-REF-01 A		IA-REF-01 B		IA-REF-01 C		IA-REF-02 A		IA-REF-02 B		IA-REF-02 C		SC-REF-01		SC-REF-02		SC-REF-03		
	Sample Date:	2/22/2021		2/22/2021		2/22/2021		2/19/2021		2/19/2021		2/19/2021		2/21/2021		2/21/2021		2/21/2021		
	Depth (ftbgs):	0-0.5'		0-0.5'		0-0.5'		0-0.5'		0-0.5'		0-0.5'		0-0.5'		0-2.6'		0-3'		
	CASN	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
Metals																				
Antimony	7440-36-0	0.54	U			0.56	U	0.56	U	0.56	U	0.52	U	0.4	U	0.38	U	0.28	J F1	0.09
Arsenic	7440-38-2	1.2	J			1.3	J B	1.6		1.6		2		0.55	J	0.51	J	6.3		2.00
Barium	7440-39-3	72				73		74		73		75		59		46		46		83.26
Beryllium	7440-41-7	0.3				0.31		0.25	J	0.24	J	0.25	J	0.18	J B	0.17	J	0.14	J	0.34
Cadmium	7440-43-9	0.27	U			0.28	U	0.28	U	0.28	U	0.095	J	0.047	J	0.056	J	0.19		0.11
Chromium	7440-47-3	39				36		18		19		20		14		12		16		44.48
Copper	7440-50-8	63	^1+			62		73		76		79		65		73		41		85.03
Lead	7439-92-1	17				18		4.1		3.2		4.8		1		0.72		18		18.12
Mercury	7439-97-6	0.021	J	0.021	J			0.11	U	0.11	U	0.017	J	0.12	U	0.1	U	0.022	J	0.03
Nickel	7440-02-0	17				17		12		12		13		10		10		11		19.78
Selenium	7782-49-2	0.29	J			0.31	J	0.22	J	0.2	J	0.2	J	0.15	J	0.13	J	0.24	J	0.34
Silver	7440-22-4	0.036	J			0.038	J	0.28	U	0.28	U	0.26	U	0.2	U	0.19	U	0.038	J	0.05
Thallium	7440-28-0	0.27	U			0.28	U	0.077	J	0.28	U	0.26	U	0.076	J	0.067	J	0.18	U	0.08
Zinc	7440-66-6	38				40	B	50		49		54		43		46		77	F1	56.64
Pesticides																				
4,4'-DDE	72-55-9	0.0049	U	0.005	U	0.0047	U	0.025	U	0.0049	U	0.022		0.0052	U	0.0054	U	0.004	J	0.025
4,4'-DDT	50-29-3	0.0049	U	0.005	U	0.0047	U	0.025	U	0.0049	U	0.008		0.0052	U	0.0054	U	0.0053	U	0.009
Dieldrin	60-57-1	0.0049	U	0.005	U	0.0047	U	0.025	U	0.0049	U	0.0065		0.0052	U	0.0054	U	0.0053	U	0.013
Semivolatile Organic Compounds (SVOC)																				
1-Methylnaphthalene	90-12-0	0.015	U	0.015	U	0.015	U	0.015	U	0.0051	J	0.015	U	0.016	U	0.016	U	0.017	U	
2-Methylnaphthalene	91-57-6	0.0067	J	0.0044	J	0.0053	J	0.0038	J	0.0086	J	0.0036	J	0.016	U	0.016	U	0.017	U	
Acenaphthene	83-32-9	0.015	U	0.015	U	0.015	U	0.015	U	0.0058	J	0.015	U	0.016	U	0.016	U	0.017	U	
Anthracene	120-12-7	0.015	U	0.015	U	0.015	U	0.015	U	0.0039	J	0.015	U	0.016	U	0.016	U	0.017	U	
Benzo_a_anthracene	56-55-3	0.015	U	0.015	U	0.015	U	0.015	U	0.0037	J	0.015	U	0.016	U	0.016	U	0.0066	J	
Benzo_b_fluoranthene	205-99-2	0.015	U	0.015	U	0.015	U	0.015	U	0.015	U	0.015	U	0.016	U	0.016	U	0.0078	J	
Chrysene	218-01-9	0.015	U	0.015	U	0.015	U	0.015	U	0.0039	J	0.015	U	0.016	U	0.016	U	0.0081	J	
Fluoranthene	206-44-0	0.015	U	0.015	U	0.015	U	0.0056	J	0.017		0.0072	J	0.016	U	0.016	U	0.012	J	
Fluorene	86-73-7	0.004	J	0.015	U	0.015	U	0.0044	J	0.012	J	0.0045	J	0.016	U	0.016	U	0.017	U	
Naphthalene	91-20-3	0.0098	J	0.0077	J	0.0094	J	0.0052	J	0.0082	J	0.0053	J	0.016	U	0.016	U	0.017	U	
Phenanthrene	85-01-8	0.013	J	0.0084	J	0.011	J	0.017		0.059		0.018		0.016	U	0.016	U	0.0057	J	
Pyrene	129-00-0	0.015	U	0.015	U	0.015	U	0.005	J	0.011	J	0.0046	J	0.016	U	0.016	U	0.011	J	
Volatile Organic Compounds (VOC)																				
Carbon disulfide	75-15-0													0.0034	J H H3	0.0064	U	0.0058	U	

Notes:

The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).

Concentrations are presented in milligrams per kilograms (mg/kg)

ft-bgs = feet below ground surface

CASN = Chemical Abstracts Service Number

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

p = The relative percent different (RPD) between the primary and confirmation column/detector is >40%. The lower value has been reported.

F1 = Matrix spike and/or matrix spike duplicate recovery exceeds control limit

H = Sample was prepped or analyzed beyond the specified holding time.

H3 = Sample was received and analyzed past holding time.

[1] This table presents only the constituents that were detected in at least one soil sample collected from reference areas.

^1+ = ICV out of limts, high, bias.

B = Compound was found in the blank and sample

[1] VHB provided background/reference concentrations that were statically derived for each constituent that had a result that exceeded a risk-based screening level.

TABLE 1.6
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

Caneel Bay Resort; St. John Island, U.S. Virgin Island

DRAFT	Medium:	Groundwater	
	Sample Name:	MW-01	
Constituent [1]	Sample Date:	2/24/2021	
	CASN	Result	Qualifier
Metals			
Arsenic	7440-38-2	2.4	
Barium	7440-39-3	100	
Cadmium	7440-43-9	0.86	
Chromium	7440-47-3	2.2	
Copper	7440-50-8	15	B
Lead	7439-92-1	3.4	
Nickel	7440-02-0	13	
Silver	7440-22-4	0.34	J
Zinc	7440-66-6	110	
Semivolatile Organic Compounds (SVOC)			
1-Methylnaphthalene	90-12-0	0.032	J H *- *1
Fluoranthene	206-44-0	0.022	J H *- *1
Fluorene	86-73-7	0.039	J H *- *1
Pyrene	129-00-0	0.024	J H *- *1
Volatile Organic Compounds (VOC)			
Acetone	67-64-1	1.2	J
Chloromethane	74-87-3	0.1	J
Ethylbenzene	100-41-4	0.12	J
Methyl tert-butyl ether	1634-04-4	0.13	J
Toluene	108-88-3	0.075	J
Xylenes, Total	1330-20-7	0.39	J

Notes:
The laboratory reporting limit (RL) is provided for non-detects ('U' qualifier).
Concentrations are presented in micrograms per liter (ug/L)
CASN = Chemical Abstracts Service Number
J = Result is less than the RL but greater than or equal to the MDL
and the concentration is an approximate value.
H = Sample was prepped or analyzed beyond the specified holding time.
*1 = ICV out of limts
*- = LCS and/or LCSD is outside the acceptance limits, low biased
B = Compound was found in the blank and sample.
[1] This table presents only the constituents that were detected in the sampl

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SOIL SURFACE (0-0.5 FT-BGS): AREA 1

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Soil Surface (0-0.50 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Semivolatile Organic Compounds															
Area 1	90-12-0	1-Methylnaphthalene	5.30E-03	1.13E-02	mg/kg	IA-1-04	2/4	0.015 - 0.015	1.13E-02	-	1.80E+01	-	-	N	BSL
	91-57-6	2-Methylnaphthalene	6.00E-03	1.03E-02	mg/kg	IA-1-04	4/4	All Detects	1.03E-02	-	2.40E+01	-	-	N	BSL
	83-32-9	Acenaphthene	1.08E-02	1.40E-02	mg/kg	IA-1-04	3/4	0.015 - 0.015	1.40E-02	-	3.60E+02	-	-	N	BSL
	120-12-7	Anthracene	1.05E-02	6.21E-02	mg/kg	IA-1-03	4/4	All Detects	6.21E-02	-	1.80E+03	-	-	N	BSL
	56-55-3	Benzo_a_anthracene	4.17E-02	4.57E-01	mg/kg	IA-1-03	4/4	All Detects	4.57E-01	-	1.10E+00	-	-	N	BSL
	50-32-8	Benzo_a_pyrene	4.81E-02	3.40E-01	mg/kg	IA-1-03	4/4	All Detects	3.40E-01	-	1.10E-01	-	-	**Y**	ASL
	205-99-2	Benzo_b_fluoranthene	6.80E-02	4.75E-01	mg/kg	IA-1-03	4/4	All Detects	4.75E-01	-	1.10E+00	-	-	N	BSL
	191-24-2	Benzo_g,h,i_perylene	2.95E-02	8.52E-02	mg/kg	IA-1-03	4/4	All Detects	6.01E-01	-	1.80E+02	-	-	N	BSL
	207-08-9	Benzo_k_fluoranthene	2.63E-02	2.05E-01	mg/kg	IA-1-03	4/4	All Detects	2.05E-01	-	1.10E+01	-	-	N	BSL
	218-01-9	Chrysene	5.37E-02	4.22E-01	mg/kg	IA-1-03	4/4	All Detects	4.22E-01	-	1.10E+02	-	-	N	BSL
	53-70-3	Dibenz(a,h)anthracene	7.60E-03	4.86E-02	mg/kg	IA-1-03	3/4	0.015 - 0.015	4.86E-02	-	1.10E-01	-	-	N	BSL
	206-44-0	Fluoranthene	1.14E-01	8.13E-01	mg/kg	IA-1-03	4/4	All Detects	8.13E-01	-	2.40E+02	-	-	N	BSL
	86-73-7	Fluorene	6.70E-03	8.00E-03	mg/kg	IA-1-03	3/4	0.015 - 0.015	8.00E-03	-	2.40E+02	-	-	N	BSL
	193-39-5	Indeno_1,2,3-cd_pyrene	3.08E-02	1.04E-01	mg/kg	IA-1-03	4/4	All Detects	1.04E-01	-	1.10E+00	-	-	N	BSL
	91-20-3	Naphthalene	8.40E-03	1.43E-02	mg/kg	IA-1-04	4/4	All Detects	1.43E-02	-	2.00E+00	-	-	N	BSL
	85-01-8	Phenanthrene	6.29E-02	2.59E-01	mg/kg	IA-1-03	4/4	All Detects	6.01E-01	-	1.80E+02	-	-	N	BSL
	129-00-0	Pyrene	8.04E-02	6.01E-01	mg/kg	IA-1-03	4/4	All Detects	6.01E-01	-	1.80E+02	-	-	N	BSL

Notes

(1) Area 1 summary statistics are based on a 95% upper confidence limit (UCL) derived using the ITRC Incremental Sampling Methodology (ISM) calculator. The 95% UCL was derived for each decision unit (DU) located within Area 1 using ISM soil samples collected between 0-0.5 ft-bgs from DU IA-1-01 through IA-1-04 in 2021. Constituents detected at least once are presented on this table.

(2) The concentration used for screening is the maximum of the 95% UCLs derived for each ISM sample collected in Area 1.

(3) Values were statistically calculated using concentrations from soil samples collected from reference areas. These values are provided for informational purposes and are not used to select COPCs.

(4) Screening Toxicity Value was derived using USEPA's Residential Soil Regional Screening Level Generic Table. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Screening values are based on a noncancer hazard quotient of 0.1 and a cancer risk of 10^{-6}.

Where toxicity information for a constituent was not available, toxicity values for a structurally similar constituent were used. Toxicity information for pyrene was used for benzo(g,h,i)perylene, and phenanthrene, refer to Table 2.5.

(5) ASL = Maximum detected concentration above screening level(s).

BSL = Maximum detected concentration below screening level(s).

ARAR = Applicable or Relevant and Appropriate Requirements (none identified)

TBC = To be considered

COPC = Chemical of Potential Concern

"-" = Not available

mg/kg = milligrams per kilogram

(6) Samples were analyzed for total chromium. Based on the historical use of the Site, hexavalent chromium is not expected to be found at the Site. Therefore, analytical results for total chromium were screened against trivalent chromium in this risk assessmen

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SOIL SURFACE (0-0.5 FT-BGS): AREA 2

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Soil Surface (0-0.50 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Metals															
Area 2	7440-36-0	Antimony	2.19E-01	4.03E-01	mg/kg	IA-2-04	5/5	All Detects	4.03E-01	0.09	3.10E+00	-	-	N	BSL
	7440-38-2	Arsenic	2.94E+00	1.21E+01	mg/kg	IA-2-05	5/5	All Detects	1.21E+01	2.00	6.80E-01	-	-	**Y**	ASL
	7440-39-3	Barium	5.12E+01	3.20E+02	mg/kg	IA-2-01	5/5	All Detects	3.20E+02	83.26	1.50E+03	-	-	N	BSL
	7440-41-7	Beryllium	2.50E-01	3.15E-01	mg/kg	IA-2-05	5/5	All Detects	3.15E-01	0.34	1.60E+01	-	-	N	BSL
	7440-43-9	Cadmium	1.80E-01	1.10E+00	mg/kg	IA-2-04	5/5	All Detects	1.10E+00	0.11	7.10E+00	-	-	N	BSL
	7440-47-3	Chromium	2.86E+01	4.16E+01	mg/kg	IA-2-01	5/5	All Detects	4.16E+01	44.48	1.20E+04	-	-	N	BSL
	7440-50-8	Copper	7.69E+01	2.90E+02	mg/kg	IA-2-02	5/5	All Detects	2.90E+02	85.03	3.10E+02	-	-	N	BSL
	7439-92-1	Lead	1.37E+01	3.56E+01	mg/kg	IA-2-05	5/5	All Detects	3.56E+01	18.12	4.00E+02	-	-	N	BSL
	7439-97-6	Mercury	5.30E-02	1.64E-01	mg/kg	IA-2-02	5/5	All Detects	1.64E-01	0.03	1.10E+00	-	-	N	BSL
	7440-02-0	Nickel	1.83E+01	2.44E+01	mg/kg	IA-2-05	5/5	All Detects	2.44E+01	19.78	1.50E+02	-	-	N	BSL
	7782-49-2	Selenium	2.70E-01	3.69E-01	mg/kg	IA-2-01	5/5	All Detects	3.69E-01	0.34	3.90E+01	-	-	N	BSL
	7440-22-4	Silver	6.10E-02	1.20E-01	mg/kg	IA-2-04	5/5	All Detects	1.20E-01	0.05	3.90E+01	-	-	N	BSL
	7440-66-6	Zinc	1.09E+02	3.42E+02	mg/kg	IA-2-01	5/5	All Detects	3.42E+02	56.64	2.30E+03	-	-	N	BSL
Polychlorinated Biphenyls (PCBs)															
Pesticides															
Area 2	72-54-8	4,4'-DDD	2.49E+00	2.49E+00	mg/kg	IA-2-02	1/5	0.0047 - 0.1	2.49E+00		1.90E-01	-	-	**Y**	ASL
	72-55-9	4,4'-DDE	3.60E-03	4.26E+00	mg/kg	IA-2-02	5/5	All Detects	4.26E+00	0.025	2.00E+00	-	-	**Y**	ASL
	50-29-3	4,4'-DDT	1.78E-03	9.36E+00	mg/kg	IA-2-02	5/5	All Detects	9.36E+00	0.009	1.90E+00	-	-	**Y**	ASL
	309-00-2	Aldrin	5.88E-02	5.88E-02	mg/kg	IA-2-01	1/5	0.0047 - 0.25	5.88E-02	-	3.90E-02	-	-	**Y**	ASL
	12789-03-6	Chlordane (technical)	3.74E-02	1.80E+00	mg/kg	IA-2-02	3/5	0.047 - 2.5	1.80E+00	-	1.70E+00	-	-	**Y**	ASL
	5103-71-9	cis-Chlordane	1.99E-02	1.48E-01	mg/kg	IA-2-02	2/5	0.0047 - 0.25	1.48E-01	-	1.70E+00	-	-	N	BSL
	60-57-1	Dieldrin	2.02E-02	8.38E+00	mg/kg	IA-2-01	3/5	0.0047 - 0.25	8.38E+00	0.013	3.40E-02	-	-	**Y**	ASL
	959-98-8	Endosulfan I	1.50E-02	1.50E-02	mg/kg	IA-2-04	1/5	0.0047 - 0.25	1.50E-02		4.70E+01	-	-	N	BSL
	33213-65-9	Endosulfan II	4.66E-02	4.66E-02	mg/kg	IA-2-04	1/5	0.0047 - 0.25	4.66E-02	-	4.70E+01	-	-	N	BSL
	1031-07-8	Endosulfan sulfate	1.95E-02	1.95E-02	mg/kg	IA-2-04	1/5	0.0047 - 0.25	1.95E-02	-	3.80E+01	-	-	N	BSL
	5103-74-2	trans-Chlordane	4.70E-03	1.36E-01	mg/kg	IA-2-02	3/5	0.0047 - 0.25	1.36E-01	-	1.70E+00	-	-	N	BSL

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SOIL SURFACE (0-0.5 FT-BGS): AREA 2

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Soil Surface (0-0.50 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Semivolatile Organic Compounds															
Area 2	90-12-0	1-Methylnaphthalene	5.80E-03	2.70E-02	mg/kg	IA-2-04	2/5	0.015 - 0.039	2.70E-02	-	1.80E+01	-	-	N	BSL
	91-57-6	2-Methylnaphthalene	5.10E-03	2.86E-02	mg/kg	IA-2-04	4/5	0.015 - 0.039	2.86E-02	-	2.40E+01	-	-	N	BSL
	83-32-9	Acenaphthene	8.20E-03	1.51E-02	mg/kg	IA-2-02	4/5	0.015 - 0.039	1.51E-02	-	3.60E+02	-	-	N	BSL
	120-12-7	Anthracene	1.38E-02	2.96E-02	mg/kg	IA-2-02	5/5	All Detects	2.96E-02	-	1.80E+03	-	-	N	BSL
	56-55-3	Benzo_a_anthracene	4.05E-02	1.64E-01	mg/kg	IA-2-01	4/5	0.015 - 0.039	1.64E-01	-	1.10E+00	-	-	N	BSL
	50-32-8	Benzo_a_pyrene	3.86E-02	1.42E-01	mg/kg	IA-2-02	5/5	All Detects	1.42E-01	-	1.10E-01	-	-	**Y**	ASL
	205-99-2	Benzo_b_fluoranthene	4.77E-02	2.16E-01	mg/kg	IA-2-01	5/5	All Detects	2.16E-01	-	1.10E+00	-	-	N	BSL
	191-24-2	Benzo_g,h,i_perylene	2.10E-02	1.10E-01	mg/kg	IA-2-02	4/5	0.015 - 0.039	1.10E-01	-	1.80E+02	-	-	N	BSL
	207-08-9	Benzo_k_fluoranthene	3.09E-02	9.85E-02	mg/kg	IA-2-01	5/5	All Detects	9.85E-02	-	1.10E+01	-	-	N	BSL
	218-01-9	Chrysene	4.32E-02	1.76E-01	mg/kg	IA-2-01	5/5	All Detects	1.76E-01	-	1.10E+02	-	-	N	BSL
	53-70-3	Dibenz(a,h)anthracene	7.50E-03	2.26E-02	mg/kg	IA-2-02	3/5	0.015 - 0.039	2.26E-02	-	1.10E-01	-	-	N	BSL
	206-44-0	Fluoranthene	4.70E-02	4.17E-01	mg/kg	IA-2-01	5/5	All Detects	4.17E-01	-	2.40E+02	-	-	N	BSL
	86-73-7	Fluorene	8.00E-03	3.41E-02	mg/kg	IA-2-04	4/5	0.015 - 0.039	3.41E-02	-	2.40E+02	-	-	N	BSL
	193-39-5	Indeno_1,2,3-cd_pyrene	1.73E-02	8.67E-02	mg/kg	IA-2-02	4/5	0.015 - 0.039	8.67E-02	-	1.10E+00	-	-	N	BSL
	91-20-3	Naphthalene	7.30E-03	1.41E-02	mg/kg	IA-2-01	4/5	0.015 - 0.039	1.41E-02	-	2.00E+00	-	-	N	BSL
	85-01-8	Phenanthrene	3.11E-02	2.30E-01	mg/kg	IA-2-01	5/5	All Detects	2.30E-01	-	1.80E+02	-	-	N	BSL
	129-00-0	Pyrene	5.60E-02	3.01E-01	mg/kg	IA-2-01	5/5	All Detects	3.01E-01	-	1.80E+02	-	-	N	BSL
Volatile Organic Compounds (VOCs)															
Area 2	79-20-9	Methyl acetate	1.10E+00	1.10E+00	mg/kg	IA-2-05A	1/1	All Detects	1.10E+00	-	7.80E+03	-	-	N	BSL

Notes

(1) Area 2 summary statistics are based on a 95% upper confidence limit (UCL) derived using the ITRC Incremental Sampling Methodology (ISM) calculator. The 95% UCL was derived for each decision unit (DU) located within Area 2 using ISM soil samples collected between 0-0.5 ft-bgs from DU IA-2-01 through IA-2-05 in 2021. Constituents detected at least once are presented on this table.

(2) The concentration used for screening is the maximum of the 95% UCLs derived for each ISM sample collected in Area 2.

(3) Values were statistically calculated using concentrations from soil samples collected from reference areas. These values are provided for informational purposes and are not used to select COPCs.

(4) Screening Toxicity Value was derived using USEPA's Residential Soil Regional Screening Level Generic Table. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Screening values are based on a noncancer hazard quotient of 0.1 and a cancer risk of 10^{-6}.

Where toxicity information for a constituent was not available, toxicity values for a structurally similar constituent were used. A list of surrogate compounds is provided in Table 2.5.

(5) ASL = Maximum detected concentration above screening level(s).

BSL = Maximum detected concentration below screening level(s).

ARAR = Applicable or Relevant and Appropriate Requirements (none identified)

TBC = To be considered

COPC = Chemical of Potential Concern

"-" = Not available

mg/kg = milligrams per kilogram

(6) Samples were analyzed for total chromium. Based on the historical use of the Site, hexavalent chromium is not expected to be found at the Site. Therefore, analytical results for total chromium were screened against trivalent chromium in this risk assessment.

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SOIL SURFACE (0-0.5 FT-BGS): AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Soil Surface (0-0.50 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Metals															
Area 3	7440-36-0	Antimony	2.95E-01	2.95E-01	mg/kg	IA-3-01	1/4	0.54 - 0.56	2.95E-01	0.09	3.10E+00	-	-	N	BSL
	7440-38-2	Arsenic	2.24E+00	4.08E+00	mg/kg	IA-3-02	4/4	All Detects	4.08E+00	2.00	6.80E-01	-	-	**Y**	ASL
	7440-39-3	Barium	6.67E+01	8.83E+01	mg/kg	IA-3-02	4/4	All Detects	8.83E+01	83.26	1.50E+03	-	-	N	BSL
	7440-41-7	Beryllium	2.32E-01	3.16E-01	mg/kg	IA-3-02	4/4	All Detects	3.16E-01	0.34	1.60E+01	-	-	N	BSL
	7440-43-9	Cadmium	9.90E-02	1.30E+00	mg/kg	IA-3-02	4/4	All Detects	1.30E+00	0.11	7.10E+00	-	-	N	BSL
	7440-47-3	Chromium	2.13E+01	2.72E+01	mg/kg	IA-3-02	4/4	All Detects	2.72E+01	44.48	1.20E+04	-	-	N	BSL
	7440-50-8	Copper	6.90E+01	1.49E+02	mg/kg	IA-3-02	4/4	All Detects	1.49E+02	85.03	3.10E+02	-	-	N	BSL
	7439-92-1	Lead	8.86E+00	7.19E+01	mg/kg	IA-3-01	4/4	All Detects	7.19E+01	18.12	4.00E+02	-	-	N	BSL
	7439-97-6	Mercury	2.49E-02	9.59E-02	mg/kg	IA-3-01	4/4	All Detects	9.59E-02	0.03	1.10E+00	-	-	N	BSL
	7440-02-0	Nickel	1.20E+01	1.67E+01	mg/kg	IA-3-02	4/4	All Detects	1.67E+01	19.78	1.50E+02	-	-	N	BSL
	7782-49-2	Selenium	3.60E-01	1.28E+00	mg/kg	IA-3-01	4/4	All Detects	1.28E+00	0.34	3.90E+01	-	-	N	BSL
	7440-22-4	Silver	3.30E-02	1.43E-01	mg/kg	IA-3-02	4/4	All Detects	1.43E-01	0.05	3.90E+01	-	-	N	BSL
	7440-66-6	Zinc	5.75E+01	9.36E+01	mg/kg	IA-3-02	4/4	All Detects	9.36E+01	56.64	2.30E+03	-	-	N	BSL
Pesticides															
Area 3	72-54-8	4,4'-DDD	3.30E-03	6.43E-03	mg/kg	IA-3-02	2/4	0.0043 - 0.022	6.43E-03	-	1.90E-01	-	-	N	BSL
	72-55-9	4,4'-DDE	1.82E-02	3.59E-02	mg/kg	IA-3-02	3/4	0.0047 - 0.005	3.59E-02	0.025	2.00E+00	-	-	N	BSL
	50-29-3	4,4'-DDT	3.10E-03	3.02E-01	mg/kg	IA-3-02	3/4	0.0045 - 0.005	3.02E-01	0.009	1.90E+00	-	-	N	BSL
	309-00-2	Aldrin	3.90E-03	1.17E-02	mg/kg	IA-3-01	2/4	0.0045 - 0.005	1.17E-02	-	3.90E-02	-	-	N	BSL
	60-57-1	Dieldrin	2.90E-03	1.44E-02	mg/kg	IA-3-01	3/4	0.0047 - 0.005	1.44E-02	0.013	3.40E-02	-	-	N	BSL
	5103-74-2	trans-Chlordane	3.00E-03	4.36E-03	mg/kg	IA-3-02	2/4	0.0043 - 0.022	4.36E-03	-	1.70E+00	-	-	N	BSL

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SOIL SURFACE (0-0.5 FT-BGS): AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Soil Surface (0-0.50 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Semivolatile Organic Compounds															
Area 3	90-12-0	1-Methylnaphthalene	1.03E-02	1.46E-02	mg/kg	IA-3-01	3/4	0.015 - 0.015	1.46E-02	-	1.80E+01	-	-	N	BSL
	91-57-6	2-Methylnaphthalene	5.70E-03	1.46E-02	mg/kg	IA-3-01	4/4	All Detects	1.46E-02	-	2.40E+01	-	-	N	BSL
	83-32-9	Acenaphthene	1.04E-02	5.38E-02	mg/kg	IA-3-01	3/4	0.015 - 0.015	5.38E-02	-	3.60E+02	-	-	N	BSL
	120-12-7	Anthracene	1.04E-02	6.20E-02	mg/kg	IA-3-01	3/4	0.015 - 0.015	6.20E-02	-	1.80E+03	-	-	N	BSL
	56-55-3	Benzo_a_anthracene	4.15E-02	1.33E-01	mg/kg	IA-3-02	3/4	0.015 - 0.015	1.33E-01	-	1.10E+00	-	-	N	BSL
	50-32-8	Benzo_a_pyrene	4.07E-02	1.33E-01	mg/kg	IA-3-02	3/4	0.015 - 0.015	1.33E-01	-	1.10E-01	-	-	**Y**	ASL
	205-99-2	Benzo_b_fluoranthene	5.82E-02	1.65E-01	mg/kg	IA-3-02	3/4	0.015 - 0.015	1.65E-01	-	1.10E+00	-	-	N	BSL
	191-24-2	Benzo_g,h,i_perylene	1.38E-02	5.76E-02	mg/kg	IA-3-02	3/4	0.015 - 0.015	5.76E-02	-	1.80E+02	-	-	N	BSL
	207-08-9	Benzo_k_fluoranthene	2.06E-02	8.05E-02	mg/kg	IA-3-01	3/4	0.015 - 0.015	8.05E-02	-	1.10E+01	-	-	N	BSL
	218-01-9	Chrysene	1.16E-02	1.34E-01	mg/kg	IA-3-01	4/4	All Detects	1.34E-01	-	1.10E+02	-	-	N	BSL
	53-70-3	Dibenz(a,h)anthracene	2.17E-02	2.17E-02	mg/kg	IA-3-02	1/4	0.015 - 0.015	2.17E-02	-	1.10E-01	-	-	N	BSL
	206-44-0	Fluoranthene	8.80E-03	2.66E-01	mg/kg	IA-3-01	4/4	All Detects	2.66E-01	-	2.40E+02	-	-	N	BSL
	86-73-7	Fluorene	6.40E-03	4.41E-02	mg/kg	IA-3-01	3/4	0.015 - 0.015	4.41E-02	-	2.40E+02	-	-	N	BSL
	193-39-5	Indeno_1,2,3-cd_pyrene	1.00E-02	4.61E-02	mg/kg	IA-3-02	3/4	0.015 - 0.015	4.61E-02	-	1.10E+00	-	-	N	BSL
	91-20-3	Naphthalene	6.40E-03	1.80E-02	mg/kg	IA-3-01	4/4	All Detects	1.80E-02	-	2.00E+00	-	-	N	BSL
	85-01-8	Phenanthrene	1.27E-02	2.78E-01	mg/kg	IA-3-01	4/4	All Detects	2.78E-01	-	1.80E+02	-	-	N	BSL
	129-00-0	Pyrene	6.50E-03	2.16E-01	mg/kg	IA-3-01	4/4	All Detects	2.16E-01	-	1.80E+02	-	-	N	BSL

Notes

(1) Area 3 summary statistics are based on a 95% upper confidence limit (UCL) derived using the ITRC Incremental Sampling Methodology (ISM) calculator. The 95% UCL was derived for each decision unit (DU) located within Area 3 using ISM soil samples collected between 0-0.5 ft-bgs from DU IA-3-01 through IA-3-04 in 2021. Constituents detected at least once are presented on this table.

(2) The concentration used for screening is the maximum of the 95% UCLs derived for each ISM sample collected in Area 3.

(3) Values were statistically calculated using concentrations from soil samples collected from reference areas. These values are provided for informational purposes and are not used to select COPCs.

(4) Screening Toxicity Value was derived using USEPA's Residential Soil Regional Screening Level Generic Table. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Screening values are based on a noncancer hazard quotient of 0.1 and a cancer risk of 10^{-6}.

Where toxicity information for a constituent was not available, toxicity values for a structurally similar constituent were used. A list of surrogate compounds is provided in Table 2.5.

(5) ASL = Maximum detected concentration above screening level(s).

BSL = Maximum detected concentration below screening level(s).

ARAR = Applicable or Relevant and Appropriate Requirements (none identified)

TBC = To be considered

COPC = Chemical of Potential Concern

"-" = Not available

mg/kg = milligrams per kilogram

(6) Samples were analyzed for total chromium. Based on the historical use of the Site, hexavalent chromium is not expected to be found at the Site. Therefore, analytical results for total chromium were screened against trivalent chromium in this risk assessm

TABLE 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SUBSURFACE SOIL (0-6 FT-BGS): AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Medium: Subsurface Soil (0-6 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Metals															
Area 3	7440-36-0	Antimony	1.20E-01	1.60E-01	mg/kg	SC-3-08	2/20	0.29 - 0.53	1.60E-01	0.09	3.10E+00	-	-	N	BSL
	7440-38-2	Arsenic	6.10E-01	5.70E+00	mg/kg	SC-3-07	20/20	All Detects	5.70E+00	2.00	6.80E-01	-	-	**Y**	ASL
	7440-39-3	Barium	3.50E+01	8.10E+01	mg/kg	SC-3-06	20/20	All Detects	8.10E+01	83.26	1.50E+03	-	-	N	BSL
	7440-41-7	Beryllium	1.50E-01	2.90E-01	mg/kg	SC-3-08	20/20	All Detects	2.90E-01	0.34	1.60E+01	-	-	N	BSL
	7440-43-9	Cadmium	5.20E-02	7.00E-01	mg/kg	SC-3-08	19/20	0.2 - 0.2	7.00E-01	0.11	7.10E+00	-	-	N	BSL
	7440-47-3	Chromium	1.20E+01	3.80E+01	mg/kg	SC-3-07	20/20	All Detects	3.80E+01	44.48	1.20E+04	-	-	N	BSL
	7440-50-8	Copper	4.70E+01	9.00E+01	mg/kg	SC-3-06	20/20	All Detects	9.00E+01	85.03	3.10E+02	-	-	N	BSL
	7439-92-1	Lead	9.10E-01	1.30E+01	mg/kg	SC-3-08	20/20	All Detects	1.30E+01	18.12	4.00E+02	-	-	N	BSL
	7439-97-6	Mercury	2.20E-02	1.00E-01	mg/kg	SC-3-06	12/20	0.09 - 0.13	1.00E-01	0.03	1.10E+00	-	-	N	BSL
	7440-02-0	Nickel	7.90E+00	1.70E+01	mg/kg	SC-3-08	20/20	All Detects	1.70E+01	19.78	1.50E+02	-	-	N	BSL
	7782-49-2	Selenium	9.40E-02	4.20E-01	mg/kg	SC-3-08	19/20	1 - 1	4.20E-01	0.34	3.90E+01	-	-	N	BSL
	7440-22-4	Silver	1.80E-02	7.30E-02	mg/kg	SC-3-08	15/20	0.14 - 0.23	7.30E-02	0.05	3.90E+01	-	-	N	BSL
	7440-28-0	Thallium	5.20E-02	1.00E-01	mg/kg	SC-3-01	5/20	0.14 - 0.26	1.00E-01	0.08	7.80E-02	-	-	**Y**	ASL
	7440-66-6	Zinc	3.70E+01	9.20E+01	mg/kg	SC-3-07	20/20	All Detects	9.20E+01	0.025	2.30E+03	-	-	N	BSL
Polychlorinated Biphenyls (PCBs)															
Area 3	11096-82-5	Aroclor-1260	1.10E-01	1.10E-01	mg/kg	SC-3-08	1/20	0.05 - 0.071	1.10E-01	-	2.40E-01	-	-	N	BSL
Pesticides															
Area 3	72-54-8	4,4'-DDD	1.20E-02	1.50E-02	mg/kg	SC-3-08	2/20	0.005 - 0.0066	1.50E-02	-	1.90E-01	-	-	N	BSL
	72-55-9	4,4'-DDE	3.10E-03	4.90E-02	mg/kg	SC-3-08	12/20	0.005 - 0.0066	4.90E-02	0.025	2.00E+00	-	-	N	BSL
	50-29-3	4,4'-DDT	2.10E-03	1.00E-01	mg/kg	SC-3-08	8/20	0.005 - 0.0066	1.00E-01	0.009	1.90E+00	-	-	N	BSL
	309-00-2	Aldrin	2.00E-03	2.00E-03	mg/kg	SC-3-11	1/20	0.005 - 0.0071	2.00E-03	-	3.90E-02	-	-	N	BSL
	319-85-7	beta-BHC	1.30E-02	1.30E-02	mg/kg	SC-3-10	1/20	0.005 - 0.0071	1.30E-02	-	3.00E-01	-	-	N	BSL
	60-57-1	Dieldrin	3.30E-03	3.30E-03	mg/kg	SC-3-11	1/20	0.005 - 0.0071	3.30E-03	0.013	3.40E-02	-	-	N	BSL
	33213-65-9	Endosulfan II	8.30E-03	8.30E-03	mg/kg	SC-3-02	1/20	0.005 - 0.0071	8.30E-03	-	4.70E+01	-	-	N	BSL
	7421-93-4	Endrin aldehyde	3.20E-03	3.20E-03	mg/kg	SC-3-08	1/20	0.005 - 0.0071	3.20E-03	-	1.90E+00	-	-	N	BSL
	5103-74-2	trans-Chlordane	1.40E-03	3.80E-03	mg/kg	SC-3-08	4/20	0.005 - 0.0071	3.80E-03	-	1.70E+00	-	-	N	BSL

TABLE 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN: SUBSURFACE SOIL (0-6 FT-BGS): AREA 3

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Medium: Subsurface Soil (0-6 ft-bgs)
Exposure Medium: Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Soil															
Semivolatile Organic Compounds															
Area 3	90-12-0	1-Methylnaphthalene	5.10E-03	1.40E-01	mg/kg	SC-3-01	3/20	0.016 - 0.019	1.40E-01	-	1.80E+01	-	-	N	BSL
	91-57-6	2-Methylnaphthalene	7.50E-03	2.90E-01	mg/kg	SC-3-01	3/20	0.016 - 0.019	2.90E-01	-	2.40E+01	-	-	N	BSL
	83-32-9	Acenaphthene	4.30E-03	3.50E-02	mg/kg	SC-3-01	5/20	0.016 - 0.022	3.50E-02	-	3.60E+02	-	-	N	BSL
	120-12-7	Anthracene	4.20E-03	2.40E-02	mg/kg	SC-3-11	6/20	0.016 - 0.019	2.40E-02	-	1.80E+03	-	-	N	BSL
	56-55-3	Benzo_a_anthracene	4.30E-03	6.80E-02	mg/kg	SC-3-09	14/20	0.016 - 0.019	6.80E-02	-	1.10E+00	-	-	N	BSL
	50-32-8	Benzo_a_pyrene	1.10E-02	7.50E-02	mg/kg	SC-3-11	10/20	0.016 - 0.019	7.50E-02	-	1.10E-01	-	-	N	BSL
	205-99-2	Benzo_b_fluoranthene	7.90E-03	9.90E-02	mg/kg	SC-3-11	13/20	0.016 - 0.019	9.90E-02	-	1.10E+00	-	-	N	BSL
	191-24-2	Benzo_g,h,i_perylene	8.60E-03	4.20E-02	mg/kg	SC-3-11	7/20	0.016 - 0.022	4.20E-02	-	1.80E+02	-	-	N	BSL
	207-08-9	Benzo_k_fluoranthene	8.50E-03	4.00E-02	mg/kg	SC-3-11	8/20	0.016 - 0.019	4.00E-02	-	1.10E+01	-	-	N	BSL
	218-01-9	Chrysene	3.90E-03	7.40E-02	mg/kg	SC-3-09	15/20	0.016 - 0.019	7.40E-02	-	1.10E+02	-	-	N	BSL
	53-70-3	Dibenz(a,h)anthracene	8.20E-03	1.20E-02	mg/kg	SC-3-11	2/20	0.016 - 0.022	1.20E-02	-	1.10E-01	-	-	N	BSL
	206-44-0	Fluoranthene	7.40E-03	1.70E-01	mg/kg	SC-3-11	15/20	0.016 - 0.019	1.70E-01	-	2.40E+02	-	-	N	BSL
	86-73-7	Fluorene	6.10E-03	1.80E-02	mg/kg	SC-3-01	4/20	0.016 - 0.022	1.80E-02	-	2.40E+02	-	-	N	BSL
	193-39-5	Indeno_1,2,3-cd_pyrene	1.10E-02	3.60E-02	mg/kg	SC-3-11	6/20	0.016 - 0.022	3.60E-02	-	1.10E+00	-	-	N	BSL
	91-20-3	Naphthalene	2.10E-02	5.70E-02	mg/kg	SC-3-01	2/20	0.016 - 0.022	5.70E-02	-	2.00E+00	-	-	N	BSL
	85-01-8	Phenanthrene	4.00E-03	1.30E-01	mg/kg	SC-3-11	15/20	0.016 - 0.019	1.30E-01	-	1.80E+02	-	-	N	BSL
	129-00-0	Pyrene	4.30E-03	1.30E-01	mg/kg	SC-3-09	16/20	0.016 - 0.019	1.30E-01	-	1.80E+02	-	-	N	BSL
Volatile Organic Compounds (VOCs)															
Area 3	78-93-3	2-Butanone (MEK)	9.50E-03	3.10E-02	mg/kg	SC-3-04	7/19	0.022 - 0.037	3.10E-02	-	2.70E+03	-	-	N	BSL
	67-64-1	Acetone	3.50E-02	1.60E-01	mg/kg	SC-3-04	7/19	0.028 - 0.047	1.60E-01	-	6.10E+03	-	-	N	BSL
	75-15-0	Carbon disulfide	1.40E-03	1.90E-03	mg/kg	SC-3-04	3/19	0.0049 - 0.0094	1.90E-03	-	7.70E+01	-	-	N	BSL

Notes

(1) Area 3 summary statistics are based on discrete soil samples collected between 0-6 ft-bgs from SC-3-01 through SC-3-11 in 2021. Constituents detected at least once are presented on this table.

(2) The concentration used for screening is the maximum detected concentration in soil samples collected from 0-6 ft-bgs from Area 3.

(3) Values were statistically calculated using concentrations from soil samples collected from reference areas. These values are provided for informational purposes and are not used to select COPCs.

(4) Screening Toxicity Value was derived using USEPA's Residential Soil Regional Screening Level Generic Table. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Screening values are based on a noncancer hazard quotient of 0.1 and a cancer risk of 10^{-6}.

Where toxicity information for a constituent was not available, toxicity values for a structurally similar constituent were used. A list of surrogate compounds is provided in Table 2.5.

(5) ASL = Maximum detected concentration above screening level(s).

BSL = Maximum detected concentration below screening level(s).

ARAR = Applicable or Relevant and Appropriate Requirements (none identified)

TBC = To be considered

COPC = Chemical of Potential Concern

"-" = Not available

mg/kg = milligrams per kilogram

(6) Samples were analyzed for total chromium. Based on the historical use of the Site, hexavalent chromium is not expected to be found at the Site. Therefore, analytical results for total chromium were screened against trivalent chromium in this risk assessment.

TABLE 2.5

SUMMARY OF SURROGATES USED IN THE HUMAN HEALTH RISK ASSESSMENT

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituent	Surrogate
Soil	
Pesticides	
cis-Chlordane	Chlordane
trans-Chlordane	Chlordane
delta-BHC	Technical HCH
Endosulfan II	Endosulfan
Endosulfan I	Endosulfan
Endosulfan II	Endosulfan
Endrin aldehyde	Endrin
Endrin ketone	Endrin
Semivolatile Organic Compounds	
Benzo(g,h,i) perylene	Pyrene
Phenanthrene	Pyrene
Acenaphthylene	Pyrene

TABLE 2.6
SELECTION OF EXPOSURE PATHWAYS[1]
Caneel Bay Resort
St. John Island, U.S. Virgin Island

Receptor Population	Receptor Age	Scenario Timeframe	Medium[2]	Exposure Medium	Exposure Point	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Park/Resort Worker	Adult	Current/Future	Surface Soil 0-0.5' bgs	Soil	Area 1 Area 2 Area 3	Dermal Contact Incidental Ingestion Inhalation of Fugitive Dust	Quantitative	The site is the former location of Caneel Bay Resort. A Park/Resort Worker may potentially be exposed to contaminants in surface soils in Areas 1, 2 or 3 when accessing the Site.
Site Visitor	Child or Adult	Current/Future	Surface Soil 0-0.5' bgs	Soil	Area 1 Area 2 Area 3	Dermal Contact Incidental Ingestion Inhalation of Fugitive Dust	Qualitative	Local residents or tourists may access the site. However, these occasional or one-time exposures are expected to be lower than those of either the Park/Resort Work or Hypothetical Resident; thus, potential for risk is addressed qualitatively for this receptor.
Construction Worker	Adult	Future	Surface Soil 0-0.5 ft-bgs	Soil	Area 1 Area 2 Area 3	Dermal Contact Incidental Ingestion Inhalation of Fugitive Dust	Quantitative	Construction workers may potentially be exposed to surface soils while performing excavation-related activities within Areas 1, 2, and 3. Additionally, it is assumed that there is the potential for construction workers to encounter subsurface soils in Area 3.
			Soil (Subsurface) 0.5-6 ft-bgs	Soil	Area 3	Dermal Contact Incidental Ingestion Inhalation of Fugitive Dust	Quantitative	
Hypothetical Resident	Child and Adult	Future	Surface Soil 0-0.5' bgs	Soil	Area 1 Area 2 Area 3	Dermal Contact Incidental Ingestion Inhalation of Fugitive Dust	Quantitative	While the Site has historically been used for commercial purposes, it is assumed that the property could eventually be redeveloped for residential use. Therefore, a future resident may potentially be exposed to surface soil in Areas 1, 2 or 3 during day to day activities outside.

1. Exposure pathways are those associated with impacted soils. Because no groundwater was encountered during Site investigations conducted in 2021, groundwater-related pathways are not considered as complete.
2. No exposure to subsurface soils is assumed for Areas 1 and 2. Excavation and subsequent exposure to Area 3 subsurface soils assumed relevant for only short-term construction activities.

TABLE 2.7
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - PARK/RESORT WORKER
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Medium:	Soil (Surface 0-0.5')
Exposure Medium:	Soil

Exposure Route	Receptor Population and Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Incidental ingestion, dermal contact and inhalation of dust	Curent Park Worker/CBR Employee Adult	Area 1 Area 2 Area 3	IR_{soil}	Ingestion rate of soil	100	mg/day	USEPA 2014	1
			AF_{soil}	Soil adherence factor	0.12	mg/cm^2	USEPA 2014	2
			SA_{soil}	Skin surface area	3,527	cm^2 / day	USEPA 2014	3
			EF	Exposure Frequency	250	days/yr	USEPA 1991	4
			ED	Exposure Duration	10	years	NPS, Professional judgment	5
			ET_{out}	Exposure time outdoors	8	hours/event	USEPA 2014	6
			FS	Fraction soil contact at Site	1	unitless	Professional judgment	7
			BW	Body Weight	80	kg	USEPA 2014	8
			PEF	Particulate Emission Factor	1.36E+09	m^3/kg	USEPA 2020	9
			VF	Volatilization Factor	Chemical-specific	m^3/kg	USEPA 2020	10
			AT_c	Averaging Time - cancer	70	years	USEPA 1989	11
			AT_{nc}	Averaging Time - noncancer	10	years	USEPA 1989	12
			ABSd	Dermal absorption factor	Chemical-specific	unitless	USEPA 2004	13
			RBA	Relative Bioavailability Factor	Chemical-specific	%	USEPA 2012	14
			EPC	Exposure point concentration	Chemical-specific	mg/kg	Calculated	15

Soil Average Daily Intake (ADI) and Exposure (ADE) Equations:
$ADI_{ingestion}$ (mg/kg-d) = EPCs * IR * RBA * FS * EF * ED * C1 * 1/BW * 1/AT * 1/C2

ADI_{dermal} (mg/kg-d) = EPCs * ABSd * SA * AF * EF * ED * C1* 1/BW * 1/AT * 1/C2

$ADE_{inhalation}$ (mg/m^3) = EPCair* EF * ET * ED * 1/AT * 1/C3 * 1/C2
Where EPC air = EPC soil * (1/VF + 1/PEF)

Unit conversion factors: C1 = 0.000001 kg/mg
C2 = 365 days/yr
C3 = 24 hours/day

TABLE 2.7 Notes:

1. Soil ingestion rate is USEPA default value for an adult worker scenario (USEPA, 2014).
2. The soil adherence factor (AFsoil) is the USEPA default soil adherence factor for an adult worker (USEPA 2014).
3. The skin surface area is the EPA-recommended default SA for the adult worker and reflects the weighted average of mean values for head, hands and forearms (USEPA 2014).
4. The exposure frequency (EF) describes how often the exposure occurs over a given period of time. It was assumed that a park worker would be present at the Site 250 days per year (5 days p
5. The exposure duration (ED) describes the length of time over which the receptor comes into contact with contaminants. The ED assumed an estimated tenure at the park of 10 years; based c
6. The exposure time (ET) is the amount of time spent outdoors. An ET of 8 hours per day was selected, which is the EPA default for a worker (USEPA 2014).
7. Soil ingestion parameters are reflective of the daily dose of soil. It was assumed that a park worker would be exposed to the full daily dose when at the Site; therefore, a FS of 1.0 was used, based on professional judgment.
8. The body weight for the adult is the recommended default body weight in USEPA 2014.
9. PEF value was obtained from the USEPA Regional Screening Level (RSL) table, November 2020.
10. Volatilization factors were obtained from the USEPA Regional Screening Level (RSL) table, November 2020.
11. The averaging time (AT) for cancer effects (AT_c) for all receptors is set equal to a lifetime (i.e., 70 years), as recommended in USEPA 1989.
12. The averaging time for non-cancer effects (AT_{nc}) for all receptors is set equal to the exposure duration, as recommended in USEPA 1989.
13. The dermal absorption factors (ABSd) are recommended values in Exhibit 3-4 of USEPA 2004, with updates as provided on: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rag
14. The EPA recommended default RBA value of 60% is applied to oral arsenic exposures. An RBA of 100% is used for all other constituents (USEPA 2012).
15. Soil EPCs are the 95% upper confidence limit (UCL) for each COPC retained for each COPC in Areas 1, 2, and 3.

References:

USEPA. 2020. Regional Screening Levels - Generic Tables. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

USEPA 2014. Memorandum: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February 6, 2014. Office of Solid Waste and Emergency Response. OSWER Directive 9200.1-120.

USEPA 2012. Recommendations for the Default Value for Relative Bioavailability of Arsenic in Soil. December 2012. OSWER Directive 9200.1-113.

USEPA 2011. Exposure Factors Handbook, 2011 Edition. EPA/600/R-090/052F, September 2011. Office of Research and Development, USEPA, Washington, D.C.

USEPA 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, OSWER Directive 9285.7-02EP. EPA/540/R/99/005, USEPA, Washington D.C., July 2004.

USEPA 1991.Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. (OSWER Directive 9282.6-03)

USEPA 1989. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A, Interim Final, OSWER Directive 9285.701A. Office of Solid Waste and Emergency Response, USEPA, Washington D.C., December 1989.

TABLE 2.8
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - CONSTRUCTION WORKER
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Scenario Timeframe:	Future
Medium:	Soil (Surface and Subsurface) 0-6'
Exposure Medium:	Soil

Exposure Route	Receptor Population and Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Incidental ingestion, dermal contact and inhalation of dust	Construction worker Adult	Area 1 (Surface Soil) Area 2 (Surface Soil) Area 3 (Surface and Subsurface Soil)	IR_{soil}	Ingestion rate of soil	330	mg/day	USEPA 2002	1
			AF_{soil}	Soil adherence factor	0.3	mg/cm^2	USEPA 2002	2
			SA_{soil}	Skin surface area	3,527	cm^2 / day	USEPA 2014	3
			EF	Exposure Frequency	250	days/yr	Professional judgment	4
			ED	Exposure Duration	1	years	USEPA 2014	5
			ET_{out}	Exposure time outdoors	8	hours/event	USEPA 2014	6
			FS	Fraction soil contact at Site	1	unitless	Professional judgment	7
			BW	Body Weight	80	kg	USEPA 2014	8
			PEF	Particulate Emission Factor	1.36E+09	m^3/kg	USEPA 2020	9
			VF	Volatilization Factor	Chemical-specific	m^3/kg	USEPA 2020	10
			AT_c	Averaging Time - cancer	70	years	USEPA 1989	11
			AT_{nc}	Averaging Time - noncancer	1	years	USEPA 1989	12
			ABSd	Dermal absorption factor	Chemical-specific	unitless	USEPA 2020	13
			RBA	Relative Bioavailability Factor	Chemical-specific	%	USEPA 2012	14
			EPC	Exposure point concentration	Chemical-specific	mg/kg	Calculated	15

Soil Average Daily Intake (ADI) and Exposure (ADE) Equations:
$ADI_{ingestion}$ (mg/kg-d) = EPCs * IR * RBA * FS * EF * ED * C1 * 1/BW * 1/AT * 1/C2

ADI_{dermal} (mg/kg-d) = EPCs * ABSd * SA * AF * EF * ED * C1* 1/BW * 1/AT * 1/C2

$ADE_{inhalation}$ (mg/m^3) = EPCair* EF * ET * ED * 1/AT * 1/C3 * 1/C2
Where EPC air = EPC soil * (1/VF + 1/PEF)

Unit conversion factors: C1 = 0.000001 kg/mg
C2 = 365 days/yr
C3 = 24 hours/day

TABLE 2.8 Notes:

1. Soil ingestion rate (IR) is the EPA recommended soil ingestion rate for a construction worker as cited in Exhibit 5-1 of USEPA, 2002.

2. The soil adherence factor (AF) is the EPA recommended default exposure factor for a construction worker as cited in Exhibit 5-1 of USEPA 2002.

3. The skin surface area (SA) is the EPA recommended default exposure factor for an adult worker (USEPA 2014).

4. The exposure frequency (EF) describes how often the exposure occurs over a given period of time. It was assumed that a construction/utility worker would be performing activities for 250 days over a period of a year (5 days per week for 50 weeks), based on professional judgement.

5. The exposure duration (ED) describes the length of time over which the receptor comes into contact with contaminants. It was assumed the construction/utility worker would perform work for one

6. The exposure time (ET) is the amount of time spent outdoors. The ET is the USEPA recommended default exposure factor for an outdoor worker of 8 hours (USEPA 2014).

7. Fraction soil contact (FS) is reflective of the daily dose of soil. It was assumed that an adult worker would be exposed to the full daily dose when at the site.

8. The EPA-recommended body weight (BW) for an adult (USEPA 2014).

9. PEF value was obtained from the USEPA Regional Screening Level (RSL) table, November 2020.

10. Volatilization factors were obtained from the USEPA Regional Screening Level (RSL) table, November 2020.

11. The averaging time (AT) for cancer effects (AT_c) for all receptors is set equal to a lifetime (i.e., 70 years), as recommended in USEPA 1989.

12. The averaging time for non-cancer effects (AT_{nc}) for all receptors is set equal to the exposure duration, as recommended in USEPA 1989.

13. The dermal absorption factors (ABSd) are recommended values in Exhibit 3-4 of USEPA 2004, with updates as provided on: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-p

14. The EPA recommended default RBA value of 60% is applied to oral arsenic exposures. An RBA of 100% is used for all other constituents (USEPA 2012).

15. Soil EPCs are the 95% upper confidence limit (UCL) for each COPC retained for each COPC in Areas 1, 2, and 3.

References:

USEPA. 2020. Regional Screening Levels - Generic Tables. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables
USEPA 2014. Memorandum: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February 6, 2014. Office of Solid Waste and Emergency Response. OSWER Directive 9200.1-120.
USEPA 2012. Recommendations for the Default Value for Relative Bioavailability of Arsenic in Soil. December 2012. OSWER Directive 9200.1-113.
USEPA 2011. Exposure Factors Handbook, 2011 Edition. EPA/600/R-090/052F, September 2011. Office of Research and Development, USEPA, Washington, D.C.
USEPA 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, OSWER Directive 9285.7-02EP. EPA/540/R/99/005, USEPA, Washington D.C., July 2004.
USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Solid Waste and Emergency Response. OSWER 9355.4-24. December.
USEPA 1989. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A, Interim Final, OSWER Directive 9285.701A. Office of Solid Waste and Emergency Response, USEPA, Washington D.C., December 1989.

TABLE 2.9
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RESIDENT
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Medium:	Surface Soil (0-0.5')
Exposure Medium:	Soil

Exposure Route	Receptor Population and Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Incidental ingestion, dermal contact and inhalation of dust	Future Resident Child (0<6 years)	Area 1 Area 2 Area 3	IR_{soil}	Ingestion rate of soil	200	mg/day	USEPA 2014	1
			AF_{soil}	Soil adherence factor	0.20	mg/cm^2	USEPA 2014	2
			SA_{soil}	Skin surface area	2,373	cm^2 / day	USEPA 2014	3
			EF	Exposure Frequency	350	days/yr	USEPA 2014	4
			ED	Exposure Duration	6	years	USEPA 2014	5
			ET_{out}	Exposure time outdoors	24	hours/event	USEPA 2014	6
			FS	Fraction soil contact at Site	1	unitless	Professional judgment	7
			BW	Body Weight	15	kg	USEPA 2011	8
			PEF	Particulate Emission Factor	1.36E+09	m^3/kg	USEPA, 2020	9
			VF	Volatilization Factor	Chemical-specific	m^3/kg	USEPA, 2020	10
			AT_c	Averaging Time - cancer	70	years	USEPA 1989	11
			AT_{nc}	Averaging Time - noncancer	6	years	USEPA 1989	12
			ABSd	Dermal absorption factor	Chemical-specific	unitless	USEPA 2020	13
			RBA	Relative Bioavailability Factor	Chemical-specific	%	USEPA 2012	14
			EPC	Exposure point concentration	Chemical-specific	mg/kg	Calculated	15

TABLE 2.9
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RESIDENT
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Medium:	Surface Soil (0-0.5')
Exposure Medium:	Soil

Exposure Route	Receptor Population and Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Incidental ingestion, dermal contact and inhalation of dust	Future Resident Adult	Area 1	IR_{soil}	Ingestion rate of soil	100	mg/day	USEPA 2014	1
		Area 2	AF_{soil}	Soil adherence factor	0.07	mg/cm^2	USEPA 2014	2
		Area 3	SA_{soil}	Skin surface area	6,032	cm^2 / day	USEPA 2014	3
			EF	Exposure Frequency	350	days/yr	USEPA 2014	4
			ED	Exposure Duration	20	years	USEPA 2014	5
			ET_{out}	Exposure time outdoors	24	hours/event	USEPA 2014	6
			FS	Fraction soil contact at Site	1	unitless	Professional judgment	7
			BW	Body Weight	80	kg	USEPA 2014	8
			PEF	Particulate Emission Factor	1.36E+09	m^3/kg	USEPA, 2020	9
			VF	Volatilization Factor	Chemical-specific	m^3/kg	USEPA, 2020	10
			AT_c	Averaging Time - cancer	70	years	USEPA 1989	11
			AT_{nc}	Averaging Time - noncancer	20	years	USEPA 1989	12
			ABSd	Dermal absorption factor	Chemical-specific	unitless	USEPA 2020	13
			RBA	Relative Bioavailability Factor	Chemical-specific	%	USEPA 2012	14
			EPC	Exposure point concentration	Chemical-specific	mg/kg	Calculated	15

Soil Average Daily Intake (ADI) and Exposure (ADE) Equations:
$ADI_{ingestion}$ (mg/kg-d) = EPCs * IR * RBA * FS * EF * ED * C1 * 1/BW * 1/AT * 1/C2

ADI_{dermal} (mg/kg-d) = EPCs * ABSd * SA * AF * EF * ED * C1* 1/BW * 1/AT * 1/C2

$ADE_{inhalation}$ (mg/m^3) = EPCair* EF * ET * ED * 1/AT * 1/C3 * 1/C2
Where EPC air = EPC soil * (1/VF + 1/PEF)

Unit conversion factors: C1 = 0.000001 kg/mg
C2 = 365 days/yr
C3 = 24 hours/day

For carcinogenic COPCs identified as having a mutagenic mode of action, an age dependent adjustment factor (ADAF) is applied for exposures to receptors ages birth through 15 (EPA 2005).

The ADAFs are as follows:

Year	ADAF
0-2	10
2 < 16	3
≥16	1

Mutagenic Equations:

Incidental Ingestion: Intake = EPC * IR * EF * ED * CF_1 * SF * ADAF *1/BW * 1/AT *1/CF_2

Dermal Contact: Intake = EPC * SA * AF * ABSd * EF * ED * CF_1 * SF * ADAF *1/BW * 1/AT * 1/CF_2

Inhalation: Intake = EPCair* EF * ET * ED * ADAF * 1/AT * 1/C3 * 1/C2

TABLE 2.9 Notes:

1. Soil ingestion rates are the USEPA default soil ingestion rates for children and adults (USEPA 2014).

2. The soil adherence factors (AFsoil) are the USEPA default soil adherence factors for children and adults (USEPA 2014).

3. The skin surface areas are the EPA-recommended default SAs for the adult and child resident (USEPA 2014) and reflect the weighted average of mean values for head, hands, forearms and lower legs (and feet, for the child).

4. The exposure frequency (EF) describes how often the exposure occurs over a given period of time. The EF is the USEPA default EF for a resident (USEPA 2014).

5. The exposure duration (ED) describes the length of time over which the receptor comes into contact with contaminants. ED values are the EPA-recommended default values for a child (6 years) and adult (20 years), which reflect a total 26 year residential tenure.

6. The exposure time (ET) is the amount of time spent outdoors. The EPA-recommended value of 24 hours per day was selected (USEPA 2014).

7. Soil parameters are reflective of the daily dose of soil. It was assumed that a resident would be exposed to the entire full daily dose when at the site; therefore, a FS of 1 was used, based on professional judgment.

8. The body weights for the child and adult are the recommended default body weights in USEPA 2014.

9. PEF value was obtained from the USEPA Regional Screening Level (RSL) table, November 2020.

10. Volatilization factors were obtained from the USEPA Regional Screening Level (RSL) table, November 2020.

11. The averaging time (AT) for cancer effects (AT_c) for all receptors is set equal to a lifetime (i.e., 70 years), as recommended in USEPA 1989.

12. The averaging time for non-cancer effects (AT_{nc}) for all receptors is set equal to the exposure duration, as recommended in USEPA 1989.

13. The dermal absorption factors (ABSd) are recommended values in Exhibit 3-4 of USEPA 2004, with updates as provided on: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part-e.

14. The EPA recommended default RBA value of 60% is applied to oral arsenic exposures. An RBA of 100% is used for all other constituents (USEPA 2012).

15. Soil EPCs are the 95% upper confidence limit (UCL) for each COPC retained for each COPC in Areas 1, 2, and 3.

References:

USEPA. 2020. Regional Screening Levels - Generic Tables. November 2020. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables
USEPA 2014. Memorandum: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February 6, 2014. Office of Solid Waste and Emergency Response. OSWER Directive 9200.1-120.
USEPA 2012. Recommendations for the Default Value for Relative Bioavailability of Arsenic in Soil. December 2012. OSWER Directive 9200.1-113.
USEPA 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, OSWER Directive 9285.7-02EP. EPA/540/R/99/005, USEPA, Washington D.C., July 2004.
USEPA 1989. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A, Interim Final, OSWER Directive 9285.701A. Office of Solid Waste and Emergency Response, USEPA, Washington D.C., December 1989.

TABLE 2.10
SUMMARY OF VALUES USED FOR DERMAL ABSORPTION FRACTION FROM SOIL
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Contaminant of Potential Concern	CAS Number	Dermal Absorption Fraction from Soil	Source [1]
Metals			
Arsenic	7440-38-2	0.03	USEPA 2004
Thallium	7440-28-0	NA	--
Pesticides			
4,4'-DDD	72-54-8	0.1	USEPA 2004
4,4'-DDE	72-55-9	NA	--
4,4'-DDT	50-29-3	0.03	USEPA 2004
Aldrin	309-00-2	NA	--
Chlordane (technical)	12789-03-6	0.04	USEPA 2004
Dieldrin	60-57-1	0.1	USEPA 2004
Semivolatile Organic Compounds			
Benzo(a)pyrene	50-32-8	0.13	USEPA 2004

NA = Not Available

1. Unless otherwise noted, values are from Exhibit 3-4, USEPA 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final. EPA/540/R/99/005. For constituents with no available values, risks from those constituents is addressed qualitatively in the uncertainty analysis, in accordance with USEPA 2004.

TABLE 2.11
SUMMARY OF VOLATILIZATION AND PARTICULATE EMISSION FACTORS
Caneel Bay Resort, St. John Island, U.S. Virgin Island

Contaminant of Potential Concern	CAS Number	VF m^3/kg	PEF m^3/kg
Metals			
Arsenic	7440-38-2	NA	1.36E+09
Thallium	7440-28-0	NA	1.36E+09
Pesticides			
4,4'-DDD	72-54-8	NA	1.36E+09
4,4'-DDE	72-55-9	2.10E+06	1.36E+09
4,4'-DDT	50-29-3	NA	1.36E+09
Aldrin	309-00-2	1.72E+06	1.36E+09
Chlordane (technical)	12789-03-6	1.53E+06	1.36E+09
Dieldrin	60-57-1	NA	1.36E+09
Semo-Volatile Organic Compounds			
Benzo(a)pyrene	50-32-8	NA	1.36E+09

VF = Volatilization Factor, in cubic meters per kilogram
PEF = Particulate Emission Factor, in cubic meters per kilogram
NA = Not available
USEPA. 2020. Regional Screening Levels - Generic Tables. November.
https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

TABLE 2.12

EXPOSURE POINT CONCENTRATION SUMMARY: AREA 1 SURFACE SOIL (0-0.5 FT-BGS)

REASONABLE MAXIMUM EXPOSURE: AREA 1 SURFACE SOIL

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Surface Soil (0-0.5 ft-bgs)
Exposure Medium: Area 1

Exposure Point	CAS Number	Chemical of Potential Concern	Units	95% UCL (Distribution) (1)	Maximum Concentration	Exposure Point Concentration (2)			
						Value	Units	Statistic	Rationale
Area 1	**Metals**								
	7440-38-2	Arsenic	mg/kg	5.30E+00	8.24E+00	5.30E+00	mg/kg	Student's t 95% UCL	95% UCL
	7440-28-0	Thallium	mg/kg	1.40E-01	1.83E-01	1.40E-01	mg/kg	Student's t 95% UCL	95% UCL
	Semivolatile Organic Compounds								
	50-32-8	Benzo(a)pyrene	mg/kg	6.20E-02	3.40E-01	6.20E-02	mg/kg	Chebyshev 95%	95% UCL

Notes

Samples within this exposure medium include surface ISM samples collected between 0-0.5 ft-bgs from Decision Unit (DU) IA-1-01 through IA-1-04 from Area 1 in 2021.

(1) The 95% UCL and maximum concentration were derived based on the following:

a. The ITRC Incremental Sampling Methodology (ISM) calculator was used to calculate a 95% upper confidence limit (UCL) for Area 1.
95% UCLs were calculated using one-half the detection limit for non-detect values, if present.

b. The maximum concentration represents the maximum of the 95% UCLs derived for each ISM sample in Area 1.

(2) 95% UCL calculated using ITRC ISM calculator was selected as the exposure point concentration.

UCL calculated using Chebyshev or Student's-t statistics.

mg/kg = milligrams per kilogram

UCL = 95% Upper confidence limit

TABLE 2.13

EXPOSURE POINT CONCENTRATION SUMMARY: AREA 2 SURFACE SOIL (0-0.5 FT-BGS)

REASONABLE MAXIMUM EXPOSURE: AREA 2 SURFACE SOIL

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Surface Soil (0-0.5 ft-bgs)
Exposure Medium: Area 2

Exposure Point	CAS Number	Chemical of Potential Concern	Units	95% UCL (Distribution) (1)	Maximum Concentration	Exposure Point Concentration (2)			
						Value	Units	Statistic	Rationale
Area 2	**Metals**								
	7440-38-2	Arsenic	mg/kg	6.61E+00	1.21E+01	6.61E+00	mg/kg	Student's t 95% UCL	95% UCL
	Pesticides								
	72-54-8	4,4'-DDD	mg/kg	4.07E-01	2.49E+00	4.07E-01	mg/kg	Student's t 95% UCL	95% UCL
	72-55-9	4,4'-DDE	mg/kg	7.90E-01	4.26E+00	7.90E-01	mg/kg	Chebyshev 95%	95% UCL
	50-29-3	4,4'-DDT	mg/kg	1.50E+00	9.36E+00	1.50E+00	mg/kg	Chebyshev 95%	95% UCL
	309-00-2	Aldrin	mg/kg	4.44E-02	5.88E-02	4.44E-02	mg/kg	Chebyshev 95%	95% UCL
	12789-03-6	Chlordane (technical)	mg/kg	4.40E-01	1.80E+00	4.40E-01	mg/kg	Chebyshev 95%	95% UCL
	60-57-1	Dieldrin	mg/kg	2.42E+00	8.38E+00	2.42E+00	mg/kg	Chebyshev 95%	95% UCL
	Semivolatile Organic Compounds								
	50-32-8	Benzo(a)pyrene	mg/kg	7.60E-02	1.42E-01	7.60E-02	mg/kg	Chebyshev 95%	95% UCL

Notes

Samples within this exposure medium include surface ISM samples collected between 0-0.5 ft-bgs from Decision Unit (DU) IA-2-01 through IA-2-05 from Area 2 in 2021.

(1) The 95% UCL and maximum concentration were derived based on the following:

a. The ITRC Incremental Sampling Methodology (ISM) calculator was used to calculate a 95% upper confidence limit (UCL) for Area 1.
95% UCLs were calculated using one-half the detection limit for non-detect values, if present.

b. The maximum concentration represents the maximum of the 95% UCLs derived for each ISM sample in Area 2.

(2) 95% UCL calculated using ITRC ISM calculator was selected as the exposure point concentration.

UCL calculated using Chebyshev or Student's-t statistics.

mg/kg = milligrams per kilogram

UCL = 95% Upper confidence limit

TABLE 2.14

EXPOSURE POINT CONCENTRATION SUMMARY: AREA 3 SURFACE SOIL (0-0.5 FT-BGS)

REASONABLE MAXIMUM EXPOSURE: AREA 3 SURFACE SOIL

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current
Medium: Surface Soil (0-0.5 ft-bgs)
Exposure Medium: Area 3

Exposure Point	CAS Number	Chemical of Potential Concern	Units	95% UCL (Distribution) (1)	Maximum Concentration	Exposure Point Concentration (2)			
						Value	Units	Statistic	Rationale
Area 3	**Metals**								
	7440-38-2	Arsenic	mg/kg	2.43E+00	4.08E+00	2.43E+00	mg/kg	Student's-t	95% UCL
	Semivolatile Organic Compounds								
	50-32-8	Benzo(a)pyrene	mg/kg	7.10E-02	1.33E-01	7.10E-02	mg/kg	Chebyshev	95% UCL

Notes

Samples within this exposure medium include surface ISM samples collected between 0-0.5 ft-bgs from Decision Unit (DU) IA-3-01 through IA-3-04 from Area 3 in 2021.

(1) The 95% UCL and maximum concentration were derived based on the following:

a. The ITRC Incremental Sampling Methodology (ISM) calculator was used to calculate a 95% upper confidence limit (UCL) for Area 3.

95% UCLs were calculated using one-half the detection limit for non-detect values, if present.

b. The maximum concentration represents the maximum of the 95% UCLs derived for each ISM sample in Area 3.

(2) 95% UCL calculated using ITRC ISM calculator was selected as the exposure point concentration.

UCL calculated using Chebyshev or Student's-t statistics.

UCL = 95% UCL

mg/kg = milligrams per kilogram

TABLE 2.15

EXPOSURE POINT CONCENTRATION SUMMARY: AREA 3 SUBSURFACE SOIL (0-6 FT-BGS)

REASONABLE MAXIMUM EXPOSURE: AREA 3 SOIL

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Medium: Subsurface Soil (0-6 ft-bgs)
Exposure Medium: Area 3

Exposure Point	CAS Number	Chemical of Potential Concern	Units	95% UCL (Distribution) (1)		Maximum Concentration (2)	Exposure Point Concentration (3)			
							Value	Units	Statistic	Rationale
Area 3	**Metals**									
	7440-38-2	Arsenic	mg/kg	2.55E+00	N	5.70E+00	2.55E+00	mg/kg	95% Student's-t UCL	95% UCL
	7440-28-0	Thallium	mg/kg	9.07E-02	N	1.00E-01	9.07E-02	mg/kg	95% KM (t) UCL	95% UCL

Notes

Samples within this exposure medium include discrete soil samples collected between 0-6 ft-bgs from SC-3-01 through SC-3-11 in 2021.

(1) 95% Upper Confidence Limit (UCL) of the mean concentration calculated using USEPA ProUCL Version 5.1.

UCL calculated using Kaplan Meier (KM) and Student's-t statistics.

N = Normal Distribution

(2) The maximum concentration is based on the maximum detected concentration in discrete soil samples collected in Area 3 between 0-6 ft-bgs.

(3) The exposure point concentration is the 95% UCL

UCL = 95% UCL

mg/kg = milligrams per kilogram

TABLE 2.16
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Chemical of Potential Concern	Chronic/ Subchronic	Oral Reference Dose (RfD)		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s) (3)	Date(s)
Semi Volatile Organic Compounds										
Benzo(a)pyrene	Chronic	3.0E-04	(mg/kg-day)	1.0E+00	3.0E-04	(mg/kg-day)	Developmental	300	IRIS	04/13/21
Metals										
Arsenic	Chronic	3.0E-04	(mg/kg-day)	1.0E+00	3.0E-04	(mg/kg-day)	Cardiovascular / Skin	3	IRIS	04/13/21
Thallium (Soluble Salts)	Chronic	1.0E-05	(mg/kg-day)	1.0E+00	1.0E-05	(mg/kg-day)	Skin	3000	PPRTV	1984 , 1990
Pesticides										
4,4'-DDD	Chronic	3.0E-05	(mg/kg-day)	1.0E+00	3.0E-05	(mg/kg-day)	Liver	300	PPRTV	09/28/17
4,4'-DDE	Chronic	3.0E-04	(mg/kg-day)	1.0E+00	3.0E-04	(mg/kg-day)	Liver	3000	PPRTV	09/26/17
4,4'-DDT	Chronic	5.0E-04	(mg/kg-day)	1.0E+00	5.0E-04	(mg/kg-day)	Liver	100	IRIS	04/13/21
Aldrin	Chronic	3.0E-05	(mg/kg-day)	1.0E+00	3.0E-05	(mg/kg-day)	Liver	1000	IRIS	04/13/21
Chlordane	Chronic	5.0E-04	(mg/kg-day)	1.0E+00	5.0E-04	(mg/kg-day)	Liver	300	IRIS	04/13/21
Dieldrin	Chronic	5.0E-05	(mg/kg-day)	1.0E+00	5.0E-05	(mg/kg-day)	Liver	100	IRIS	04/13/21

Notes
mg/kg-day = milligrams per kilogram per day
(1) The oral absorption efficiency for dermal was obtained from USEPA Risk Assessment Guidance for Superfund (RAGS): Part E, Exhibit 4-1. 2004.
(2) The absorbed RfD for dermal is calculated by multiplying the oral RfD by the oral absorption efficiency value (EPA RAGS : Part E, 2004).
(3) IRIS = Integrated Risk Information System. Searched 2021. IRIS Final Assessments Search. https://cfpub.epa.gov/ncea/iris2/atoz.cfm

TABLE 2.17

NON-CANCER TOXICITY DATA -- INHALATION

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Chemical of Potential Concern	cas	Chronic/ Subchronic	Inhalation Reference Concentration (RfC)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
			Value	Units			Source(s) (1)	Date(s)
Semi Volatile Organic Compounds								
Benzo(a)pyrene	50-32-8	Chronic	2.0E-06	mg/m^3	Developmental	3000	IRIS	4/13/2021
Metals								
Arsenic	7440-38-2	Chronic	1.5E-05	mg/m^3	Developmental / Cardiovascular / Nervous / Respiratory	30	CAL EPA	1999, 2003, 2004
Thallium (Soluble Salts)	7440-28-0	-	-	-	-	-	-	-
Pesticides								
4,4'-DDD	72-54-8	-	-	-	-	-	-	-
4,4'-DDE	72-55-9	-	-	-	-	-	-	-
4,4'-DDT	50-29-3	-	-	-	-	-	-	-
Chlordane	12789-03-6	Chronic	7.0E-04	mg/m^3	Liver	1000	IRIS	4/13/2021
Aldrin	309-00-2	-	-	-	-	-	-	-
Dieldrin	60-57-1	-	-	-	-	-	-	-

Notes

mg/m^3 = milligrams per meter cubed

(1) IRIS = Integrated Risk Information System. Searched 2021. IRIS Final Assessments Search. https://cfpub.epa.gov/ncea/iris2/atoz.cfm

CAL EPA = California Environmental Protection Agency. Chronic Reference Exposure Level (REL). OEHAA 2008, Technical Supporting Document for Noncancer RELs Appendix D1.

TABLE 2.18

CANCER TOXICITY DATA -- ORAL/DERMAL

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Chemical of Potential Concern	Oral Cancer Slope Factor (CSF)		Oral Absorption Efficiency for Dermal (1)	Absorbed CSF for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Source(s) (3)	Date(s)
	Value	Units		Value	Units			
Semi Volatile Organic Compounds								
Benzo(a)pyrene	1.0E+00	$(mg/kg\text{-}day)^{-1}$	1.0E+00	1.0E+00	$(mg/kg\text{-}day)^{-1}$	B2***	IRIS	4/13/2021
Metals								
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.0E+00	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/13/2021
Thallium (Soluble Salts)	-	-	-	-	-	Inadequate Evidence	-	-
Pesticides								
4,4'-DDD	2.4E-01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	2.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021
4,4'-DDE	3.4E-01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021
4,4'-DDT	3.4E-01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021
Chlordane	3.5E-01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	3.5E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021
Aldrin	1.7E+01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	1.7E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021
Dieldrin	1.6E+01	$(mg/kg\text{-}day)^{-1}$	1.0E+00	1.6E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/13/2021

Notes

mg/kg-day = milligrams per kilogram per day

(1) The oral absorption efficiency for dermal was obtained from USEPA Risk Assessment Guidance for Superfund (RAGS): Part E, Exhibit 4-1. 2004.

(2) Absorbed cancer slope factor for dermal was calculated by dividing the oral cancer slope factor by the oral absorption efficiency value (EPA RAGS- Part E, 2004).

(3) IRIS = Integrated Risk Information System. Searched 2021. IRIS Final Assessments Search. https://cfpub.epa.gov/ncea/iris2/atoz.cfm

Cancer Description (USEPA 1986):

A = Human carcinogen

B2 = Probable human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans

*** Constituent has a mutagenic mode of action (MOA). Cancer risk for constituents identified as having a (MOA) is calculated by applying an age-dependent adjustment factor (ADAF) for childhood exposures from birth through 15 years. These ADAFs are summarized below (EPA 2005).

The ADAFs are as follows:

Year	ADAF
0-2	10
2 < 16	3
≥16	1

TABLE 2.19

CANCER TOXICITY DATA -- INHALATION

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Chemical of Potential Concern	Unit Risk		Unit Risk		Weight of Evidence/ Cancer Guideline Description	Source(s)	Date(s)
	Value	Units	Value	Units			
Semi Volatile Organic Compounds							
Benzo(a)pyrene	6.00E-04	$(ug/m^3)^{-1}$	6.0E-01	$(mg/m^3)^{-1}$	B2***	IRIS	4/13/2021
Metals							
Arsenic	4.30E-03	$(ug/m^3)^{-1}$	4.3E+00	$(mg/m^3)^{-1}$	A	IRIS	4/13/2021
Thallium	-	-	-	-	Inadequate Evidence	-	-
Pesticides							
4,4'-DDD	6.90E-05	$(ug/m^3)^{-1}$	6.9E-02	$(mg/m^3)^{-1}$	B2	CAL EPA	1964, 1976, 1977
4,4'-DDE	9.70E-05	$(ug/m^3)^{-1}$	9.7E-02	$(mg/m^3)^{-1}$	B2	CAL EPA	1964, 1976, 1977
4,4'-DDT	9.70E-05	$(ug/m^3)^{-1}$	9.7E-02	$(mg/m^3)^{-1}$	B2	IRIS	4/13/2021
Chlordane	1.00E-04	$(ug/m^3)^{-1}$	1.0E-01	$(mg/m^3)^{-1}$	B2	IRIS	4/13/2021
Aldrin	4.90E-03	$(ug/m^3)^{-1}$	4.9E+00	$(mg/m^3)^{-1}$	B2	IRIS	4/13/2021
Dieldrin	4.60E-03	$(ug/m^3)^{-1}$	4.6E+00	$(mg/m^3)^{-1}$	B2	IRIS	4/13/2021

Notes

$(mg/m^3)^{-1}$ = milligrams per cubic meter

$(mg/kg\text{-}day)^{-1}$ = milligrams per kilograms per day

IRIS = Integrated Risk Information System. IRIS Final Assessments Searched 2021. https://cfpub.epa.gov/ncea/iris2/atoz.cfm

Cancer Description (USEPA 1986):

A = Human carcinogen

B2 = Probably human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans

*** Constituent has a mutagenic mode of action (MOA). Cancer risk for constituents identified as having a MOA is calculated by applying an age-dependent adjustment factor (ADAF) for childhood exposures from birth through 15 years. These ADAFs are summarized below.

The ADAFs are as follows:

Year	ADAF
0-2	10
2 < 16	3
≥16	1

TABLE 2.20
SUMMARY OF RECEPTOR RISKS FOR AREA 1
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Receptor	Total Cancer Risk		Total Noncancer Hazard	
	Cancer Risk	**Risk Driver**	**Non-Cancer (HI)**	**Risk Driver**
Current/Future Park/Resort Worker				
Soil -Surface				
Incidental Ingestion	*6E-07*	None	*0.02*	None
Dermal Contact	*1E-07*	None	*0.002*	None
Inhalation (Fugitive Dust)	*5E-10*	None	*0.00006*	None
Total Risk	**7E-07**		**0.02**	
Future Construction Worker				
Soil -Surface				
Incidental Ingestion	*2E-07*	None	*0.07*	None
Dermal Contact	*3E-08*	None	*0.005*	None
Inhalation (Fugitive Dust)	*5E-11*	None	*0.00006*	None
Total Risk	**2E-07**		**0.08**	
Future Resident				
Soil -Surface				
Incidental Ingestion	*7E-06*	Arsenic	*0.3*	None
Dermal Contact	*1E-06*	None	*0.02*	None
Inhalation (Fugitive Dust)	*6E-09*	None	*0.0003*	None
Total Risk	**8E-06**		**0.3**	

Notes:
Risk drivers are provided only for chemicals of potential concern within a medium that have a cumulative Hazard Index greater than one (1), or a cumulative cancer risk greater than one in one million (1E-06).
HI = Hazard Index

TABLE 2.21
SUMMARY OF RECEPTOR RISKS FOR AREA 2
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Receptor	Total Cancer Risk		Total Noncancer Hazard	
	Cancer Risk	**Risk Driver**	**Non-Cancer (HI)**	**Risk Driver**
Current/Future Park/Resort Worker				
Soil - Surface				
Incidental Ingestion	*6E-06*	Dieldrin	*0.07*	None
Dermal Contact	*2E-06*	Dieldrin	*0.03*	None
Inhalation (Fugitive Dust)	*7E-09*	None	*0.00017*	None
Total Risk	**8E-06**		**0.1**	
Future Construction Worker				
Soil - Surface				
Incidental Ingestion	*2E-06*	Dieldrin	*0.2*	None
Dermal Contact	*5E-07*	None	*0.06*	None
Inhalation (Fugitive Dust)	*7E-10*	None	*0.0002*	None
Total Risk	**2E-06**		**0.3**	
Future Resident				
Soil - Surface				
Incidental Ingestion	*7E-05*	Arsenic, Aldrin, Dieldrin	*1*	None
Dermal Contact	*2E-05*	Arsenic, Dieldrin	*0.2*	None
Inhalation (Fugitive Dust)	*8E-08*	None	*0.0007*	None
Total Risk	**8E-05**		**1**	

Notes:
Risk drivers are provided only for chemicals of potential concern within a medium that have a
cumulative Hazard Index greater than one (1), or a cumulative cancer risk greater than one in one million (1E-06).
HI = Hazard Index

TABLE 2.22
SUMMARY OF RECEPTOR RISKS FOR AREA 3
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Receptor	Total Cancer Risk		Total Noncancer Hazard	
	Cancer Risk	**Risk Driver**	**Non-Cancer (HI)**	**Risk Driver**
Current/Future Park/Resort Worker				
Soil - Surface				
Incidental Ingestion	*3E-07*	None	*0.004*	None
Dermal Contact	*6E-08*	None	*0.001*	None
Inhalation (Fugitive Dust)	*3E-10*	None	*0.00003*	None
Total Risk	**3E-07**		**0.01**	
Future Construction Worker				
Soil - Surface				
Incidental Ingestion	*9E-08*	None	*0.01*	None
Dermal Contact	*2E-08*	None	*0.002*	None
Inhalation (Fugitive Dust)	*3E-11*	None	*0.00003*	None
Total Risk	**1E-07**		**0.02**	
Future Construction Worker				
Soil - Subsurface				
Incidental Ingestion	*9E-08*	None	*0.04*	None
Dermal Contact	*1E-08*	None	*0.002*	None
Inhalation (Fugitive Dust)	*3E-11*	None	*0.00003*	None
Total Risk	**1E-07**		**0.04**	
Future Resident				
Soil - Surface				
Incidental Ingestion	*4E-06*	Arsenic	*0.07*	None
Dermal Contact	*6E-07*	None	*0.008*	None
Inhalation (Fugitive Dust)	*3E-09*	None	*0.0001*	None
Total Risk	**4E-06**		**0.07**	

Notes:
Risk drivers are provided only for chemicals of potential concern within a medium that have a cumulative Hazard Index greater than one (1), or a cumulative cancer risk greater than one in one million (1E-06).
HI = Hazard Index

TABLE 3.1
ECOLOGICAL SCREENING VALUES FOR DETECTED ANALYTES
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Analyte	Plant ESV	Plant ESV Source	Invertebrate ESV	Invertebrate ESV Source	Avian ESV	Avian ESV Source	Mammal ESV	Mammal ESV Source
Antimony	5	ORNL, 1997	78	EPA Eco-SSL	NS	---	0.27	EPA Eco-SSL
Arsenic	18	EPA Eco-SSL	60	ORNL	43	EPA Eco-SSL	46	EPA Eco-SSL
Barium	110	LANL	330	EPA Eco-SSL	720	LANL	2000	EPA Eco-SSL
Beryllium	2.5	LANL	40	EPA Eco-SSL	NS	---	21	EPA Eco-SSL
Cadmium	32	EPA Eco-SSL	140	EPA Eco-SSL	0.77	EPA Eco-SSL	0.36	EPA Eco-SSL
Chromium	128	EPA Eco-SSL data	57	EPA Eco-SSL data	26	EPA Eco-SSL	34	EPA Eco-SSL
Copper	70	EPA Eco-SSL	80	EPA Eco-SSL	28	EPA Eco-SSL	49	EPA Eco-SSL
Lead	120	EPA Eco-SSL	1700	EPA Eco-SSL	11	EPA Eco-SSL	56	EPA Eco-SSL
Mercury	34	LANL	0.05	LANL	0.013	LANL	1.7	LANL
Nickel	38	EPA Eco-SSL	280	EPA Eco-SSL	210	EPA Eco-SSL	130	EPA Eco-SSL
Selenium	0.52	EPA Eco-SSL	4.1	EPA Eco-SSL	1.2	EPA Eco-SSL	0.63	EPA Eco-SSL
Silver	560	EPA Eco-SSL	1596	Beglinger and Ruffing 1997	4.2	EPA Eco-SSL	14	EPA Eco-SSL
Thallium	0.05	LANL	NS	---	4.5	LANL	0.42	LANL
Zinc	160	EPA Eco-SSL	120	EPA Eco-SSL	46	EPA Eco-SSL	79	EPA Eco-SSL
4,4'-DDD	see DDT+	LANL	see DDT+	EPA Eco-SSL data	0.006	LANL	see DDT+	EPA Eco-SSL
4,4'-DDE	see DDT+	LANL	see DDT+	EPA Eco-SSL data	0.11	LANL	see DDT+	EPA Eco-SSL
4,4'-DDT	see DDT+	LANL	see DDT+	EPA Eco-SSL data	0.36	LANL	see DDT+	EPA Eco-SSL
DDT and metabolites	4.1	LANL	0.118	EPA Eco-SSL data	0.093	EPA Eco-SSL	0.021	EPA Eco-SSL
Aldrin	0.0033	EPA Region 5	13	---	NS	---	0.037	LANL
Chlordane (technical)	0.22	EPA Region 5	0.017	EPA Region 4	0.27	LANL	0.27	LANL
cis-Chlordane	0.22	EPA Region 5	0.0029	EPA Region 4	0.27	LANL	0.27	LANL
Dieldrin	10	LANL	0.0029	EPA Region 4	0.022	EPA Eco-SSL	0.0049	EPA Eco-SSL
Endosulfan I	10	Hulzebos et al 1993	0.0009	EPA Region 4	15	LANL	0.064	LANL
Endosulfan II	10	Hulzebos et al 1993	0.0009	EPA Region 4	15	LANL	0.064	LANL
Endosulfan sulfate	10	Hulzebos et al 1993	0.0065	EPA Region 4	15	LANL	0.064	LANL
trans-Chlordane	0.22	EPA Region 5	0.02	EPA Region 4	2.2	LANL	2.3	LANL
1-Methylnaphthalene	see TPAH	---	29	EPA Eco-SSL	3.4	LANL	16	LANL
2-Methylnaphthalene	see TPAH	---	29	EPA Eco-SSL	3.4	LANL	16	LANL
Acenaphthene	see TPAH	---	29	EPA Eco-SSL	3.4	LANL	130	LANL
Anthracene	see TPAH	---	29	EPA Eco-SSL	3.4	LANL	210	LANL
Benzo_a_anthracene	see TPAH	---	18	EPA Eco-SSL	33	LANL	3.4	LANL
Benzo_a_pyrene	see TPAH	---	18	EPA Eco-SSL	33	LANL	62	LANL
Benzo_b_fluoranthene	see TPAH	---	18	EPA Eco-SSL	33	LANL	44	LANL
Benzo_g,h,i_perylene	see TPAH	---	18	EPA Eco-SSL	33	LANL	25	LANL
Benzo_k_fluoranthene	see TPAH	---	18	EPA Eco-SSL	33	LANL	71	LANL
Chrysene	see TPAH	---	18	EPA Eco-SSL	33	LANL	3.1	LANL
Dibenz(a,h)anthracene	see TPAH	---	18	EPA Eco-SSL	33	LANL	1.1	EPA Eco-SSL
Fluoranthene	see TPAH	---	10	LANL	3.4	LANL	22	LANL
Fluorene	see TPAH	---	30	ORNL	3.4	LANL	250	LANL
Indeno_1,2,3-cd_pyrene	see TPAH	---	18	EPA Eco-SSL	33	LANL	71	LANL
Naphthalene	see TPAH	---	29	EPA Eco-SSL	3.4	LANL	9.6	LANL
Phenanthrene	see TPAH	---	5.5	LANL	3.4	LANL	11	LANL
Pyrene	see TPAH	---	10	LANL	33	LANL	23	LANL
Total PAHs	10	EPA-SSL data	NS	---	NS	---	NS	---
Methyl acetate	NS	---	NS	---	2.5	EPA Region 5	NS	---

Notes:
All concentrations in mg/kg
All entries consistent with values or sources in NPS 2018
ESV = Ecological Screening Value
EPA = Environmental Protection Agency
Eco-SSL = Ecological Soil Screening Level
NS = no standard
LANL = Los Alamos National Laboratory
ORNL = Oak Ridge National Laboratory; specific references cited below.
TPAH = total polyaromatic hydrocarbons

Constituent-specific Notes:

Chromium plant value is the average of the three NOEL values that are above EPA's background range in the dataset assembled by EPA for the development of Eco-SSLs. See USEPA, 2008. Ecological Soil Screening Level for Chromium. OSWER Directive 9285.7-66.
Chromium invertebrate value is from the two approved studies obtained for the development of EPA Eco-SSLs. No Eco-SSL was published because three studies are required.
DDD, DDE plant- no benchmark available; DDT value used as a surrogate for DDT+ as conservative approach to capture all metabolites
DDT, DDD, DDE invertebrate and mammal ESVs derived from EPA Eco-SSL data ; value is the geomean of cited LOEC values, divided by an uncertainty factor of 50 for NOEL use. See Table 4.1 in EPA, 2007. Ecological Soil Screening Level for DDT & Metabolites. OSWER Directive 9285.7-57.
Silver benchmarks for invertebrates obtained from the scientific literature. Reference below.
Endosulfan: No plant benchmark available for Endosulfan I or Endosulfan sulfate; Endosulfan II used as a surrogate. Values from Hulzebos et al. 1993 per reference below.
Trans-chlordane: no benchmark available for for plants or invertebrates; cis-chlordane used as a surrogate.
Chlordane, technical grade: no benchmarks available for this compound, which is a mix of chemicals; cis-chlordane used as a surrogate.
Total PAH value for plants was obtained from EPA's Eco-SSL dataset and is the LOEC for effects of a PAH mixture to ryegrass. Reported study LOEC of 100 divided by 10 for NOEC use. See Table 3.1 in USEPA, 2007. Ecological Soil Screening Level for Polycyclic Aromatic Hydrocarbons (PAHs). OSWER Directive 9285.7-78.
LMW PAH benchmarks for birds is based on the LANL value for naphthalene, used as a surrogate for all other LMW PAHs
HMW PAH benchmarks for birds is based on the LANL value for pyrene, used as a surrogate for all other HMW PAHs
Methyl acetate: no benchmarks available. Acetone used as a surrogate based on similar chemical structure.

Sources:
Beglinger J.M. and C.J. Ruffing, 1997. Effects of silver sulfide on the terrestrial earthworm. in Andren, Anders W.; Bober, Thomas W. (ed.) / The 5th international conference proceedings: transport, fate and effects of silver in the environment. Univ. of Wisconsin
Oak Ridge National Laboratory (ORNL) 1997. *Toxicologial Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* ES/ER/TM-85/R3. Oak Ridge, TN.
Oak Ridge National Laboratory (ORNL), 1997. Toxicologial Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. ES/ER/TM-126/R2. Oak Ridge, TN.
EPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.
EPA Region 4, 2018, Ecological Risk Assessment Supplemental Guidance March 2018 Update.
USEPA. Region 5, 2003. Ecological Screening Levels. Most soils values based on food chain effects. Website version: https://archive.epa.gov/region5/waste/cars/web/pdf/ecological-screening-levels-200308.pdf
Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.
National Park Service (NPS), 2018. NPS protocol for the selection and use of ecological screening values for non-radiological analytes. Rev. 3 NPS Contaminated Sites Program, Washington DC

TABLE 3.2
AREA 1 MAXIMUM DETECTED CONCENTRATIONS AND HAZARD QUOTIENTS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituents of Potential Concern[1]	Frequency of Detection	% Detection	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Plant ESV	Maximum Plant HQ	Invertebrate ESV	Maximum Invertebrate HQ	Avian ESV	Maximum Avian HQ	Mammal ESV	Maximum Mammal HQ	Maximum HQ	Selected as PCOPEC? [2]	IA-1-01 MAX 0-0.5' bgs [3]	IA-1-02 MAX 0-0.5' bgs	IA-1-03 MAX 0-0.5' bgs	IA-1-04 MAX 0-0.5' bgs
Metals																			
Arsenic	4 / 4	100%	1.9	7.6	IA-1-02 MAX	18	0.4	60	0.1	43	0.2	46	0.2	0.4	**No**	2.5	7.6	2.2	1.9
Barium	4 / 4	100%	64	72	IA-1-04 MAX	110	0.7	330	0.2	720	0.1	2000	0.04	0.7	**No**	66	72	64	72
Beryllium	4 / 4	100%	0.240	0.30	IA-1-01 MAX	2.5	0.1	40	0.01	NS	NA	21	0.01	0.1	**No**	0.30	0.27	0.24	0.24
Cadmium	4 / 4	100%	0.11	0.24	IA-1-01 MAX	32	0.01	140	0.002	1	0.3	0.36	0.7	0.7	**No**	0.24	0.15	0.11	0.11
Chromium	4 / 4	100%	47	59	IA-1-02 MAX	128	0.5	57	1.0	26	2.3	34	1.7	2.3	**Yes**	47	59	48	58
Copper	4 / 4	100%	79	120	IA-1-01 MAX	70	1.7	80	1.5	28	4.3	49	2.4	4.3	**Yes**	120	96	85	79
Lead	4 / 4	100%	5.5	12	IA-1-01 MAX	120	0.1	1700	0.007	11	1.1	56	0.2	1.1	**Yes**	12	10	10	5.5
Mercury	4 / 4	100%	0.024	0.033	IA-1-01 MAX	34	0.001	0.1	0.7	0.01	2.5	1.70	0.02	2.5	**Yes**	0.033	0.025	0.027	0.024
Nickel	4 / 4	100%	23	30	IA-1-01 MAX	38	0.8	280	0.1	210	0.1	130	0.2	0.8	**No**	30	28	23	26
Selenium	4 / 4	100%	0.17	0.27	IA-1-01 MAX	0.52	0.5	4	0.1	1.20	0.2	0.63	0.4	0.5	**No**	0.3	0.2	0.2	0.2
Silver	4 / 4	100%	0.04	0.07	IA-1-01 MAX	560	0.0001	1596	0.00004	4.2	0.02	14	0.005	0.02	**No**	0.07	0.05	0.06	0.04
Thallium	1 / 4	25%	0.08	0.08	IA-1-01 MAX	0.05	1.6	NS	NA	4.5	0.02	0.42	0.2	1.6	**Yes**	0.08	ND	ND	ND
Zinc	4 / 4	100%	72	150	IA-1-04 MAX	160	0.9	120	1.3	46	3.3	79	1.9	3.3	**Yes**	110	120	72	150
Pesticides																			
4,4'-DDD	1 / 4	25%	0.001	0.001	IA-1-03 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	**No**	ND	ND	0.001	ND
4,4'-DDE	2 / 4	50%	0.010	0.017	IA-1-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	**No**	0.010	0.017	ND	ND
4,4'-DDT	3 / 4	75%	0.002	0.005	IA-1-01 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	**No**	0.005	0.003	0.002	ND
DDT+ [4]	3 / 4	75%	0.002	0.020	IA-1-02 MAX	4.1	0.005	0.12	0.2	0.093	0.2	0.02	1.0	1.0	**No**	0.013	0.020	0.002	ND
Dieldrin	1 / 4	25%	0.001	0.001	IA-1-02 MAX	10	0.0001	0.003	0.4	0.022	0.1	0.005	0.2	0.4	**No**	ND	0.001	ND	ND
Semivolatile Organic Compounds (SVOCs)																			
1-Methylnaphthalene	2 / 4	50%	0.004	0.005	IA-1-01 MAX	see TPAH	NA	29	0.0002	3.4	0.001	16	0.0003	0.001	**No**	0.005	ND	ND	0.004
2-Methylnaphthalene	4 / 4	100%	0.006	0.008	IA-1-04 MAX	see TPAH	NA	29	0.0003	3.4	0.002	16	0.001	0.002	**No**	0.006	0.006	0.006	0.008
Acenaphthene	3 / 4	75%	0.010	0.010	IA-1-01 MAX	see TPAH	NA	29	0.0003	3.4	0.003	130	0.0001	0.003	**No**	0.010	ND	0.010	0.010
Anthracene	4 / 4	100%	0.004	0.038	IA-1-03 MAX	see TPAH	NA	29	0.001	3.4	0.01	210	0.0002	0.01	**No**	0.016	0.004	0.038	0.021
Benzo_a_anthracene	4 / 4	100%	0.027	0.290	IA-1-03 MAX	see TPAH	NA	18	0.02	33	0.01	3.4	0.09	0.09	**No**	0.067	0.027	0.290	0.063
Benzo_a_pyrene	4 / 4	100%	0.031	0.220	IA-1-03 MAX	see TPAH	NA	18	0.01	33	0.01	62	0.004	0.01	**No**	0.071	0.031	0.220	0.063
Benzo_b_fluoranthene	4 / 4	100%	0.044	0.310	IA-1-03 MAX	see TPAH	NA	18	0.02	33	0.01	44	0.01	0.02	**No**	0.100	0.044	0.310	0.086
Benzo_g,h,i_perylene	4 / 4	100%	0.023	0.060	IA-1-03 MAX	see TPAH	NA	18	0.003	33	0.002	25	0.002	0.003	**No**	0.023	0.026	0.060	0.033
Benzo_k_fluoranthene	4 / 4	100%	0.018	0.130	IA-1-03 MAX	see TPAH	NA	18	0.01	33	0.004	71	0.002	0.01	**No**	0.036	0.018	0.130	0.036
Chrysene	4 / 4	100%	0.035	0.270	IA-1-03 MAX	see TPAH	NA	18	0.015	33	0.01	3	0.09	0.1	**No**	0.067	0.035	0.270	0.064
Dibenz(a,h)anthracene	3 / 4	75%	0.007	0.032	IA-1-03 MAX	see TPAH	NA	18	0.002	33	0.001	1.1	0.03	0.03	**No**	0.008	ND	0.032	0.007
Fluoranthene	4 / 4	100%	0.071	0.510	IA-1-03 MAX	see TPAH	NA	10	0.051	3.4	0.2	22	0.02	0.2	**No**	0.140	0.071	0.510	0.140
Fluorene	3 / 4	75%	0.007	0.008	IA-1-04 MAX	see TPAH	NA	30	0.0003	3.4	0.002	250	0.000	0.002	**No**	0.007	ND	0.007	0.008
Indeno_1,2,3-cd_pyrene	4 / 4	100%	0.021	0.071	IA-1-03 MAX	see TPAH	NA	18	0.0039	33	0.002	71	0.001	0.004	**No**	0.024	0.021	0.071	0.034
Naphthalene	4 / 4	100%	0.008	0.011	IA-1-04 MAX	see TPAH	NA	29	0.0004	3.4	0.003	10	0.001	0.003	**No**	0.010	0.008	0.008	0.011
Phenanthrene	4 / 4	100%	0.039	0.160	IA-1-03 MAX	see TPAH	NA	6	0.03	3.4	0.05	11	0.01	0.05	**No**	0.081	0.039	0.160	0.087
Pyrene	4 / 4	100%	0.050	0.380	IA-1-03 MAX	see TPAH	NA	10	0.038	33	0.01	23	0.02	0.04	**No**	0.097	0.050	0.380	0.095
TPAHs [5]	4 / 4	100%	0.380	2.501	IA-1-03 MAX	10	0.3	NS	NA	NS	NA	NS	NA	0.3	**No**	0.767	0.380	2.501	0.770

Notes:
All concentrations are in mg/kg = milligrams per kilogram
0-0.5' bgs = 0-0.5 feet below ground surface
ESV = ecological screening value
PCOPEC = preliminary constituent of potential ecological concern
HQ = Hazard Quotient
ND = not detected
NS= No Standard
NA = Not Applicable
DDT + = sum of DDD, DDE, and DDT concentrations
TPAH = Total Polycyclic Aromatic Hydrocarbons

	Constituent with Maximum Concentration with HQ >1.0 for at least one receptor
	Sample concentration greater than at least one soil receptor ESV

[1] This table only presents constituents that were detected in at least one ISM sample located within Caneel Bay Resort property Area 1.
[2] All constituents detected in soil above one receptor ESV were retained as PCOPECs unless otherwise noted.
[3] Summary statistics are based on the maximum detected concentration from each Decision Units (DU) located within Area 1. Decision units in Area 1 include IA-1-01 through IA-1-04
[4] Combined "DDT and metabolites" ESVs and concentrations are used for all receptors. Sample-specific DDD, DDE and DDT concentrations were summed and used for analysis.
[5] EPA uses a combined TPAH ESV for PAH constituents and plant receptors. A sum of PAH concentrations is presented and compared to the ESV.

TABLE 3.3
AREA 2 MAXIMUM DETECTED CONCENTRATIONS AND HAZARD QUOTIENTS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituents of Potential Concern [1]	Frequency of Detection	% Detection	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Plant ESV	Maximum Plant HQ	Invertebrate ESV	Maximum Invertebrate HQ	Avian ESV	Maximum Avian HQ	Mammal ESV	Maximum Mammal HQ	Maximum HQ	Selected as PCOPEC? [2]	IA-2-01 MAX 0-0.5' bgs [3]	IA-2-02 MAX 0-0.5' bgs	IA-2-03 MAX 0-0.5' bgs	IA-2-04 MAX 0-0.5' bgs	IA-2-05 MAX 0-0.5' bgs
Metals																				
Antimony	5 / 5	100%	0.17	0.27	IA-2-01 MAX	5	0.1	78	0.003	NS	NA	0.27	1.0	1.0	No	0.27	0.2	0.23	0.17	0.22
Arsenic	5 / 5	100%	2.80	11	IA-2-05 MAX	18	0.6	60	0.2	43	0.3	46	0.2	0.6	No	6.8	2.8	4.2	8.2	11
Barium	5 / 5	100%	50	220	IA-2-01 MAX	110	2.0	330	0.7	720	0.3	2000	0.1	2.0	Yes	220	66	56	50	72
Beryllium	5 / 5	100%	0.25	0.30	IA-2-05 MAX	2.5	0.1	40	0.01	NS	NA	21.00	0.01	0.1	No	0.27	0.25	0.25	0.27	0.3
Cadmium	5 / 5	100%	0.17	1	IA-2-04 MAX	32	0.02	140	0.01	0.77	0.9	0.36	2.0	2.0	Yes	0.31	0.39	0.17	0.72	0.31
Chromium	5 / 5	100%	28	41	IA-2-01 MAX	128	0.3	57	0.7	26	1.6	34	1.2	1.6	Yes	41	34	33	34	28
Copper	5 / 5	100%	75	200	IA-2-02 MAX	70	2.9	80	2.5	28	7.1	49	4.1	7.1	Yes	86	200	75	91	84
Lead	5 / 5	100%	13	33	IA-2-05 MAX	120	0.3	1700	0.02	11.0	3.0	56	0.6	3.0	Yes	27	32	13	24	33
Mercury	5 / 5	100%	0.05	0.12	IA-2-02 MAX	34	0.004	0.05	2.4	0.013	9.2	1.70	0.1	9.2	Yes	0.055	0.12	0.05	0.052	0.049
Nickel	5 / 5	100%	18	23	IA-2-05 MAX	38	0.6	280	0.1	210	0.1	130	0.2	0.6	No	19	20	18	19	23
Selenium	5 / 5	100%	0.27	0.36	IA-2-01 MAX	0.52	0.7	4.1	0.1	1.2	0.3	0.63	0.6	0.7	No	0.36	0.32	0.27	0.27	0.32
Silver	5 / 5	100%	0.06	0.11	IA-2-04 MAX	560	0.0002	1596	0.0001	4.2	0.03	14	0.01	0.0	No	0.082	0.1	0.059	0.11	0.086
Zinc	5 / 5	100%	98	330	IA-2-01 MAX	160	2.1	120	2.8	46	7.2	79	4.2	7.2	Yes	330	170	110	140	98
Pesticides																				
4,4'-DDD	1 / 5	20%	2.40	2.40	IA-2-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	ND	2.40	ND	ND	ND
4,4'-DDE	5 / 5	100%	0.003	3.90	IA-2-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	0.16	3.90	0.01	0.05	0.003
4,4'-DDT	5 / 5	100%	0.002	6.70	IA-2-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	0.097	6.70	0.005	0.01	0.002
DDT+ [4]	5 / 5	100%	0.01	12.30	IA-2-02 MAX	4.1	3.0	0.1	104	0.093	132.3	0.02	585.7	585.7	Yes	0.199	12.30	0.02	0.05	0.01
Aldrin	1 / 5	20%	0.04	0.04	IA-2-01 MAX	0.0033	13.0	13	0.003	NS	NA	0.04	1.2	13.0	Yes	0.04	ND	ND	ND	ND
Chlordane (technical)	3 / 5	60%	0.01	0.67	IA-2-02 MAX	0.22	3.0	0.02	39.4	0.270	2.5	0.27	2.5	39.4	Yes	ND	0.67	0.01	0.03	ND
cis-Chlordane	2 / 5	40%	0.01	0.14	IA-2-02 MAX	0.22	0.6	0.003	48.3	0.270	0.5	0.27	0.52	48.3	Yes	ND	0.14	ND	0.01	ND
Dieldrin	3 / 5	60%	0.01	5.40	IA-2-01 MAX	10	0.5	0.003	1862.1	0.022	245	0.00	1102.0	1862.1	Yes	5.4	0.02	ND	0.01	ND
Endosulfan I	1 / 5	20%	0.01	0.01	IA-2-04 MAX	10	0.001	0.001	10.6	15	0.001	0.06	0.15	10.6	Yes	ND	ND	ND	0.01	ND
Endosulfan II	1 / 5	20%	0.03	0.03	IA-2-04 MAX	10	0.003	0.001	30.0	15	0.002	0.06	0.42	30.0	Yes	ND	ND	ND	0.03	ND
Endosulfan sulfate	1 / 5	20%	0.01	0.01	IA-2-04 MAX	10	0.001	0.007	1.8	15	0.001	0.06	0.19	1.8	Yes	ND	ND	ND	0.01	ND
trans-Chlordane	3 / 5	60%	0.004	0.13	IA-2-02 MAX	0.22	0.6	0.02	6.5	2.2	0.06	2.30	0.06	6.5	Yes	ND	0.13	0.004	0.01	ND
Semivolatile Organic Compounds (SVOCs)																				
1-Methylnaphthalene	2 / 5	40%	0.005	0.018	IA-2-04 MAX	see TPAH	NA	29	0.001	3.4	0.01	16	0.001	0.01	No	0.005	ND	ND	0.018	ND
2-Methylnaphthalene	4 / 5	80%	0.005	0.020	IA-2-04 MAX	see TPAH	NA	29	0.001	3.4	0.01	16	0.001	0.01	No	0.008	0.005	0.006	0.020	ND
Acenaphthene	4 / 5	80%	0.006	0.011	IA-2-02 MAX	see TPAH	NA	29	0.0004	3.4	0.003	130	0.0001	0.003	No	0.010	0.011	0.008	0.006	ND
Anthracene	5 / 5	100%	0.010	0.021	IA-2-02 MAX	see TPAH	NA	29	0.001	3.4	0.01	210	0.0001	0.01	No	0.018	0.021	0.012	0.010	0.016
Benzo_a_anthracene	4 / 5	80%	0.027	0.130	IA-2-02 MAX	see TPAH	NA	18	0.01	33	0.004	3.4	0.04	0.04	No	0.110	0.130	0.062	0.027	ND
Benzo_a_pyrene	5 / 5	100%	0.026	0.130	IA-2-02 MAX	see TPAH	NA	18	0.01	33	0.004	62	0.002	0.01	No	0.100	0.130	0.064	0.026	0.026
Benzo_b_fluoranthene	5 / 5	100%	0.038	0.200	IA-2-02 MAX	see TPAH	NA	18	0.01	33	0.01	44	0.005	0.01	No	0.150	0.200	0.100	0.038	0.050
Benzo_g,h,i_perylene	4 / 5	80%	0.015	0.089	IA-2-02 MAX	see TPAH	NA	18	0.005	33	0.003	25	0.004	0.005	No	0.057	0.089	0.031	0.015	ND
Benzo_k_fluoranthene	5 / 5	100%	0.019	0.077	IA-2-02 MAX	see TPAH	NA	18	0.004	33	0.002	71	0.001	0.004	No	0.067	0.077	0.038	0.019	0.021
Chrysene	5 / 5	100%	0.030	0.150	IA-2-02 MAX	see TPAH	NA	18	0.01	33	0.005	3.1	0.05	0.05	No	0.120	0.150	0.066	0.030	0.035
Dibenz(a,h)anthracene	2 / 5	40%	0.015	0.020	IA-2-02 MAX	see TPAH	NA	18	0.001	33	0.001	1.1	0.02	0.02	No	0.015	0.020	ND	ND	ND
Fluoranthene	5 / 5	100%	0.029	0.290	IA-2-02 MAX	see TPAH	NA	10	0.03	3.4	0.1	22	0.01	0.1	No	0.270	0.290	0.120	0.054	0.029
Fluorene	4 / 5	80%	0.007	0.023	IA-2-04 MAX	see TPAH	NA	30	0.001	3.4	0.01	250	0.00009	0.01	No	0.008	0.013	0.007	0.023	ND
Indeno_1,2,3-cd_pyrene	4 / 5	80%	0.013	0.080	IA-2-02 MAX	see TPAH	NA	18	0.004	33	0.002	71	0.001	0.004	No	0.055	0.080	0.027	0.013	ND
Naphthalene	4 / 5	80%	0.007	0.011	IA-2-01 MAX	see TPAH	NA	29	0.0004	3.4	0.003	9.6	0.001	0.003	No	0.011	0.007	0.007	0.009	ND
Phenanthrene	5 / 5	100%	0.004	0.150	IA-2-01 MAX	see TPAH	NA	5.5	0.03	3.4	0.04	11	0.01	0.04	No	0.150	0.120	0.070	0.071	0.004
Pyrene	5 / 5	100%	0.034	0.230	IA-2-02 MAX	see TPAH	NA	10	0.02	33	0.01	23	0.01	0.02	No	0.200	0.230	0.100	0.082	0.034
TPAHs [5]	5 / 5	100%	0.215	1.573	IA-2-02 MAX	10	0.2	NS	NA	NS	NA	NS	NA	0.2	No	1.354	1.573	0.717	0.461	0.215

Notes:
All concentrations are in mg/kg = milligrams per kilogram
0-0.5' bgs = 0-0.5 feet below ground surface
ESV = ecological screening value
PCOPEC = preliminary constituent of potential ecological concern
HQ = Hazard Quotient
ND = not detected
NS= No Standard
NA = Not Applicable
DDT + = sum of DDD, DDE, and DDT concentrations
TPAH = Total Polycyclic Aromatic Hydrocarbons
Constituent with Maximum Concentration with HQ >1.0 for at least one receptor
Sample concentration greater than at least one soil receptor ESV
[1] This table only presents constituents that were detected in at least one ISM sample located within Caneel Bay Resort property Area 2.
[2] All constituents detected in soil above one receptor ESV were retained as PCOPECs unless otherwise noted.
[3] Summary statistics are based on the maximum detected concentration from each Decision Units (DU) located within Area 1. Decision units in Area 1 include IA-1-01 through IA-1-04
[4] Combined "DDT and metabolites" ESVs and concentrations are used for all receptors. Sample-specific DDD, DDE and DDT concentrations were summed and used for analysis.
[5] EPA uses a combined TPAH ESV for PAH constituents and plant receptors. A sum of PAH concentrations is presented and compared to the ESV.

TABLE 3.4
AREA 2 MAXIMUM DETECTED CONCENTRATIONS AND HAZARD QUOTIENTS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Constituents of Potential Concern [1]	Frequency of Detection	% Detection	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detected Concentration	Plant ESV	Maximum Plant HQ	Invertebrate ESV	Maximum Invertebrate HQ	Avian ESV	Maximum Avian HQ	Mammal ESV	Maximum Mammal HQ	Maximum HQ	Selected as PCOPEC? [2]	IA-3-01 MAX 0-0.5' bgs [3]	IA-3-02 MAX 0-0.5' bgs	IA-3-03 MAX 0-0.5' bgs	IA-3-04 MAX 0-0.5' bgs
Metals																			
Antimony	1 / 4	25%	0.29	0.29	IA-3-01 MAX	5	0.1	78	0.004	NS	NA	0.27	1.1	1.1	Yes	0.29	ND	ND	ND
Arsenic	4 / 4	100%	2.10	3.20	IA-3-03 MAX	18	0.2	60	0.05	43	0.07	46	0.1	0.2	No	2.1	3	3.2	2.3
Barium	4 / 4	100%	64	85	IA-3-03 MAX	110	0.8	330	0.3	720	0.1	2000	0.04	0.8	No	72	64	85	67
Beryllium	4 / 4	100%	0.22	0.31	IA-3-03 MAX	2.5	0.1	40	0.01	NS	NA	21	0.01	0.1	No	0.23	0.22	0.31	0.25
Cadmium	4 / 4	100%	0.07	0.90	IA-3-04 MAX	32	0.03	140	0.006	0.8	1.2	0.36	2.5	2.5	Yes	0.11	0.097	0.066	0.9
Chromium	4 / 4	100%	21	26	IA-3-01 MAX	128	0.2	57	0.5	26	1.0	34	0.8	1.0	No	26	26	22	21
Copper	4 / 4	100%	67	110	IA-3-03 MAX	70	1.6	80	1.4	28	3.9	49	2.2	3.9	Yes	81	72	110	67
Lead	4 / 4	100%	8	44	IA-3-01 MAX	120	0.4	1700	0.03	11	4.0	56	0.8	4.0	Yes	44	8	12	34
Mercury	4 / 4	100%	0.02	0.06	IA-3-01 MAX	34	0.002	0.05	1.3	0.01	4.8	1.70	0.04	4.8	Yes	0.063	0.036	0.023	0.041
Nickel	4 / 4	100%	12	16	IA-3-01 MAX and IA-3-02 MAX	38	0.4	280	0.1	210	0.1	130.0	0.1	0.4	No	16	16	12	12
Selenium	4 / 4	100%	0.18	0.36	IA-3-04 MAX	0.52	0.7	4.10	0.1	1.2	0.3	0.63	0.6	0.7	No	0.18	0.2	0.34	0.36
Silver	3 / 4	75%	0.03	0.06	IA-3-01 MAX	560	0.0001	1596	0.00003	4.2	0.01	14	0.004	0.01	No	0.055	0.036	ND	0.032
Zinc	4 / 4	100%	54	89	IA-3-04 MAX	160	0.6	120	0.7	46	1.9	79	1.1	1.9	Yes	76	65	54	89
Pesticides																			
4,4'-DDD	2 / 4	50%	0.002	0.005	IA-3-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	ND	0.005	ND	0.002
4,4'-DDE	3 / 4	75%	0.012	0.02	IA-3-04 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	0.014	0.012	ND	0.024
4,4'-DDT	3 / 4	75%	0.003	0.17	IA-3-02 MAX	see DDT+	NA	see DDT+	NA	see DDT+	NA	see DDT+	NA	NA	No	0.012	0.170	ND	0.003
DDT+ [4]	3 / 4	75%	0.023	0.19	IA-3-02 MAX	4.1	0.05	0.12	1.6	0.1	2.01	0.02	8.9	8.9	Yes	0.023	0.187	ND	0.026
Aldrin	2 / 4	50%	0.001	0.01	IA-3-01 MAX	0.003	2.2	13	0.0006	NS	NA	0.04	0.2	2.2	Yes	0.007	0.001	ND	ND
Dieldrin	3 / 4	75%	0.003	0.01	IA-3-01 MAX	10	0.001	0.003	3.8	0.02	0.5	0.005	2.2	3.8	Yes	0.011	0.003	ND	0.004
trans-Chlordane	2 / 4	50%	0.002	0.004	IA-3-03 MAX	0.22	0.02	0.02	0.2	2	0.002	2.30	0.002	0.2	No	ND	0.002	0.004	ND
Semivolatile Organic Compounds (SVOCs)																			
1-Methylnaphthalene	3 / 4	75%	0.004	0.010	IA-3-01 MAX	see TPAH	NA	29	0.0003	3.4	0.003	16	0.001	0.003	No	0.010	0.004	ND	0.005
2-Methylnaphthalene	4 / 4	100%	0.005	0.011	IA-3-01 MAX	see TPAH	NA	29	0.0004	3.4	0.003	16	0.001	0.003	No	0.011	0.005	0.006	0.007
Acenaphthene	3 / 4	75%	0.005	0.033	IA-3-01 MAX	see TPAH	NA	29	0.0011	3.4	0.010	130	0.0003	0.01	No	0.033	0.005	ND	0.011
Anthracene	3 / 4	75%	0.006	0.037	IA-3-01 MAX	see TPAH	NA	29	0.001	3.4	0.01	210	0.0002	0.01	No	0.037	0.006	ND	0.021
Benzo_a_anthracene	3 / 4	75%	0.028	0.100	IA-3-04 MAX	see TPAH	NA	18	0.01	33	0.003	3.4	0.03	0.03	No	0.075	0.028	ND	0.100
Benzo_a_pyrene	3 / 4	75%	0.028	0.100	IA-3-04 MAX	see TPAH	NA	18	0.01	33	0.003	62	0.002	0.01	No	0.067	0.028	ND	0.100
Benzo_b_fluoranthene	3 / 4	75%	0.040	0.130	IA-3-04 MAX	see TPAH	NA	18	0.01	33	0.004	44	0.003	0.01	No	0.088	0.040	ND	0.130
Benzo_g,h,i_perylene	3 / 4	75%	0.011	0.046	IA-3-04 MAX	see TPAH	NA	18	0.003	33	0.001	25	0.002	0.003	No	0.026	0.011	ND	0.046
Benzo_k_fluoranthene	3 / 4	75%	0.015	0.048	IA-3-01 MAX	see TPAH	NA	18	0.003	33	0.001	71	0.001	0.003	No	0.048	0.015	ND	0.046
Chrysene	4 / 4	100%	0.004	0.094	IA-3-04 MAX	see TPAH	NA	18	0.005	33	0.003	3.1	0.03	0.03	No	0.080	0.028	0.004	0.094
Dibenz(a,h)anthracene	1 / 4	25%	0.016	0.016	IA-3-04 MAX	see TPAH	NA	18	0.001	33	0.0005	1.1	0.01	0.01	No	ND	ND	ND	0.016
Fluoranthene	4 / 4	100%	0.008	0.160	IA-3-01 MAX	see TPAH	NA	10	0.016	3.4	0.05	22	0.01	0.05	No	0.160	0.055	0.008	0.160
Fluorene	3 / 4	75%	0.006	0.027	IA-3-01 MAX	see TPAH	NA	30	0.001	3.4	0.01	250	0.0001	0.01	No	0.027	0.006	ND	0.007
Indeno_1,2,3-cd_pyrene	3 / 4	75%	0.009	0.042	IA-3-04 MAX	see TPAH	NA	18	0.002	33	0.001	71	0.001	0.002	No	0.024	0.009	ND	0.042
Naphthalene	4 / 4	100%	0.006	0.013	IA-3-01 MAX	see TPAH	NA	29	0.0004	3.4	0.004	10	0.001	0.004	No	0.013	0.006	0.011	0.009
Phenanthrene	4 / 4	100%	0.012	0.170	IA-3-01 MAX	see TPAH	NA	5.50	0.03	3.4	0.05	11	0.02	0.05	No	0.170	0.045	0.012	0.093
Pyrene	4 / 4	100%	0.006	0.130	IA-3-04 MAX	see TPAH	NA	10	0.013	33	0.004	23	0.01	0.01	No	0.120	0.045	0.006	0.130
TPAHs [5]	4 / 4	100%	0.047	1.017	IA-3-04 MAX	10	0.1	NS	NA	NS	NA	NS	NA	0.1	No	0.989	0.337	0.047	1.017

Notes:
All concentrations are in mg/kg = milligrams per kilogram
0-0.5' bgs = 0-0.5 feet below ground surface
ESV = ecological screening value
PCOPEC = preliminary constituent of potential ecological concern
HQ = Hazard Quotient
ND = not detected
NS= No Standard
NA = Not Applicable
DDT + = sum of DDD, DDE, and DDT concentrations
TPAH = Total Polycyclic Aromatic Hydrocarbons
Constituent with Maximum Concentration with HQ >1.0 for at least one receptor
Sample concentration greater than at least one soil receptor ESV

[1] This table only presents constituents that were detected in at least one ISM sample located within Caneel Bay Resort property Area 3.
[2] All constituents detected in soil above one receptor ESV were retained as PCOPECs unless otherwise noted.
[3] Summary statistics are based on the maximum detected concentration from each Decision Units (DU) located within Area 1. Decision units in Area 1 include IA-1-01 through IA-1-04
[4] Combined "DDT and metabolites" ESVs and concentrations are used for all receptors. Sample-specific DDD, DDE and DDT concentrations were summed and used for analysis.
[5] EPA uses a combined TPAH ESV for PAH constituents and plant receptors. A sum of PAH concentrations is presented and compared to the ESV.

TABLE 3.5A
REFINED SOIL SCREENING LEVELS: PLANTS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Analyte Class	Analyte	Background Concentration [1]	Plant ESV	Plant ESV Source	Plant LOEL-SSL	Plant LOEL SSL Source	Refined Soil Screening Level [2]
METAL	Barium	83.26	110	LANL	260	LANL	185
METAL	Copper	85.03	70	EPA Eco-SSL	148	EPA Eco-SSL dataset	109
METAL	Thallium	0.08	0.05	LANL	0.5	LANL	0.3
METAL	Zinc	56.64	160	EPA Eco-SSL	250	EPA Eco-SSL dataset	205
PEST	4,4'-DDD	0.0047	see DDT+	LANL	see DDT+	LANL	see DDT+
PEST	4,4'-DDE	0.025	see DDT+	LANL	see DDT+	LANL	see DDT+
PEST	4,4'-DDT	0.009	see DDT+	LANL	see DDT+	LANL	see DDT+
PEST	DDT and metabolites	0.049	4.1	LANL	6	LANL	5.1
PEST	Aldrin	0.0047	0.0032	EPA Region 5	0.032	EPA Region 5	0.02
PEST	Chlordane (technical)	0.047	0.22	EPA Region 5	22	LANL	11.1

Notes:
All concentrations in mg/kg.
ESV = Ecological Screening Value
EPA = Environmental Protection Agency
Eco-SSL = Ecological Soil Screening Level
NS = no standard
LANL = Los Alamos National Laboratory
TPAH = total polynuclear aromatic hydrocarbons
[1] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM sam
[2] Refined soil screening values are the midpoint (average) of the screening value and the identified lowest obseved effect level (LOEL).

Constituent-specific Notes:
Aldrin: no LOEL value available; RSL obtained from the EPA Region 5 benchmark using a NOEL-LOEL uncertainty factor of 10.
Copper LOEL is the geomean of LOELs from the three studies for which LOELs were available in the dataset used to develop the SSLs. See Copper Eco-SSL technical background document.
DDT and metabolites = sum of DDD, DDE, and DDT concentrations. DDD, DDE - no benchmark available; DDT value used as a surrogate for DDT+ as conservative approach to capture all metabolites.
Zinc LOEL is the geomean of LOELs from EPA studies that were used to develop the SSLs. See EPA Eco-SSL technical background document.

Sources:
EPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.
EPA Region 5, 2003. Ecological Screening Levels. . Website version: https://www3.epa.gov/region5/waste/cars/pdfs/ecological-screening-levels-200308.pdf.
Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.

TABLE 3.5 B
REFINED SOIL SCREENING LEVELS: SOIL INVERTEBRATES
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Analyte Class	Analyte	Background Concentration [1]	Invertebrate ESV	Invertebrate ESV Source	Invertebrate LOEL-SSL	Invertebrate LOEL SSL Source	Refined Soil Screening Level [2]
METAL	Copper	85.03	80	EPA Eco-SSL	117	EPA SSL dataset	98.5
Mercury (CVAA)	Mercury	0.03	0.05	LANL	0.5	LANL	0.275
METAL	Zinc	56.64	120	EPA Eco-SSL	174	EPA SSL dataset	147
PEST	4,4'-DDD	0.0047	see DDT+	EPA Eco-SSL data	see DDT+	EPA Eco-SSL data	see DDT+
PEST	4,4'-DDE	0.025	see DDT+	EPA Eco-SSL data	see DDT+	EPA Eco-SSL data	see DDT+
PEST	4,4'-DDT	0.009	see DDT+	EPA Eco-SSL data	see DDT+	EPA Eco-SSL data	see DDT+
PEST	DDT and metabolites	0.049	0.118	EPA Eco-SSL data	0.59	EPA SSL dataset	0.354
PEST	Chlordane (technical)	0.047	0.017	EPA Region 4	2.39	EPA EcoTox Database	1.2035
PEST	cis-Chlordane	0.0047	0.0029	EPA Region 4	2.39	EPA EcoTox Database	1.20
PEST	Dieldrin	0.013	0.0029	EPA Region 4	25	Neuhauser and Callahan 1990	12.50
PEST	Endosulfan I	0.0047	0.0009	EPA Region 4	0.5	Farrukh and Ali 2011	0.25
PEST	Endosulfan II	0.0047	0.0009	EPA Region 4	0.5	Farrukh and Ali 2011	0.25
PEST	Endosulfan sulfate	0.0047	0.0065	EPA Region 4	0.5	Farrukh and Ali 2011	0.25
PEST	trans-Chlordane	0.0047	0.02	EPA Region 4	2.39	EPA EcoTox Database	1.21
VOC	Methyl acetate	NA	NS	---	NS	---	---

Notes:
All concentrations in mg/kg.
ESV = Ecological Screening Value
EPA = Environmental Protection Agency
Eco-SSL = Ecological Soil Screening Level
NS = no standard
NA = not analyzed
LANL = Los Alamos National Laboratory
TPAH = total polyaromatic hydrocarbons
[1] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples
[2] Refined soil screening values are the midpoint (average) of the screening value and the identified lowest obseved effect level (LOEL).

Constituent-specific Notes:

Cis-chlordane: no invertebrate value available; chlordane used as a surrogate.
Copper Invertebrate value is the geomean of the reported or estimated effect levels from the ten studies used by EPA to develop the Eco-SSL.
DDT and metabolites= sum of all 3 metabolites. DDT, DDD, DDE invertebrate benchmark is derived from EPA Eco-SSL invertebrate data; value is the geomean of cited LOEC values, divided by an uncertainty factor of 50 for NOEL use. See Table 4.1 in EPA, 2007
Zinc invertebrate value is the geomean of reported or estimated LOELs from 5 of 6 EPA studies used to generate the Eco-SSL. Three LOELs estimated as the midpoint between reported EC10 and EC50 values in study. Sixth study not available.
DDT and metabolites= sum of all 3 metabolites. DDT, DDD, DDE invertebrate benchmark is derived from EPA Eco-SSL invertebrate data; value is the geomean of cited LOEC values, divided by an uncertainty factor of 50 for NOEL use. See Table 4.1 in EPA, 2007. Ecological Soil Screening Level for DDT & Metabolites. OSWER Directive 9285.7-57.
Silver benchmarks for invertebrates obtained from the scientific literature. Reference below.
Endosulfan: No plant benchmark available for Endosulfan I, II or Endosulfan sulfate; Endosulfan used as a surrogate.
Trans-chlordane: no benchmark available for for invertebrates; cis-chlordane used as a surrogate.
Chlordane, technical grade: no benchmarks available for this compound, which is a mix of chemicals; cis-chlordane used as a surrogate.

Sources:

Farrukh S. and A. Ali., 2011. Effects of Endosulfan, an organochlorine pesticide on growth, reproduction and avoidance behavior of earthworm Eisenia foetida. Biosci. Biotech. Res. Comm.,Vol. 4, No. 1, June, 2011(84-89). Values are for reduction in cocoon production.

Neuhauser E. and C. Callahan 1990. Growth and reproduction of the earthworm Eisenia fetida exposed to sublethal concentrations of orgnaic chemicals. Soi Biol.Biochem, Vol. 22, No. 2 pp. 175-79. Values is lowest concentration for effects on reproduction.
EPA ECOTOX Knowledgebase. (n.d.). Retrieved April 09, 2021, from https://cfpub.epa.gov/ecotox/

EPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.
EPA Region 4, 2018, Ecological Risk Assessment Supplemental Guidance March 2018 Update.
Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.

TABLE 3.5 C
REFINED SOIL SCREENING LEVELS: BIRDS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Analyte Class	Analyte	Background Concentration [1]	Avian ESV	Avian ESV Source	Avian LOEL-SSL [2]	Avian LEL Source	Refined Soil Screening Level [3]
METAL	Antimony	0.52	NS	---	NS	---	NS
METAL	Cadmium	0.11	0.77	EPA Eco-SSL	5.5	Calculated	3.14
METAL	Chromium	44.48	26	EPA Eco-SSL	173	Calculated	99.5
METAL	Copper	85.03	28	EPA Eco-SSL	180	Calculated	104
METAL	Lead	18.12	11	EPA Eco-SSL	140	Calculated	75.5
Mercury (CVAA)	Mercury	0.03	0.013	LANL	13	Calculated	6.5
METAL	Zinc	56.64	46	EPA Eco-SSL	400	Calculated	223
PEST	4,4'-DDD	0.0047	0.006	LANL	see DDT+	see DDT +	see DDT +
PEST	4,4'-DDE	0.025	0.11	LANL	see DDT+	see DDT +	see DDT +
PEST	4,4'-DDT	0.009	0.36	LANL	see DDT+	see DDT +	see DDT +
PEST	DDT and metabolites	0.049	0.093	EPA Eco-SSL	0.25	Calculated	0.17
PEST	Chlordane (technical)	0.047	0.27	LANL	2.55	Calculated	1.41
PEST	Dieldrin	0.013	0.022	EPA Eco-SSL	0.08	Calculated	0.05

Notes:
All concentrations in mg/kg.
ESV = Ecological Screening Value
EPA = Environmental Protection Agency
Eco-SSL = Ecological Soil Screening Level
NS = no standard
LANL = Los Alamos National Laboratory
[1] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples
[2] LOEL-SSL values are derived using the EPA equations in the development of soil screening levels. Constituent-specific LOEL TRVs are used with thrasher-specific exposure paramenters to back-calculate an LOEL-based SSL.
[3] Refined soil screening values are the midpoint (average) of the screening value and the identified lowest obseved effect level (LOEL).

Constituent-specific Notes:
Chlordane, technical grade: no benchmarks available for this compound, which is a mix of chemicals; cis-chlordane used as a surrogate.

Sources:
EPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.
EPA Region 5, 2003. Ecological Screening Levels.

Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.

TABLE 3.5 D
REFINED SOIL SCREENING LEVELS: MAMMALS
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Analyte Class	Analyte	Background Concentration [1]	Mammal ESV	Mammal ESV Source	Mammal LOEL-SSL [2]	Mammal LOEL-SSL Source	Refined Soil Screening Level [3]
METAL	Antimony	0.52	0.27	EPA Eco-SSL	54	Calculated	27.135
METAL	Cadmium	0.11	0.36	EPA Eco-SSL	787	Calculated	393.68
METAL	Chromium	44.48	34	EPA Eco-SSL	806	Calculated	420
METAL	Copper	85.03	49	EPA Eco-SSL	2210	Calculated	1129.5
METAL	Zinc	56.64	79	EPA Eco-SSL	7025	Calculated	3552
PEST	4,4'-DDD	0.0047	see DDT+	EPA Eco-SSL	see DDT+	see DDT+	see DDT+
PEST	4,4'-DDE	0.025	see DDT+	EPA Eco-SSL	see DDT+	see DDT+	see DDT+
PEST	4,4'-DDT	0.009	see DDT+	EPA Eco-SSL	see DDT+	see DDT+	see DDT+
PEST	DDT and metabolites	0.049	0.021	EPA Eco-SSL	94	Calculated	47.01
PEST	Aldrin	0.0047	0.037	LANL	33.5	Calculated	16.77
PEST	Chlordane (technical)	0.047	0.27	LANL	62	Calculated	31.14
PEST	Dieldrin	0.013	0.0049	EPA Eco-SSL	0.3	Calculated	0.15

Notes:
All concentrations in mg/kg.
ESV = Ecological Screening Value
LEL = Lowest Effect Level
EPA = Environmental Protection Agency
Eco-SSL = Ecological Soil Screening Level
NS = no standard
LANL = Los Alamos National Laboratory

[1] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples
[2] LOEL-SSL values are derived using the EPA equations in the development of soil screening levels. Constituent-specific LOEL TRVs are used with bat-specific exposure paramenters to back-calculate an LOEL-based SSL.
[3] Refined soil screening values are the midpoint (average) of the screening value and the identified lowest obseved effect level (LOEL).

Constituent-specific Notes:

Chlordane, technical grade: no benchmarks available for this compound, which is a mix of chemicals; cis-chlordane used as a surrogate for ESL and mix of cis- and trans-chlordane used in data to derive LEL.
DDT and metabolites= sum of DDD, DDE, and DDT concentrations.

Sources:
Doucette, W., Shunthirasingham, C., Dettenmaier, E.M., Zaleski, R.T., Fantke, P., and Arnot, J.A. 2018. A review of measured bioaccumulation data on terrestrial plants for organic chemicals: Metrics, variability, and the need for standardized measurement protocols. Env. Tox. & Chem., V37, No.1. pp 21-33.
EPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.
EPA Region 5, 2003. Ecological Screening Levels.

Los Alamos National Laboratory (LANL), 2020. Ecorisk Database Release 4.2 (November 2020). Los Alamos National Laboratory, Los Alamos, New Mexico.

TABLE 3.6 A

REFINED SOIL SCREENING LEVEL HAZARD QUOTIENT BY RECEPTOR: PLANTS

Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 1											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG [2]	Plant ESV	Plant RSSL [3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	70	109	133.4	1.9	1.2	99.9	1.4	0.9	85.6	1.2	0.8	79.7	1.1	0.7
Thallium	0.08	0.05	0.28	0.2	3.7	0.7	0.1	2.7	0.5	0.1	2.9	0.5	0.1	2.7	0.5

				Area 2														
				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent	BG	Plant ESV	Plant RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Barium	83.26	110	185	320	2.9	1.7	67.9	0.6	0.4	57.3	0.5	0.3	51.2	0.5	0.3	73.9	0.7	0.4
Copper	85.03	70	109	89.1	1.3	0.8	290.4	4.1	2.7	76.9	1.1	0.7	93.4	1.3	0.9	87.7	1.3	0.8
Thallium	0.08	0.05	0.28	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.8	0.5	0.1	2.8	0.5	0.1	2.9	0.5
Zinc	56.64	160	205	342.4	2.1	1.7	181.8	1.1	0.9	114.8	0.7	0.6	143.1	0.9	0.7	108.6	0.7	0.5
DDT+ [5]	0.049	4.1	5.05	0.3	0.1	0.1	14.5	3.5	2.9	0.02	0.006	0.005	0.1	0.02	0.02	0.01	0.002	0.002
Aldrin	0.0047	0.0032	0.018	0.1	18.4	3.3	0.2	62.8	11.4	0.003	0.8	0.1	0.02	6.4	1.2	0.003	0.8	0.1
Chlordane (technical)	0.047	0.22	11.11	0.7	3.2	0.1	1.8	8.2	0.2	0.04	0.2	0.003	0.2	0.9	0.02	0.03	0.1	0.002

				Area 3											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Plant ESV	Plant RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	70	109	82.2	1.2	0.8	74.1	1.1	0.7	148.6	2.1	1.4	69.0	1.0	0.6
Thallium	0.08	0.05	0.28	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.8	0.5
Aldrin	0.0047	0.0032	0.018	0.01	3.7	0.7	0.004	1.2	0.2	0.003	0.8	0.1	0.003	0.8	0.1

Notes:

All concentrations in mg/kg

Constituent 95% UCL Concentration above maximum background concentration

Constituent 95% UCL Concentration with ESV-HQ > 1.0

Constituent 95% UCL Concentration with RSSL-HQ > 1.0

95% UCL = 95% upper confidence limit

HQ= Hazard Quotient

BG = Background

ESV = Ecological Screening Value

LEL = Lowest Effect Level

RSSL = Refined Soil Screening Level

All results from samples 0 - 5' deep.

DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).

NS= No Standard

ND = Not detected

NA = Not applicable

[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.

[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.

[3] RSSL is the midpoint between the ESV and LEL.

[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020. See Attachment A.

[5] Plant ESV and LEL benchmarks presented are for DDT only, but are compared to the combined concentration of all Site sample metabolites as a conservative approach.

TABLE 3.6 B

REFINED SOIL SCREENING LEVEL HAZARD QUOTIENT BY RECEPTOR: SOIL INVERTEBRATES

Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 1											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG [2]	Invertebrate ESV	Invertebrate RSSL [3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	133.4	1.7	1.4	99.9	1.2	1.0	85.6	1.1	0.9	79.7	1.0	0.8
Zinc	56.64	120	147	110.0	0.9	0.7	126.9	1.1	0.9	74.5	0.6	0.5	168.4	1.4	1.1
DDT+ [5]	0.049	0.118	0.354	0.02	0.2	0.1	0.03	0.3	0.1	0.01	0.1	0.02	0.4	3.8	1.3
Chlordane (technical)	0.047	0.017	1.20	0.02	1.4	0.02	0.03	1.5	0.02	0.02	1.3	0.02	0.03	1.6	0.02
Dieldrin	0.013	0.003	12.50	0.002	0.8	0.0002	0.004	1.4	0.0003	0.002	0.8	0.0002	0.003	0.9	0.0002
Endosulfan I	0.0047	0.0009	0.25	0.002	2.7	0.01	0.003	2.8	0.01	0.002	2.5	0.01	0.003	3.0	0.01
Endosulfan II	0.0047	0.0009	0.25	0.002	2.7	0.01	0.003	2.8	0.01	0.002	2.5	0.01	0.003	3.0	0.01

c

				Area 2															
				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05			
Constituent	BG	Invertebrate ESV	Invertebrate RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	89.1	1.1	0.9	290.4	3.6	2.9	76.9	1.0	0.8	93.4	1.2	0.9	87.7	1.1	0.9
Mercury	0.03	0.05	0.28	0.1	1.2	0.2	0.2	3.3	0.6	0.1	1.1	0.2	0.1	1.1	0.2	0.1	1.1	0.2
Zinc	56.64	120	147	342.4	2.9	2.3	181.8	1.5	1.2	114.8	1.0	0.8	143.1	1.2	1.0	108.6	0.9	0.7
DDT+	0.049	0.118	0.35	0.3	2.5	0.8	14.5	123.1	41.0	0.02	0.2	0.1	0.1	0.7	0.2	0.008	0.1	0.02
Chlordane (technical)	0.047	0.017	1.20	0.7	41.0	0.6	1.8	106.1	1.5	0.04	2.2	0.03	0.2	12.0	0.2	0.03	1.5	0.02
cis-Chlordane	0.0047	0.003	1.20	0.1	24.0	0.1	0.1	51.0	0.1	0.003	0.9	0.002	0.02	6.8	0.02	0.003	0.9	0.002
Dieldrin	0.013	0.003	12.50	8.4	2889.6	0.7	0.2	79.8	0.02	0.003	0.9	0.0002	0.02	7.0	0.002	0.003	0.9	0.0002
Endosulfan I	0.0047	0.0009	0.25	0.1	77.4	0.3	0.2	223.1	0.8	0.003	2.8	0.01	0.02	16.7	0.1	0.003	2.8	0.01
Endosulfan II	0.0047	0.0009	0.25	0.1	77.4	0.3	0.2	223.1	0.8	0.003	2.8	0.01	0.05	51.8	0.2	0.003	2.8	0.01
Endosulfan sulfate	0.0047	0.007	0.25	0.1	10.7	0.3	0.2	30.9	0.8	0.003	0.4	0.01	0.02	3.0	0.1	0.003	0.4	0.01
trans-Chlordane	0.0047	0.02	1.21	0.1	3.5	0.1	0.1	6.8	0.1	0.005	0.2	0.004	0.01	0.6	0.01	0.003	0.1	0.002

				Area 3											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Invertebrate ESV	Invertebrate RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	82.2	1.0	0.8	74.1	0.9	0.8	148.6	1.9	1.5	69.0	0.9	0.7
Mercury	0.03	0.05	0.28	0.1	1.9	0.3	0.05	0.9	0.2	0.02	0.5	0.1	0.04	0.9	0.2
Chlordane (technical)	0.047	0.017	1.20	0.2	10.5	0.1	0.03	1.5	0.02	0.03	1.5	0.02	0.03	1.5	0.02
cis-Chlordane	0.0047	0.003	1.20	0.02	6.2	0.01	0.003	0.9	0.002	0.003	0.9	0.002	0.003	0.9	0.002
Dieldrin	0.013	0.003	12.50	0.01	5.0	0.001	0.003	1.0	0.0002	0.003	0.9	0.0002	0.006	2.1	0.0005
Endosulfan I	0.0047	0.0009	0.25	0.02	19.8	0.1	0.003	2.9	0.01	0.003	2.9	0.01	0.003	2.9	0.01
Endosulfan II	0.0047	0.0009	0.25	0.02	19.8	0.1	0.003	2.9	0.01	0.003	2.9	0.01	0.003	2.9	0.01
Endosulfan sulfate	0.0047	0.007	0.25	0.02	2.7	0.1	0.003	0.4	0.01	0.003	0.4	0.01	0.003	0.4	0.01

Notes:

All concentrations in mg/kg

Constituent 95% UCL Concentration above maximum background concentration

Constituent 95% UCL Concentration with ESV-HQ > 1.0

Constituent 95% UCL Concentration with RSSL-HQ > 1.0

95% UCL = 95% upper confidence limit

HQ= Hazard Quotient

ESV = Ecological Screening Value

LEL = Lowest Effect Level

RSSL = Refined Soil Screening Level

All results from samples 0 - 0.5' deep.

DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).

NS= No Standard

ND = Not detected

NA = Not applicable

[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.

[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.

[3] RSSL is the midpoint between the ESV and LEL.

[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020. See Attachment A.

[5] Invertebrate ESV and RSSL benchmarks presented are for the sum of DDD, DDE, and DDT. Sample concentrations of DDD, DDE, and DDT were summed and used for 95% UCL analysis for comparison.

TABLE 3.6 C

REFINED SOIL SCREENING LEVEL HAZARD QUOTIENT BY RECEPTOR: INVERTEBRATES: BIRDS

Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 1											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG [2]	Bird ESV	Bird RSSL [3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	NS	NS	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA
Chromium	44.48	26	99.5	47.6	1.8	0.5	61.5	2.4	0.6	49.2	1.9	0.5	58.9	2.3	0.6
Copper	85.03	28	104.0	133.4	4.8	1.3	99.9	3.6	1.0	85.6	3.1	0.8	79.7	2.8	0.8
Lead	18.12	11	140.0	12.6	1.1	0.1	10.3	0.9	0.1	10.0	0.9	0.1	5.7	0.5	0.04
Mercury	0.03	0.013	6.5	0.04	2.9	0.01	0.03	2.0	0.004	0.03	2.2	0.004	0.03	2.0	0.004
Zinc	56.64	46	400.0	110.0	2.4	0.3	126.9	2.8	0.3	74.5	1.6	0.2	168.4	3.7	0.4
DDT+ [5]	0.049	0.093	0.17	0.02	0.2	0.1	0.03	0.3	0.2	0.01	0.1	0.04	0.4	4.8	2.6

				Area 2															
				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05			
Constituent	BG	Bird ESV	Bird RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	
Antimony	0.52	NS	NS	0.3	NA	NA	0.2	NA	NA	0.3	NA	NA	0.4	NA	NA	0.2	NA	NA	
Cadmium	0.11	0.77	3.1	0.3	0.4	0.1	0.4	0.5	0.1	0.2	0.2	0.06	1.1	1.4	0.4	0.4	0.6	0.1	
Chromium	44.48	26	99.5	41.6	1.6	0.4	36.6	1.4	0.4	33.7	1.3	0.3	34.9	1.3	0.4	28.6	1.1	0.3	
Copper	85.03	28	104.0	89.1	3.2	0.9	290.4	10.4	2.8	76.9	2.7	0.7	93.4	3.3	0.9	87.7	3.1	0.8	
Lead	18.12	11	140.0	28.2	2.6	0.2	33.8	3.1	0.2	13.7	1.2	0.1	25.6	2.3	0.2	35.6	3.2	0.3	
Mercury	0.03	0.013	6.5	0.1	4.5	0.01	0.2	12.6	0.03	0.1	4.2	0.01	0.1	4.4	0.01	0.1	4.1	0.01	
Zinc	56.64	46	400.0	342.4	7.4	0.9	181.8	4.0	0.5	114.8	2.5	0.3	143.1	3.1	0.4	108.6	2.4	0.3	
DDT+	0.049	0.093	0.17	0.3	3.1	1.7	14.5	156.2	84.7	0.02	0.3	0.14	0.1	0.9	0.5	0.008	0.1	0.05	
Chlordane (technical)	0.047	0.27	1.4	0.7	2.6	0.5	1.8	6.7	1.3	0.04	0.1	0.03	0.2	0.8	0.1	0.03	0.1	0.02	
Dieldrin	0.013	0.022	0.051	8.4	381	164.3	0.2	10.5	4.5	0.003	0.1	0.050	0.02	0.9	0.40	0.003	0.1	0.050	

				Area 3											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Bird ESV	Bird RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	NS	NS	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA
Chromium	44.48	26	99.5	26.6	1.0	0.3	27.2	1.0	0.3	23.4	0.9	0.2	21.3	0.8	0.2
Copper	85.03	28	104	82.2	2.9	0.8	74.1	2.6	0.7	148.6	5.3	1.4	69.0	2.5	0.7
Lead	18.12	11	140	71.9	6.5	0.5	8.9	0.8	0.1	18.1	1.6	0.1	53.2	4.8	0.4
Mercury	0.03	0.013	6.5	0.1	7.4	0.01	0.05	3.5	0.01	0.02	1.9	0.004	0.04	3.3	0.01
Zinc	56.64	46	400	77.4	1.7	0.2	68.1	1.5	0.2	57.5	1.3	0.14	93.6	2.0	0.2
DDT+	0.049	0.093	0.17	0.05	0.5	0.3	0.3	3.5	1.9	0.01	0.1	0.05	0.04	0.4	0.2

Notes:

All concentrations in mg/kg

Constituent 95% UCL Concentration above maximum background concentration

Constituent 95% UCL Concentration with ESV-HQ > 1.0

Constituent 95% UCL Concentration with RSSL-HQ > 1.0

95% UCL = 95% upper confidence limit

HQ= Hazard Quotient

ESV = Ecological Screening Value

LEL = Lowest Effect Level

RSSL = Refined Soil Screening Level

ND = Not detected

All results from samples 0 - 0.5' deep.

[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.

[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.

[3] RSSL is the midpoint between the ESV and LEL.

[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020. See Attachment A

TABLE 3.6 D

REFINED SOIL SCREENING LEVEL HAZARD QUOTIENT BY RECEPTOR: INVERTEBRATES: MAMMALS

Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 1											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG [2]	Mammal ESV	Mammal RSSL [3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.0	0.01	0.3	1.0	0.01	0.3	1.1	0.01	0.3	1.0	0.01
Chromium	44.48	34	420.0	47.6	1.4	0.1	61.5	1.8	0.1	49.2	1.4	0.1	58.9	1.7	0.1
Copper	85.03	49	1129.5	133.4	2.7	0.1	99.9	2.0	0.1	85.6	1.7	0.1	79.7	1.6	0.1
Zinc	56.64	79	3552.0	110.0	1.4	0.03	126.9	1.6	0.04	74.5	0.9	0.02	168.4	2.1	0.05
DDT+ [5]	0.049	0.021	47.0	0.02	0.85	0.0004	0.031	1.46	0.001	0.007	0.34	0.0002	0.4	21.4	0.01

				Area 2														
				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent	BG	Mammal ESV	Mammal RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.1	0.01	0.2	0.8	0.01	0.3	1.1	0.01	0.4	1.5	0.01	0.2	0.9	0.01
Cadmium	0.11	0.36	393.7	0.3	0.9	0.001	0.4	1.1	0.001	0.2	0.5	0.0004	1.1	3.1	0.003	0.4	1.2	0.001
Chromium	44.48	34	420.0	41.6	1.2	0.1	36.6	1.1	0.1	33.7	1.0	0.1	34.9	1.0	0.1	28.6	0.8	0.1
Copper	85.03	49	1129.5	89.1	1.8	0.1	290.4	5.9	0.3	76.9	1.6	0.1	93.4	1.9	0.1	87.7	1.8	0.1
Zinc	56.64	79	3552.0	342.4	4.3	0.1	181.8	2.3	0.1	114.8	1.5	0.03	143.1	1.8	0.04	108.6	1.4	0.03
DDT+	0.049	0.021	47.0	0.3	13.9	0.01	14.5	691.6	0.3	0.02	1.2	0.001	0.08	3.8	0.002	0.008	0.371	0.0002
Aldrin	0.0047	0.037	16.8	0.1	1.6	0.004	0.2	5.4	0.01	0.00	0.1	0.0002	0.0	0.6	0.001	0.003	0.1	0.0002
Chlordane (technical)	0.047	0.27	31.1	0.7	2.6	0.02	1.8	6.7	0.1	0.04	0.1	0.001	0.2	0.8	0.01	0.03	0.1	0.001
Dieldrin	0.013	0.0049	0.2	8.4	1710.2	55.0	0.2	47.2	1.5	0.003	0.5	0.02	0.02	4.1	0.13	0.003	0.5	0.02

				Area 3											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Mammal ESV	Mammal RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.1	0.01	0.3	1.1	0.01	0.3	1.0	0.01	0.3	1.0	0.01
Copper	85.03	49	1129.5	82.2	1.7	0.1	74.1	1.5	0.1	148.6	3.0	0.1	69.0	1.4	0.1
Zinc	56.64	79	3552.0	77.4	1.0	0.02	68.09	0.9	0.02	57.51	0.7	0.02	93.60	1.2	0.03
DDT+	0.049	0.021	47.0	0.05	2.3	0.001	0.3	15.5	0.01	0.01	0.4	0.0002	0.04	1.9	0.001
Dieldrin	0.013	0.0049	0.2	0.01	2.9	0.1	0.003	0.6	0.02	0.003	0.5	0.02	0.01	1.3	0.04

Notes:

All concentrations in mg/kg

Constituent 95% UCL Concentration above maximum background concentration

Constituent 95% UCL Concentration with ESV-HQ > 1.0

Constituent 95% UCL Concentration with RSSL-HQ > 1.0

95% UCL = 95% upper confidence limit

HQ= Hazard Quotient

ESV = Ecological Screening Value

LEL = Lowest Effect Level

RSSL = Refined Soil Screening Level

All results from samples 0 - 0.5' deep.

DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).

[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.

[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.

[3] RSSL is the midpoint between the ESV and LEL.

[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020. See Attachment A.

[5] Mammal ESV and RSSL benchmarks presented are for the sum of DDD, DDE, and DDT. Sample concentrations of DDD, DDE, and DDT were summed and used for 95% UCL analysis for comparison.

TABLE 3.7 A
REFINED HAZARD QUOTIENTS BY AREA
Investigation Area 1
Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 1 Plant RSSL-HQs											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG [2]	Plant ESV	Plant RSSL [3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	70	109	133.4	1.9	1.2	99.9	1.4	0.9	85.6	1.2	0.8	79.7	1.1	0.7
Thallium	0.08	0.05	0.28	0.2	3.7	0.7	0.1	2.7	0.5	0.1	2.9	0.5	0.1	2.7	0.5

				Area 1 Invertebrate RSSL-HQs											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent [1]	BG	Invertebrate ESV	Invertebrate RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	133.4	1.7	1.4	99.9	1.2	1.0	85.6	1.1	0.9	79.7	1.0	0.8
Zinc	56.64	120	147	110.0	0.9	0.7	126.9	1.1	0.9	74.5	0.6	0.5	168.4	1.4	1.1
DDT+ [5]	0.049	0.118	0.354	0.02	0.2	0.1	0.03	0.3	0.1	0.01	0.1	0.02	0.4	3.8	1.3
Chlordane (technical)	0.047	0.017	1.20	0.02	1.4	0.02	0.03	1.5	0.02	0.02	1.3	0.02	0.03	1.6	0.02
Dieldrin	0.013	0.003	12.50	0.002	0.8	0.0002	0.004	1.4	0.0003	0.002	0.8	0.0002	0.003	0.9	0.0002
Endosulfan I	0.0047	0.0009	0.25	0.002	2.7	0.01	0.003	2.8	0.01	0.002	2.5	0.01	0.003	3.0	0.01
Endosulfan II	0.0047	0.0009	0.25	0.002	2.7	0.01	0.003	2.8	0.01	0.002	2.5	0.01	0.003	3.0	0.01

				Area 1 Bird RSSL-HQs											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent	BG	Bird ESV	Bird RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	NS	NS	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA
Chromium	44.48	26	99.5	47.6	1.8	0.5	61.5	2.4	0.6	49.2	1.9	0.5	58.9	2.3	0.6
Copper	85.03	28	104.0	133.4	4.8	1.3	99.9	3.6	1.0	85.6	3.1	0.8	79.7	2.8	0.8
Lead	18.12	11	140.0	12.6	1.1	0.1	10.3	0.9	0.1	10.0	0.9	0.1	5.7	0.5	0.0
Mercury	0.03	0.013	6.5	0.04	2.9	0.01	0.03	2.0	0.004	0.03	2.2	0.004	0.03	2.0	0.004
Zinc	56.64	46	400.0	110.0	2.4	0.3	126.9	2.8	0.3	74.5	1.6	0.2	168.4	3.7	0.4
DDT+	0.049	0.093	0.17	0.02	0.2	0.1	0.03	0.3	0.2	0.01	0.1	0.04	0.4	4.8	2.6

				Area 1 Mammal RSSL-HQs											
				IA-1-01			IA-1-02			IA-1-03			IA-1-04		
Constituent	Max BG	Mammal ESV	Mammal RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.0	0.01	0.3	1.0	0.01	0.3	1.1	0.01	0.3	1.0	0.01
Chromium	44.48	34	420.0	47.6	1.4	0.1	61.5	1.8	0.1	49.2	1.4	0.1	58.9	1.7	0.1
Copper	85.03	49	1129.5	133.4	2.7	0.1	99.9	2.0	0.1	85.6	1.7	0.1	79.7	1.6	0.1
Zinc	56.64	79	3552.0	110.0	1.4	0.03	126.9	1.6	0.04	74.5	0.9	0.02	168.4	2.1	0.05
DDT+	0.049	0.021	47.0	0.02	0.85	0.0004	0.031	1.46	0.001	0.007	0.34	0.0002	0.4	21.4	0.01

Notes:
All concentrations in mg/kg
Constituent 95% UCL Concentration above maximum background concentration
Constituent 95% UCL Concentration with ESV-HQ > 1.0
Constituent 95% UCL Concentration with RSSL-HQ > 1.0
95% UCL = 95% upper confidence limit
BG = background
HQ= Hazard Quotient
ESV = Ecological Screening Value
LOEL = Lowest Observed Effect Level
RSSL = Refined Soil Screening Level
All results from samples 0 - 0.5' deep.
DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).
[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.
[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.
[3] RSSL is the midpoint between the ESV and LOEL
[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020.
[5] ESV and RSSL benchmarks presented are for the sum of DDD, DDE, and DDT. Sample concentrations of DDD, DDE, and DDT were summed and used for 95% UCL analysis for comparison

TABLE 3.7 B
REFINED HAZARD QUOTIENTS BY AREA
Investigation Area 2
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Area 2 Plant RSSL-HQs

				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent [1]	BG [2]	Plant ESV	Plant RSSL[3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Barium	83.26	110	185	320	2.9	1.7	67.9	0.6	0.4	57.3	0.5	0.3	51.2	0.5	0.3	73.9	0.7	0.4
Copper	85.03	70	109	89.1	1.3	0.8	290.4	4.1	2.7	76.9	1.1	0.7	93.4	1.3	0.9	87.7	1.3	0.8
Thallium	0.08	0.05	0.28	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.8	0.5	0.1	2.8	0.5	0.1	2.9	0.5
Zinc	56.64	160	205	342.4	2.1	1.7	181.8	1.1	0.9	114.8	0.7	0.6	143.1	0.9	0.7	108.6	0.7	0.5
DDT+ [5]	0.049	4.1	5.05	0.3	0.1	0.1	14.5	3.5	2.9	0.02	0.006	0.005	0.1	0.02	0.02	0.01	0.002	0.002
Aldrin	0.0047	0.0032	0.018	0.1	18.4	3.3	0.2	62.8	11.4	0.003	0.8	0.1	0.02	6.4	1.2	0.003	0.8	0.1
Chlordane (technical)	0.047	0.22	11.11	0.7	3.2	0.1	1.8	8.2	0.2	0.04	0.2	0.003	0.2	0.9	0.02	0.03	0.1	0.002

Area 2 Invertebrate RSSL-HQs

				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent	BG	Invertebrate ESV	Invertebrate RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	89.1	1.1	0.9	290.4	3.6	2.9	76.9	1.0	0.8	93.4	1.2	0.9	87.7	1.1	0.9
Mercury	0.03	0.05	0.28	0.1	1.2	0.2	0.2	3.3	0.6	0.1	1.1	0.2	0.1	1.1	0.2	0.1	1.1	0.2
Zinc	56.64	120	147	342.4	2.9	2.3	181.8	1.5	1.2	114.8	1.0	0.8	143.1	1.2	1.0	108.6	0.9	0.7
DDT+	0.049	0.118	0.35	0.3	2.5	0.8	14.5	123.1	41.0	0.02	0.2	0.1	0.1	0.7	0.2	0.008	0.1	0.02
Chlordane (technical)	0.047	0.017	1.20	0.7	41.0	0.6	1.8	106.1	1.5	0.04	2.2	0.03	0.2	12.0	0.2	0.03	1.5	0.02
cis-Chlordane	0.0047	0.003	1.20	0.1	24.0	0.1	0.1	51.0	0.1	0.003	0.9	0.002	0.02	6.8	0.02	0.003	0.9	0.002
Dieldrin	0.013	0.003	12.50	8.4	2889.6	0.7	0.2	79.8	0.02	0.003	0.9	0.0002	0.02	7.0	0.002	0.003	0.9	0.0002
Endosulfan I	0.0047	0.0009	0.25	0.1	77.4	0.3	0.2	223.1	0.8	0.003	2.8	0.01	0.02	16.7	0.1	0.003	2.8	0.01
Endosulfan II	0.0047	0.0009	0.25	0.1	77.4	0.3	0.2	223.1	0.8	0.003	2.8	0.01	0.05	51.8	0.2	0.003	2.8	0.01
Endosulfan sulfate	0.0047	0.007	0.25	0.1	10.7	0.3	0.2	30.9	0.8	0.003	0.4	0.01	0.02	3.0	0.1	0.003	0.4	0.01
trans-Chlordane	0.0047	0.02	1.21	0.1	3.5	0.1	0.1	6.8	0.1	0.005	0.2	0.004	0.01	0.6	0.01	0.003	0.1	0.002

Area 2 Bird RSSL-HQs

				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent	BG	Bird ESV	Bird RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	NS	NS	0.3	NA	NA	0.2	NA	NA	0.3	NA	NA	0.4	NA	NA	0.2	NA	NA
Cadmium	0.11	0.77	3.1	0.3	0.4	0.1	0.4	0.5	0.1	0.2	0.2	0.06	1.1	1.4	0.4	0.4	0.6	0.1
Chromium	44.48	26	99.5	41.6	1.6	0.4	36.6	1.4	0.4	33.7	1.3	0.3	34.9	1.3	0.4	28.6	1.1	0.3
Copper	85.03	28	104.0	89.1	3.2	0.9	290.4	10.4	2.8	76.9	2.7	0.7	93.4	3.3	0.9	87.7	3.1	0.8
Lead	18.12	11	140.0	28.2	2.6	0.2	33.8	3.1	0.2	13.7	1.2	0.1	25.6	2.3	0.2	35.6	3.2	0.3
Mercury	0.03	0.013	6.5	0.1	4.5	0.01	0.2	12.6	0.03	0.1	4.2	0.01	0.1	4.4	0.01	0.1	4.1	0.01
Zinc	56.64	46	400.0	342.4	7.4	0.9	181.8	4.0	0.5	114.8	2.5	0.3	143.1	3.1	0.4	108.6	2.4	0.3
DDT+	0.049	0.093	0.17	0.3	3.1	1.7	14.5	156.2	84.7	0.02	0.3	0.14	0.1	0.9	0.5	0.008	0.1	0.05
Chlordane (technical)	0.047	0.27	1.4	0.7	2.6	0.5	1.8	6.7	1.3	0.04	0.1	0.03	0.2	0.8	0.1	0.03	0.1	0.02
Dieldrin	0.013	0.022	0.051	8.4	381	164.3	0.2	10.5	4.5	0.003	0.1	0.050	0.02	0.9	0.40	0.003	0.1	0.050

Area 2 Mammal RSSL-HQs

				IA-2-01			IA-2-02			IA-2-03			IA-2-04			IA-2-05		
Constituent	BG	Mammal ESV	Mammal RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.1	0.01	0.2	0.8	0.01	0.3	1.1	0.01	0.4	1.5	0.01	0.2	0.9	0.01
Cadmium	0.11	0.36	393.7	0.3	0.9	0.001	0.4	1.1	0.001	0.2	0.5	0.0004	1.1	3.1	0.003	0.4	1.2	0.001
Chromium	44.48	34	420.0	41.6	1.2	0.1	36.6	1.1	0.1	33.7	1.0	0.1	34.9	1.0	0.1	28.6	0.8	0.1
Copper	85.03	49	1129.5	89.1	1.8	0.1	290.4	5.9	0.3	76.9	1.6	0.1	93.4	1.9	0.1	87.7	1.8	0.1
Zinc	56.64	79	3552.0	342.4	4.3	0.1	181.8	2.3	0.1	114.8	1.5	0.03	143.1	1.8	0.04	108.6	1.4	0.03
DDT+	0.049	0.021	47.0	0.3	13.9	0.01	14.5	691.6	0.3	0.02	1.2	0.001	0.08	3.8	0.002	0.008	0.371	0.0002
Aldrin	0.0047	0.037	16.8	0.1	1.6	0.004	0.2	5.4	0.01	0.00	0.1	0.0002	0.0	0.6	0.001	0.003	0.1	0.0002
Chlordane (technical)	0.047	0.27	31.1	0.7	2.6	0.02	1.8	6.7	0.1	0.04	0.1	0.001	0.2	0.8	0.01	0.03	0.1	0.001
Dieldrin	0.013	0.0049	0.2	8.4	1710.2	55.0	0.2	47.2	1.5	0.003	0.5	0.02	0.02	4.1	0.13	0.003	0.5	0.02

Notes:
All concentrations in mg/kg
Constituent 95% UCL Concentration above maximum background concentration
Constituent 95% UCL Concentration with ESV-HQ > 1.0
Constituent 95% UCL Concentration with RSSL-HQ > 1.0
95% UCL = 95% upper confidence limit
BG = background
HQ= Hazard Quotient
ESV = Ecological Screening Value
LOEL = Lowest Observed Effect Level
RSSL = Refined Soil Screening Level
All results from samples 0 - 0.5' deep.
DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).
[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.
[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.
[3] RSSL is the midpoint between the ESV and LOEL
[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020. See Appendix A.
[5] ESV and RSSL benchmarks presented are for the sum of DDD, DDE, and DDT. Sample concentrations of DDD, DDE, and DDT were summed and used for 95% UCL analysis for comparison.

TABLE 3.7 C
REFINED HAZARD QUOTIENTS BY AREA
Investigation Area 3
Caneel Bay Resort; St. John Island, U.S. Virgin Island

				Area 3 Plant RSSL-HQs											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent [1]	BG [2]	Plant ESV	Plant RSSL[3]	95% UCL [4]	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	70	109	82.2	1.2	0.8	74.1	1.1	0.7	148.6	2.1	1.4	69.0	1.0	0.6
Thallium	0.08	0.05	0.28	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.9	0.5	0.1	2.8	0.5
Aldrin	0.0047	0.0032	0.018	0.01	3.7	0.7	0.004	1.2	0.2	0.003	0.8	0.1	0.003	0.8	0.1

				Area 3 Invertebrate RSSL-HQs											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Invertebrate ESV	Invertebrate RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Copper	85.03	80	98.5	82.2	1.0	0.8	74.1	0.9	0.8	148.6	1.9	1.5	69.0	0.9	0.7
Mercury	0.03	0.05	0.28	0.1	1.9	0.3	0.05	0.9	0.2	0.02	0.5	0.1	0.04	0.9	0.2
Chlordane (technical)	0.047	0.017	1.20	0.2	10.5	0.1	0.03	1.5	0.02	0.03	1.5	0.02	0.03	1.5	0.02
cis-Chlordane	0.0047	0.003	1.20	0.02	6.2	0.01	0.003	0.9	0.002	0.003	0.9	0.002	0.003	0.9	0.002
Dieldrin	0.013	0.003	12.50	0.01	5.0	0.001	0.003	1.0	0.0002	0.003	0.9	0.0002	0.006	2.1	0.0005
Endosulfan I	0.0047	0.0009	0.25	0.02	19.8	0.1	0.003	2.9	0.01	0.003	2.9	0.01	0.003	2.9	0.01
Endosulfan II	0.0047	0.0009	0.25	0.02	19.8	0.1	0.003	2.9	0.01	0.003	2.9	0.01	0.003	2.9	0.01
Endosulfan sulfate	0.0047	0.007	0.25	0.02	2.7	0.1	0.003	0.4	0.01	0.003	0.4	0.01	0.003	0.4	0.01

				Area 3 Bird RSSL-HQs											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Bird ESV	Bird RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	NS	NS	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA	0.3	NA	NA
Chromium	44.48	26	99.5	26.6	1.0	0.3	27.2	1.0	0.3	23.4	0.9	0.2	21.3	0.8	0.2
Copper	85.03	28	104	82.2	2.9	0.8	74.1	2.6	0.7	148.6	5.3	1.4	69.0	2.5	0.7
Lead	18.12	11	140	71.9	6.5	0.5	8.9	0.8	0.1	18.1	1.6	0.1	53.2	4.8	0.4
Mercury	0.03	0.013	6.5	0.1	7.4	0.01	0.05	3.5	0.01	0.02	1.9	0.004	0.04	3.3	0.01
Zinc	56.64	46	400	77.4	1.7	0.2	68.1	1.5	0.2	57.5	1.3	0.14	93.6	2.0	0.2
DDT+ [5]	0.049	0.093	0.17	0.05	0.5	0.3	0.3	3.5	1.9	0.01	0.1	0.05	0.04	0.4	0.2

				Area 3 Mammal RSSL-HQs											
				IA-3-01			IA-3-02			IA-3-03			IA-3-04		
Constituent	BG	Mammal ESV	Mammal RSSL	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ	95% UCL	ESV-HQ	RSSL-HQ
Antimony	0.52	0.27	27.1	0.3	1.1	0.01	0.3	1.1	0.01	0.3	1.0	0.01	0.3	1.0	0.01
Copper	85.03	49	1129.5	82.2	1.7	0.1	74.1	1.5	0.1	148.6	3.0	0.1	69.0	1.4	0.1
Zinc	56.64	79	3552.0	77.4	1.0	0.02	68.09	0.9	0.02	57.51	0.7	0.02	93.60	1.2	0.03
DDT+	0.049	0.021	47.0	0.05	2.3	0.001	0.3	15.5	0.01	0.01	0.4	0.0002	0.04	1.9	0.001
Dieldrin	0.013	0.0049	0.2	0.01	2.9	0.1	0.003	0.6	0.02	0.003	0.5	0.02	0.01	1.3	0.04

Notes:
All concentrations in mg/kg
Constituent 95% UCL Concentration above maximum background concentration
Constituent 95% UCL Concentration with ESV-HQ > 1.0
Constituent 95% UCL Concentration with RSSL-HQ > 1.0
95% UCL = 95% upper confidence limit
BG = background
HQ= Hazard Quotient
ESV = Ecological Screening Value
LOEL = Lowest Observed Effect Level
RSSL = Refined Soil Screening Level
All results from samples 0 - 0.5' deep.
DDT + metabolites = Sum of DDD, DDE, and DDT concentrations (includes detected and nondetected concentrations).
[1] This table only presents constituents with one or more ESV-HQ >1.0 per Area.
[2] Background concentration is 95% UCL for analytes with at least one detection or the minimum reporting limit for nondetects among all Reference 1 and Reference 2 ISM samples.
[3] RSSL is the midpoint between the ESV and LOEL
[4] 95% UCLs were derived using the ITRC ISM Calculator version 3.0, August 2020.
[5] ESV and RSSL benchmarks presented are for the sum of DDD, DDE, and DDT. Sample concentrations of DDD, DDE, and DDT were summed and used for 95% UCL analysis for compariso

TABLE 3.8
SUMMARY OF REFINED HAZARD QUOTIENTS AND POTENTIAL RISK BY AREA AND DECISION UNIT
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Area 1				Area 2				Area 3			
DU	Constituent	Receptor	RSSL-HQ	DU	Constituent	Receptor	RSSL-HQ	DU	Constituent	Receptor	RSSL-HQ
IA-1-01	Copper	Plant	1.2	IA-2-01	Barium	Plant	1.7	IA-3-01	No RSSL exceedances		
IA-1-01	Copper	Invertebrate	1.4	IA-2-01	Zinc	Plant	1.7				
IA-1-01	Copper	Bird	1.3	IA-2-01	Zinc	Invertebrate	2.3	IA-3-02	DDT+	Bird	1.9
				IA-2-01	DDT+	Bird	1.7				
IA-1-02	No RSSL exceedances			IA-2-01	Aldrin	Plant	3.3	IA-3-03	Copper	Plant	1.4
				IA-2-01	Dieldrin	Bird	164.3	IA-3-03	Copper	Invertebrate	1.5
IA-1-03	No RSSL exceedances			IA-2-01	Dieldrin	Mammal	55	IA-3-03	Copper	Bird	1.4
IA-1-04	Zinc	Invertebrate	1.1	IA-2-02	Copper	Plant	2.7	IA-3-04	No RSSL exceedances		
IA-1-04	DDT+	Invertebrate	1.3	IA-2-02	Copper	Invertebrate	2.9				
IA-1-04	DDT+	Bird	2.6	IA-2-02	Copper	Bird	2.8				
				IA-2-02	Zinc	Invertebrate	1.2				
				IA-2-02	DDT+	Plant	2.9				
				IA-2-02	DDT+	Invertebrate	41				
				IA-2-02	DDT+	Bird	84.7				
				IA-2-02	Aldrin	Plant	11.4				
				IA-2-02	Chlordane	Invertebrate	1.5				
				IA-2-02	Chlordane	Bird	1.3				
				IA-2-02	Dieldrin	Bird	4.5				
				IA-2-02	Dieldrin	Mammal	1.5				
				IA-2-03	No RSSL exceedances						
				IA-2-04	Aldrin	Plant	1.2				
				IA-2-05	No RSSL exceedances						

= no RSSL exceedance; risk minimal (green)

= low to moderate risk; relatively low RSSL-HQ or naturally occurring metal (blue)

= moderate to high risk; moderate to significant RSSL exceedances (orange)

RSSL-HQ = Refined Soil Screening Level Hazard Quotient
RSSL-HQs based on 95% UCLs

Table 3.9
Summary of Potential Uncertainty
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Assessment Stage	Description of Uncertainty	Potential Bias in Risk Estimate: Under-estimate	Potential Bias in Risk Estimate: Over-estimate	Rationale
Data and Problem Formulation	ISM sampling may miss "hot spots" of elevated concentrations	X		The high number of subsample locations (30) and the use of individual decision units is designed to identify variations in concentrations. Small areas of contamination are unlikely to affect receptor populations.
	Constituents that were not detected were not included in the analysis.	X		Concentrations of these constituents were typically low, so associated risks, if any, are expected to be insignificant.
	Sampling locations may not have identified maximum concentrations.	X		Locations with higher concentration may have been missed
	Both ISM background samples for soil were collected in vegetated areas and produced disparate results. The potential exists that one of these is not fully representative of natural conditions, and that concentrations may be biased high.	X		Because the ISM background sample locations were not on Resort property and showed no sign of disturbance, no anthropogenic influence from Site or other operations is believed to exist. However, except for antimony, no constituent was eliminated as the result of a comparison to background. Anitmony effects on birds, which could not be quantitively assessed because of the lack of toxicity data, was considered to be negligible because antimony concentrations were below background, but the site-specific background data for antimony is well below background levels in EPA SSL documents and other sources. Background data did not affect the results of the report.
	J-value data from below the method reporting limit were used in the risk assessment. These data are estimated values with a high level of quantitative uncertainty.	X	X	J-qualified data may over-or under-represent actual concentrations.
	Sample extraction techniques may overestimate bioavailable fraction		X	Actual bioavailability of many compounds is less than 100%.
	Benchmark values are typically derived from a number of studies with differing site conditions.	X	X	The extent to which these values accurately reflect site conditions or responses is unknown.
	Benchmarks are in part based on adverse effects to test organisms that may not necessarily be present on-site.	X	X	Site organisms may be more, or less, sensitive than test organisms.
	Dermal contact with sediment by mammals was not evaluated.	X		This is typically a negligible exposure route

Table 3.9

Summary of Potential Uncertainty

Caneel Bay Resort; St. John Island, U.S. Virgin Island

	Ingestion of surface water by mammals was not evaluated.	X		The exposure of these animals to site contaminants is considered to be much less than the exposure of birds and especially aquatic organisms that live and reproduce in the stream.
	Sample extraction techniques may overestimate bioavailable fraction		X	Actual bioavailability of many compounds is less than 100%.
Analysis	Single values used for ingestion and body weight.	X	X	Actual populations consist of individuals of various sizes.
	Exposure effects calculated only for adult receptors using generic feeding and body weight characteristics. Young of the species or breeding females may have different feeding regimes and body weights.	X	X	Toxicological data is typically not available for these specific groups
	Concentrations of COPCs in prey and food items were estimated through modeling.	X	X	This approach may over- or under-estimate actual concentrations, which vary widely by species, COPC, and soil type.
	Species used in food chain models for RSSLs may not accurately represent all members of the feeding guild.	X	X	A limited food web exists on St. John, and the species used for RSSL development area known to be present on the island.
	Ingestion of surface water by mammals was not evaluated.	X		The exposure of these animals to site contaminants is considered to be much less than the exposure of birds and especially aquatic organisms that live and reproduce in the stream.
	The food ingestion rate of both the bird and the bat were estimated either from model equations or literature references. diet and life history characteristics (ingestion rate, body weight, etc.) of receptors were based on studies in various locations in North America.	X	X	Values may under- or over-estimate actual ingestion rates by both species.
	The soil ingestion rate for the pearly-eyed thrasher was assumed to be the same as for the American woodcock, used for the EPA Eco-SSL. Thrasher diet consists of a variety of insects, not all of which live within the soil, as do the earthworms consumed by the woodcock.		X	This was a conservative assumption that focuses on the proportion the thrasher diet that consists of soil-dwelling beetles and other species.
	Some effect levels were geomeans of LOEL TRV or study data	X		Actual effects may exist at a lower concentration than the geomean.
	The mammalian LOEL TRV for chlordane was obtained from a NOEL by the use of a uncertainty factor of 10. This may result over-estimate the	X		Use of an uncertainty factor to estimate LOELs from NOELs is a common approach that is used only when more empirical estimates are unavailable. LANL, the source of the LOEL TRVs, uses this technique for many constituents. The effect of the

Table 3.9
Summary of Potential Uncertainty
Caneel Bay Resort; St. John Island, U.S. Virgin Island

	LOEL and result in a high RSSL.			use of this estimated LOEL TRV is reduced by the averaging of ESV and LOEL-SSLs to generate the RSSL used for screening.
	Effect levels are typically derived from a number of studies with differing site conditions.	X	X	The extent to which these values accurately reflect Site conditions or responses is unknown.
	Refined soil screening levels were generated with an area use factor of 1.0, which assumes that wildlife obtain 100% of their diet from each decision unit separately. This significantly over-estimates risk potential when the RSSLs are used for screening purposes in the Refinement.		X	Use of a DU-limited RSSL with no allowance for off-site foraging is a conservative approach that accommodates potential future scenarios where soils may be distributed or dispersed though excavation or other means. It also reflects preferential or limited foraging that may occur with populations habituated to human presence. Actual risk is likely to be lower than predicted by use of RSSLs.
	Receptor-specific mammal and bird toxicity data were unavailable; therefore, interspecies extrapolations were required for the COPCs. Test species may be more, or less, sensitive than site receptors.	X	X	Physiological similarities help to offset the variance between individual species. However, uncertainty is unavoidable when species-specific data is unavailable.
	TRVs are based on laboratory species exposed under controlled conditions. The magnitude of effects may differ from laboratory results.	X	X	Actual results may be higher or lower than predicted by toxicity tests.
Risk Characterization and Refinement	Constituents with RSSL-HQs less than 2 were considered to present a relatively low risk.	X		This is a qualitative assessment that reflects the fact that small exceedances of even refined screening values are typically within the range of responses and uncertainty. PRGs were developed for all COPECs, regardless of the magnitude of the RSSL-HQ
	Toxicity values for alpha-chlordane is used for technical grade chlordane, which is a mixture of chemical forms.		X	Alpha, or cis-chlordane, is the most toxic form and values for this were used as a conservative approach, since the actual composition of chlordane is unknown.
	DUs were evaluated individually, when in fact wildlife receptors would roam both on and off-site when foraging.		X	DU-specific RSSL comparisons is appropriate for non-mobile receptors and conservative for wildlife. However, it allows comparisons between area and gives a give to relative levels of risk. Large RSSL exceedances are expected to be associated with potential risk.

TABLE 4.1
HUMAN HEALTH RISK-BASED CLEANUP GOAL FOR ARSENIC
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Arsenic				
Receptor	**Soil EPC (mg/kg) [1]**	**Associated Cancer Risk in Soil [2]**	**Target Cancer Risk [3]**	**RBCG (mg/kg)**
Resident	5.30	7.8E-06	1.0E-06	6.8E-01

Notes
mg/kg - milligrams per kilogram
EPC - exposure point concentration
RBCG - risk-based clean-up goal
[1] The soil EPC is based on the EPC derived for arsenic using ISM surface soil data collected between 0-0.5 ft-bgs for Area 1, which was used in the human health risk assessment. The soil EPC is based on a 95% UCL which was derived using the ITRC Incremental Sampling Methodology (ISM) calculator.
[2] The cancer risk in soil is based on the total cancer risk (ingestion, dermal contact, and inhalation) for arsenic in surface soil 0-0.5 ft-bgs for the resident in Area 1.
[3] The target cancer risk is based on the NPS point of departure (i.e. 1E-06).
[4] The risk-based clean-up goal was calculated using the following ratio calculation.

Equation:

$$RBCG = \frac{(EPC \ * Target\ Cancer\ Risk)}{Calculated\ Cancer\ Risk}$$

TABLE 4.2
HUMAN HEALTH RISK-BASED CLEANUP GOAL FOR ALDRIN
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Aldrin				
Receptor	**Soil EPC (mg/kg) [1]**	**Associated Cancer Risk in Soil [2]**	**Target Cancer Risk [3]**	**RBCG (mg/kg)**
Resident	0.0444	1.1E-06	1.0E-06	3.9E-02

Notes
mg/kg - milligrams per kilogram
EPC - exposure point concentration
RBCG - risk-based clean-up goal
[1] The soil EPC is based on the EPC derived for aldrin using ISM surface soil data collected between 0-0.5 ft-bgs in Area 2, which was used in the human health risk assessment. The soil EPC is based on a 95% UCL which was derived using the ITRC Incremental Sampling Methodology (ISM) calculator.
[2] The cancer risk in soil is based on the cumulative risk (ingestion, dermal contact, and inhalation) for aldrin in Area 2 surface soil 0-0.5 ft-bgs for the resident.
[3] The target cancer risk is based on the NPS point of departure (i.e. 1E-06).
[4] The risk-based clean-up goal was calculated using the following ratio calculation.

Equation:

$$RBCG = \frac{(EPC \ * Target\ Cancer\ Risk)}{Calculated\ Cancer\ Risk}$$

TABLE 4.3
HUMAN HEALTH RISK-BASED CLEANUP GOAL FOR DIELDRIN
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Dieldrin				
Receptor	**Soil EPC (mg/kg) [1]**	**Associated Cancer Risk in Soil [2]**	**Target Cancer Risk [3]**	**RBCG (mg/kg)**
Park/Resort Worker	2.42	6.7E-06	1.0E-06	3.6E-01
Construction Worker	2.42	2.1E-06	1.0E-06	1.2E+00
Resident	2.42	7.1E-05	1.0E-06	3.4E-02

Notes

mg/kg - milligrams per kilogram

EPC - exposure point concentration

RBCG - risk-based clean-up goal

[1] The soil EPC is based on the EPC derived for dieldrin using ISM surface soil data collected between 0-0.5 ft-bgs in Area 2, which was used in the human health risk assessment. The soil EPC is based on a 95% UCL which was derived using the ITRC Incremental Sampling Methodology (ISM) calculator.

[2] The cancer risk in soil is based on the cumulative risk (ingestion, dermal contact, and inhalation) for dieldrin in Area 2 surface soil 0-0.5 ft-bgs for the park/resort worker, construction worker, and resident.

[3] The target cancer risk is based on the NPS point of departure (i.e. 1E-06).

[4] The risk-based clean-up goal was calculated using the following ratio calculation.

Equation:

$$RBCG = \frac{(EPC\ * Target\ Cancer\ Risk)}{Calculated\ Cancer\ Risk}$$

TABLE 4.4
DEVELOPMENT OF PRELIMINARY REMEDIATION GOALS FOR SOIL
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Chemical of Potential Concern[1]	Soil Human Health Risk Based Clean-up Goal[2] Based on Target Cancer Risk = 10^{-6}			Ecological RBCGs[3]	Background/ Reference Value[4]	Achievable Reporting Limit (RL) [5]	Selected PRGs[6]	Basis for PRG
	Construction Worker Scenario	Park/Resort Worker Scenario	Residential Scenario					
Arsenic	--	--	0.677	--	2.00	1.3	2.00	Background
Barium	--	--	--	185	83.26	1.3	185	ECO RBCG
Copper	--	--	--	99	85.03	0.52	99	ECO RBCG
Zinc	--	--	--	147	56.64	2.9	147	ECO RBCG
Aldrin	--	--	0.039	0.018	ND	0.0043	0.018	ECO RBCG
Chlordane	--	--	--	1.2	ND	0.043	1.2	ECO RBCG
Dieldrin	1.2	0.36	0.034	0.051	0.013	0.0043	0.034	HH RBCG
DDT and metabolites	--	--	--	0.17	0.049	0.0043	0.17	ECO RBCG

Notes:

ND = not detected; constituent was not detected in samples collected from reference locations.

"--" not applicable; indicates the constituent was not identified as a risk driver in the human health or ecological risk assessments.

1.Soil concentrations are presented in units of milligrams per kilogram (mg/kg) for chemicals of concern identified in the 2020 Human Health Risk Assessment and SLERA.

2. Risk based clean-up goal (RBCG) was calculated using a ratio equation, which is presented in Tables 4.1 through 4.3.

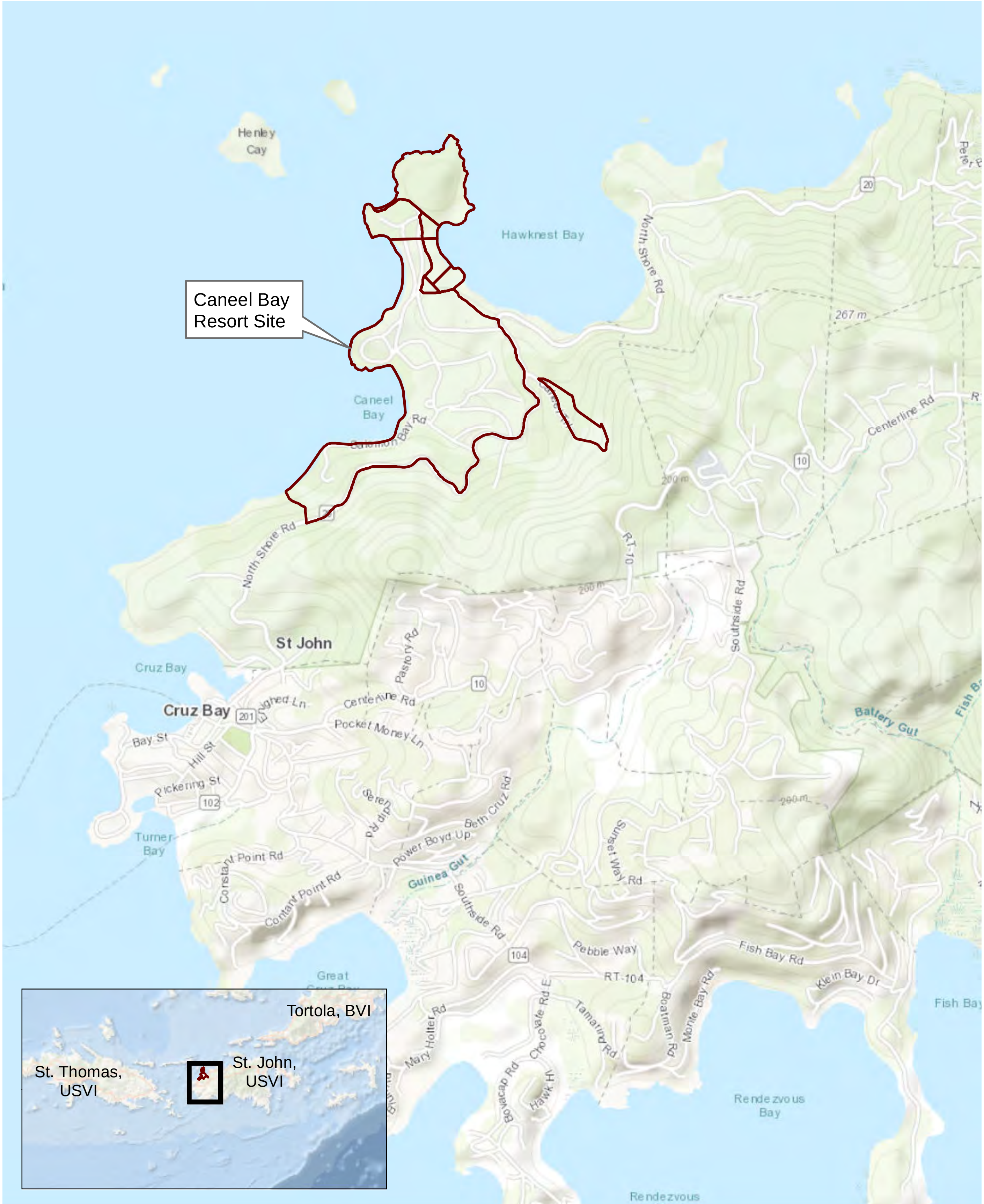
3. As described in the SLERA Refinement, ecological RBCGs were obtained from the scientific literature for plants and invertebrates and back-calculated using USEPA food chain models and toxicity data for mammals.

4. VHB provided background values that were developed using a weighted reference sample mean concentration plus a significant difference, based on soil samples collected from reference areas.

5. Reporting limits are based on the lowest laboratory reporting limits determined for 2021 soil samples.

6. The maximum concentration between the background value and RL, and the lower of the RBCG and TBC, was selected as the PRG.

Figures



\\vhb\gis\proj\Montpelier\58345.21 NPS Caneel Bay Resort\Project\SAP\Figure 1 Site Location Map.mxd

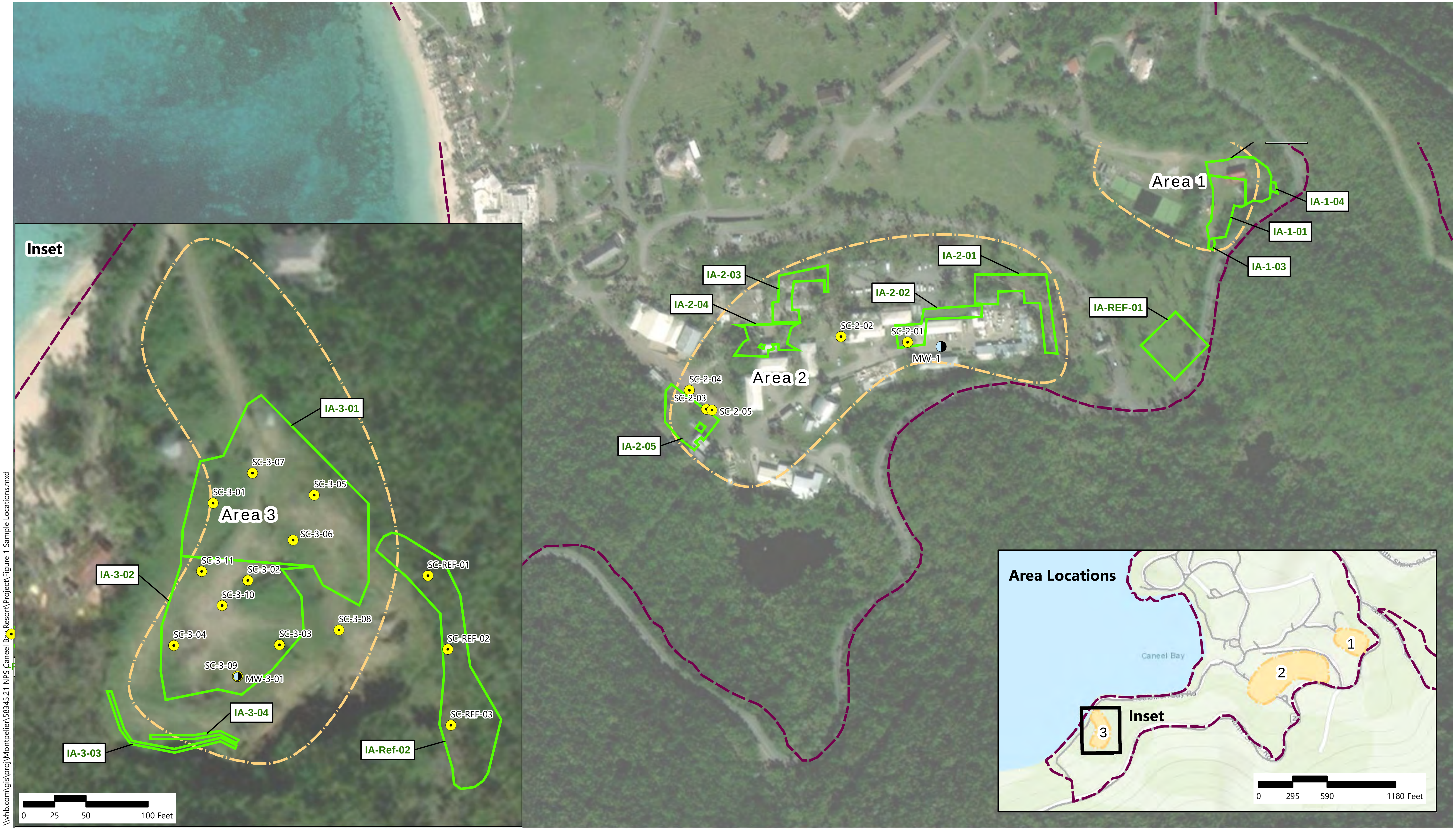
0 500 1000 2000 Feet

Caneel_Property

Caneel Bay Resort Site | St. John, USVI

Source Info:
Base map from ESRI/World Topo Map

Site Location Map



\\vhb.com\gis\proj\Montpelier\58345.21 NPS Caneel Bay Resort\Project\Figure 1 Sample Locations.mxd

0 100 200 400 Feet

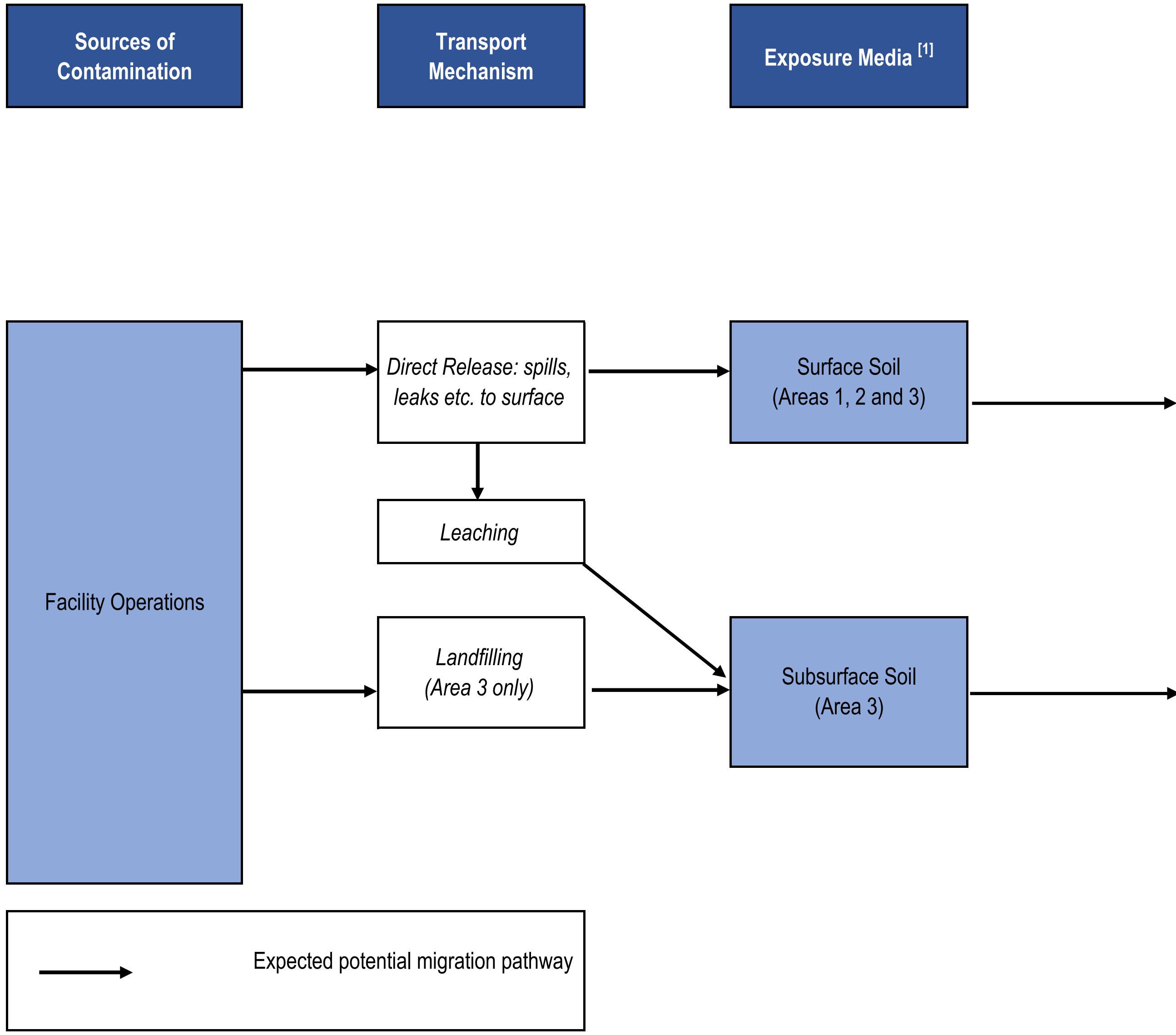
- Sample Location
- ISM Surface Soil Decision Unit
- Existing Monitoring Well
- Investigation Area
- Caneel Bay Resort

Caneel Bay Resort Site | St. John, USVI

Source Info:
Base map from ESRI/World Imagery (2017).
VHB recorded sampling locations in the field by survey or GPS.

Sample Locations
Investigation Areas

FIGURE 2-1
HUMAN HEATH AND ECOLOGICAL PATHWAY-RECEPTOR DIAGRAM
Caneel Bay Resort
St. John Island, USVI



Receptors and Potentially Complete Exposure Pathways

Exposure Route	Human Receptors: Visitor	Human Receptors: Park/Resort Worker	Human Receptors: Construction Worker	Human Receptors: Hypothetical Future Resident	Ecological Receptors (Terrestrial): Plants	Ecological Receptors (Terrestrial): Invertebrates	Ecological Receptors (Terrestrial): Amphibians/ Reptiles	Ecological Receptors (Terrestrial): Birds	Ecological Receptors (Terrestrial): Mammals
Surface Soil (Areas 1, 2 and 3)									
Inhalation of Fugitive Dust	(X) [2]	X	X	X	NA	NA	(X) [4]	NA	NA
Dermal contact	(X) [2]	X	X	X	NA	NA	(X) [4]	NA	NA
Incidental Ingestion	(X) [2]	X	X	X	NA	NA	X	X	X
Direct uptake	NA	NA	NA	NA	X	X	NA	NA	NA
Bioaccumulation through prey items	NA	NA	NA	NA	NA	NA	(X) [4]	X	X
Subsurface Soil (Area 3)									
Incidental Ingestion	NA[3]	NA[3]	X	NA[3]	NA	NA	NA	NA	NA
Dermal contact	NA[3]	NA[3]	X	NA[3]	NA	NA	NA	NA	NA
Inhalation of Fugitive Dust	NA[3]	NA[3]	X	NA[3]	NA	NA	NA	NA	NA
Direct uptake	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uptake into biota (e.g., fish)	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:

X = Indicates the complete or potentially complete exposure pathway that was retained for quantitative evaluation for this medium and receptor.

(x) = Complete or potentially complete pathway, but risk qualitatively evaluated

NA = Not applicable; not a relevant exposure pathway for receptor.

[1] Groundwater was not encountered during the 2021 site investigation. It is assumed that the presence of groundwater is ephemeral. Because of this, and because groundwater is not used as a potable source of water at the Site, groundwater-related exposure pathways are not included in the risk assessment.

[2] The visitor is expected to have an exposure potential lower than either the Park/Resort Worker or Hypothetical Future Site Resident receptor scenarios. Therefore, a quantitative evaluation of risk for the visitor was not conducted.

[3] Excavation and subsequent exposure to subsurface soils is assumed applicable to only the construction worker scenario and only for Area 3.

[4] Inadequate toxicological/exposure data available to quantify risk from this pathway.

Appendices

Appendix A: ITRC ISM 95% UCL Calculator

Appendix A-1: ITRC Calculator – Area 1

Appendix A-2: ITRC Calculator – Area 2

Appendix A-3: ITRC Calculator – Area 3

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Arsenic 7440-38-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	2.20	2.50	2.30				3	0.47	2.3	0.15	0.97	0.41	1.13	1.09	0.47	0.09	2.6	2.7	Low	2.59
2	IA-1-02	0.186	5.90	5.40	7.60				3	0.49	6.3	1.15	7.29	1.16	1.18	8.60	1.37	0.67	8.2	9.2	Low	8.24
3	IA-1-03	0.006	2.00	1.90	2.20				3	0.02	2.0	0.15	0.97	0.48	1.13	1.09	0.54	0.09	2.3	2.4	Low	2.29
4	IA-1-04	0.006	1.70	1.70	1.90				3	0.02	1.8	0.12	0.73	0.41	1.13	0.82	0.47	0.07	2.0	2.1	Low	1.96
	Sum:	0.376	--	--	--	--	--	--	12	1.00	4.3	0.58	3.64	0.85	NA	4.29	1.00	0.33	5.3	5.7	Low	5.25

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **5.25** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Barium 7440-39-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	64	66	62				3	0.47	64.0	2.00	12.65	0.20	1.13	14.25	0.22	1.15	67.4	69.0	Low	67.4
2	IA-1-02	0.186	72	64	71				3	0.49	69.0	4.36	27.57	0.40	1.13	31.09	0.45	2.52	76.3	80.0	Low	76.3
3	IA-1-03	0.006	64	64	63				3	0.02	63.7	0.58	3.65	0.06	1.13	4.12	0.06	0.33	64.6	65.1	Low	64.6
4	IA-1-04	0.006	69	68	72				3	0.02	69.7	2.08	13.17	0.19	1.13	14.83	0.21	1.20	73.2	74.9	Low	73.2
	Sum:	0.376	--	--	--	--	--	--	12	1.00	66.6	2.36	14.90	0.22	NA	16.80	0.25	1.36	70.5	72.5	Low	70.5

df by Welch-Satterthwaite approximation: **2.7**

Recommended UCL: **70.5** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003509

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Beryllium 7440-41-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.25	0.3	0.26				3	0.47	0.3	0.03	0.17	0.62	1.14	0.19	0.70	0.02	0.3	0.3	Low	0.315
2	IA-1-02	0.186	0.27	0.27	0.26				3	0.49	0.3	0.01	0.04	0.14	1.13	0.04	0.15	0.00	0.3	0.3	Low	0.276
3	IA-1-03	0.006	0.24	0.24	0.22				3	0.02	0.2	0.01	0.07	0.31	1.13	0.08	0.35	0.01	0.3	0.3	Low	0.253
4	IA-1-04	0.006	0.24	0.22	0.23				3	0.02	0.2	0.01	0.06	0.27	1.13	0.07	0.31	0.01	0.2	0.3	Low	0.247
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.3	0.01	0.08	0.30	NA	0.09	0.35	0.01	0.3	0.3	Low	0.3

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.3** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Cadmium 7440-43-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.11	0.18	0.24				3	0.47	0.2	0.07	0.41	2.33	1.40	0.58	3.27	0.04	0.3	0.3	High	0.340
2	IA-1-02	0.186	0.13	0.12	0.15				3	0.49	0.1	0.02	0.10	0.72	1.14	0.11	0.83	0.01	0.2	0.2	Low	0.159
3	IA-1-03	0.006	0.086	0.097	0.11				3	0.02	0.1	0.01	0.08	0.78	1.14	0.09	0.89	0.01	0.1	0.1	Low	0.118
4	IA-1-04	0.006	0.11	0.09	0.099				3	0.02	0.1	0.01	0.06	0.64	1.14	0.07	0.72	0.01	0.1	0.1	Low	0.117
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.2	0.03	0.20	1.31	NA	0.28	1.83	0.02	0.2	0.2	Med	0.233

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.233** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chromium 7440-47-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	45	47	45				3	0.47	45.7	1.15	7.30	0.16	1.13	8.23	0.18	0.67	47.6	48.6	Low	47.6
2	IA-1-02	0.186	59	54	58				3	0.49	57.0	2.65	16.73	0.29	1.13	18.85	0.33	1.53	61.5	63.7	Low	61.5
3	IA-1-03	0.006	48	47	45				3	0.02	46.7	1.53	9.66	0.21	1.13	10.88	0.23	0.88	49.2	50.5	Low	49.2
4	IA-1-04	0.006	56	58	55				3	0.02	56.3	1.53	9.66	0.17	1.13	10.89	0.19	0.88	58.9	60.2	Low	58.9
	Sum:	0.376	--	--	--	--	--	--	12	1.00	51.5	1.42	8.97	0.17	NA	10.11	0.20	0.82	53.9	55.0	Low	53.9

df by Welch-Satterthwaite approximation: **2.7**

Recommended UCL: **53.9** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003512

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Lead 7439-92-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	10	10	12				3	0.47	10.7	1.15	7.30	0.68	1.14	8.31	0.78	0.67	12.6	13.6	Low	12.6
2	IA-1-02	0.186	9	9.4	10				3	0.49	9.5	0.50	3.18	0.34	1.13	3.59	0.38	0.29	10.3	10.7	Low	10.3
3	IA-1-03	0.006	10	10	10				3	0.02	10.0	0.00	0.00	0.00	1.13	0.00	0.00	0.00	10.0	10.0	Low	10.0
4	IA-1-04	0.006	5.3	4.9	5.5				3	0.02	5.2	0.31	1.93	0.37	1.13	2.18	0.42	0.18	5.7	6.0	Low	5.7
	Sum:	0.376	--	--	--	--	--	--	12	1.00	10.0	0.60	3.80	0.38	NA	4.32	0.43	0.35	11.0	11.5	Low	11.0

df by Welch-Satterthwaite approximation: **2.8**

Recommended UCL: **11.0** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Copper 7440-50-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	99	120	120				3	0.47	113.0	12.12	76.68	0.68	1.14	87.27	0.77	7.00	133.4	143.5	Low	133.4
2	IA-1-02	0.186	96	83	87				3	0.49	88.7	6.66	42.11	0.47	1.13	47.57	0.54	3.84	99.9	105.4	Low	99.9
3	IA-1-03	0.006	85	84	85				3	0.02	84.7	0.58	3.65	0.04	1.13	4.12	0.05	0.33	85.6	86.1	Low	85.6
4	IA-1-04	0.006	77	78	79				3	0.02	78.0	1.00	6.32	0.08	1.13	7.14	0.09	0.58	79.7	80.5	Low	79.7
	Sum:	0.376	--	--	--	--	--	--	12	1.00	100.0	6.62	41.85	0.42	NA	47.55	0.48	3.82	108.9	116.6	Low	109

df by Welch-Satterthwaite approximation: **3.2**

Recommended UCL: **109** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Mercury 7439-97-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.024	0.032	0.033				3	0.47	0.0297	0.0049	0.03	1.05	1.17	0.04	1.23	0.00	0.0380	0.0421	Low	0.0380
2	IA-1-02	0.186	0.025	0.022	0.02				3	0.49	0.0223	0.0025	0.02	0.71	1.14	0.02	0.81	0.00	0.0266	0.0287	Low	0.0266
3	IA-1-03	0.006	0.024	0.023	0.027				3	0.02	0.0247	0.0021	0.01	0.53	1.13	0.01	0.60	0.00	0.0282	0.0299	Low	0.0282
4	IA-1-04	0.006	0.024	0.02	0.022				3	0.02	0.0220	0.0020	0.01	0.57	1.13	0.01	0.65	0.00	0.0254	0.0270	Low	0.0254
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	0.65	NA	0.02	0.75	0.00	0.0	0.0	Low	0.0294

df by Welch-Satterthwaite approximation: **3.1**

Recommended UCL: **0.0294** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003515

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Nickel 7440-02-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	29	30	28				3	0.47	29.0	1.0	6.32	0.22	1.13	7.12	0.25	0.58	30.7	31.5	Low	30.7
2	IA-1-02	0.186	28	24	27				3	0.49	26.3	2.1	13.17	0.50	1.13	14.88	0.57	1.20	29.8	31.6	Low	29.8
3	IA-1-03	0.006	23	21	22				3	0.02	22.0	1.0	6.32	0.29	1.13	7.12	0.32	0.58	23.7	24.5	Low	23.7
4	IA-1-04	0.006	25	26	24				3	0.02	25.0	1.0	6.32	0.25	1.13	7.12	0.28	0.58	26.7	27.5	Low	26.7
	Sum:	0.376	--	--	--	--	--	--	12	1.00	27.5	1.13	7.17	0.26	NA	8.10	0.29	0.65	29.4	30.4	Low	29.4

df by Welch-Satterthwaite approximation: **2.8**

Recommended UCL: **29.4** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Selenium 7782-49-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.25	0.27	0.23				3	0.47	0.3	0.0	0.13	0.51	1.13	0.14	0.57	0.01	0.3	0.3	Low	0.284
2	IA-1-02	0.186	0.18	0.19	0.22				3	0.49	0.2	0.0	0.13	0.67	1.14	0.15	0.76	0.01	0.2	0.2	Low	0.232
3	IA-1-03	0.006	0.2	0.23	0.23				3	0.02	0.2	0.0	0.11	0.50	1.13	0.12	0.56	0.01	0.2	0.3	Low	0.249
4	IA-1-04	0.006	0.17	0.7	0.16				3	0.02	0.3	0.3	1.95	5.69	3.03	5.93	17.26	0.18	0.9	1.1	High	1.121
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.2	0.01	0.09	0.42	NA	0.14	0.61	0.01	0.2	0.3	Low	0.243

df by Welch-Satterthwaite approximation:	**4.9**

Recommended UCL: **0.243** **mg/kg** >> Student's t 95% UCL
Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Silver 7440-22-4
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.055	0.06	0.066				3	0.47	0.1	0.0	0.03	0.58	1.13	0.04	0.65	0.00	0.1	0.1	Low	0.070
2	IA-1-02	0.186	0.041	0.036	0.047				3	0.49	0.0	0.0	0.03	0.84	1.15	0.04	0.97	0.00	0.1	0.1	Low	0.051
3	IA-1-03	0.006	0.054	0.061	0.061				3	0.02	0.1	0.0	0.03	0.44	1.13	0.03	0.49	0.00	0.1	0.1	Low	0.065
4	IA-1-04	0.006	0.039	0.033	0.036				3	0.02	0.0	0.0	0.02	0.53	1.13	0.02	0.60	0.00	0.0	0.0	Low	0.041
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.1	0.00	0.02	0.47	NA	0.03	0.54	0.00	0.1	0.1	Low	0.1

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.056** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003518

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Thallium 7440-28-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.07	0.08	0.135				3	0.47	0.1	0.0	0.22	2.33	1.40	0.31	3.27	0.02	0.2	0.2	High	0.183
2	IA-1-02	0.186	0.135	0.135	0.135				3	0.49	0.1	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.1	0.1	Low	0.135
3	IA-1-03	0.006	0.14	0.13	0.135				3	0.02	0.1	0.0	0.03	0.23	1.13	0.04	0.26	0.00	0.1	0.1	Low	0.143
4	IA-1-04	0.006	0.135	0.135	0.135				3	0.02	0.1	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.1	0.1	Low	0.135
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.1	0.02	0.10	0.90	NA	0.15	1.27	0.01	0.1	0.2	Low	0.144

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.144** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Zinc 7440-66-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	110	110	110				3	0.47	110.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	110.0	110.0	Low	110.0
2	IA-1-02	0.186	120	100	110				3	0.49	110.0	10.0	63.25	0.57	1.13	71.66	0.65	5.77	126.9	135.2	Low	126.9
3	IA-1-03	0.006	71	67	72				3	0.02	70.0	2.6	16.73	0.24	1.13	18.85	0.27	1.53	74.5	76.7	Low	74.5
4	IA-1-04	0.006	150	110	140				3	0.02	133.3	20.8	131.66	0.99	1.16	152.88	1.15	12.02	168.4	185.7	Low	168.4
	Sum:	0.376	--	--	--	--	--	--	12	1.00	109.7	4.96	31.36	0.29	NA	35.54	0.32	2.86	118.1	122.2	Low	118

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **118** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003520

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDD 72-54-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0024	0.0024	0.0024				3	0.47	0.0	0.0	0.00	0.08	1.13	0.00	0.09	0.00	0.0	0.0	Low	0.0024
2	IA-1-02	0.186	0.00245	0.0025	0.0025				3	0.49	0.0	0.0	0.00	0.07	1.13	0.00	0.08	0.00	0.0	0.0	Low	0.0025
3	IA-1-03	0.006	0.0013	0.0023	0.0022				3	0.02	0.0	0.0	0.00	1.74	1.27	0.00	2.20	0.00	0.0	0.0	Med	0.0032
4	IA-1-04	0.006	0.00225	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.38	1.13	0.00	0.43	0.00	0.0	0.0	Low	0.0027
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.06	NA	0.00	0.06	0.00	0.0	0.0	Low	0.0025

df by Welch-Satterthwaite approximation: **5.3**

Recommended UCL: **0.0025** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003521

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDE 72-55-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.01	0.0037	0.0095				3	0.47	0.0	0.0	0.02	2.86	1.57	0.03	4.48	0.00	0.0	0.0	High	0.0165
2	IA-1-02	0.186	0.01	0.0064	0.017				3	0.49	0.0	0.0	0.03	3.06	1.64	0.06	5.01	0.00	0.0	0.0	High	0.0247
3	IA-1-03	0.006	0.00215	0.0023	0.0022				3	0.02	0.0	0.0	0.00	0.17	1.13	0.00	0.19	0.00	0.0	0.0	Low	0.0023
4	IA-1-04	0.006	0.00225	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.38	1.13	0.00	0.43	0.00	0.0	0.0	Low	0.0027
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	2.15	NA	0.03	3.47	0.00	0.0	0.0	High	0.0171

df by Welch-Satterthwaite approximation: **3.3**

Recommended UCL: **0.0171** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003522

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT 50-29-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0024	0.0046	0.0034				3	0.47	0.0	0.0	0.01	2.01	1.33	0.01	2.66	0.00	0.0	0.0	Med	0.0062
2	IA-1-02	0.186	0.00245	0.0025	0.0031				3	0.49	0.0	0.0	0.00	0.85	1.15	0.00	0.98	0.00	0.0	0.0	Low	0.0033
3	IA-1-03	0.006	0.00215	0.0023	0.0016				3	0.02	0.0	0.0	0.00	1.11	1.17	0.00	1.30	0.00	0.0	0.0	Low	0.0026
4	IA-1-04	0.006	0.00225	0.25	0.0025				3	0.02	0.1	0.1	0.90	10.65	8.10	7.32	86.20	0.08	0.3	0.4	High	0.4447
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	3.41	NA	0.12	26.84	0.00	0.0	0.0	High	0.0103

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.0103** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dieldrin 60-57-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0024	0.0024	0.0024				3	0.47	0.0	0.0	0.00	0.08	1.13	0.00	0.09	0.00	0.0	0.0	Low	0.0024
2	IA-1-02	0.186	0.00245	0.0025	0.0011				3	0.49	0.0	0.0	0.01	2.49	1.45	0.01	3.61	0.00	0.0	0.0	High	0.0040
3	IA-1-03	0.006	0.00215	0.0023	0.0022				3	0.02	0.0	0.0	0.00	0.17	1.13	0.00	0.19	0.00	0.0	0.0	Low	0.0023
4	IA-1-04	0.006	0.00225	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.38	1.13	0.00	0.43	0.00	0.0	0.0	Low	0.0027
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	1.13	NA	0.00	1.64	0.00	0.0	0.0	Med	0.0032

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.003** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003524

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	1-Methylna 90-12-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0049	0.0043	0.0037				3	0.47	0.0	0.0	0.00	0.88	1.15	0.00	1.02	0.00	0.0	0.0	Low	0.0053
2	IA-1-02	0.186	0.0075	0.0075	0.0075				3	0.49	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-1-03	0.006	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-1-04	0.006	0.0075	0.0075	0.0041				3	0.02	0.0	0.0	0.01	1.95	1.31	0.02	2.56	0.00	0.0	0.0	Med	0.0113
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.30	NA	0.00	0.35	0.00	0.0	0.0	Low	0.0064

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0064** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	2-Methylna 91-57-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0059	0.0062	0.0055				3	0.47	0.0	0.0	0.00	0.38	1.13	0.00	0.43	0.00	0.0	0.0	Low	0.0065
2	IA-1-02	0.186	0.0041	0.0056	0.005				3	0.49	0.0	0.0	0.00	0.97	1.16	0.01	1.13	0.00	0.0	0.0	Low	0.0062
3	IA-1-03	0.006	0.0045	0.0056	0.0051				3	0.02	0.0	0.0	0.00	0.69	1.14	0.00	0.78	0.00	0.0	0.0	Low	0.0060
4	IA-1-04	0.006	0.008	0.0051	0.0067				3	0.02	0.0	0.0	0.01	1.39	1.21	0.01	1.68	0.00	0.0	0.0	Med	0.0103
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.48	NA	0.00	0.56	0.00	0.0	0.0	Low	0.0061

df by Welch-Satterthwaite approximation: **2.8**

Recommended UCL: **0.0061** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Acenaphthe 83-32-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.01	0.0075	0.0087				3	0.47	0.0	0.0	0.01	0.91	1.15	0.01	1.04	0.00	0.0	0.0	Low	0.0108
2	IA-1-02	0.186	0.0075	0.0075	0.0075				3	0.49	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-1-03	0.006	0.0075	0.0075	0.01				3	0.02	0.0	0.0	0.01	1.10	1.17	0.01	1.28	0.00	0.0	0.0	Low	0.0108
4	IA-1-04	0.006	0.0048	0.0075	0.01				3	0.02	0.0	0.0	0.02	2.21	1.37	0.02	3.04	0.00	0.0	0.0	High	0.0140
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.46	NA	0.00	0.54	0.00	0.0	0.0	Low	0.0091

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0091** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003527

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Anthracene 120-12-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.014	0.012	0.016				3	0.47	0.0	0.0	0.01	0.90	1.15	0.01	1.04	0.00	0.0	0.0	Low	0.0174
2	IA-1-02	0.186	0.0075	0.0034	0.0044				3	0.49	0.0	0.0	0.01	2.65	1.50	0.02	3.97	0.00	0.0	0.0	High	0.0105
3	IA-1-03	0.006	0.0072	0.0075	0.038				3	0.02	0.0	0.0	0.11	6.37	3.54	0.40	22.56	0.01	0.0	0.1	High	0.0621
4	IA-1-04	0.006	0.0065	0.0075	0.021				3	0.02	0.0	0.0	0.05	4.39	2.23	0.11	9.79	0.00	0.0	0.0	High	0.0320
	Sum:	0.38	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	0.96	NA	0.01	1.44	0.00	0.0	0.0	Low	0.0114

df by Welch-Satterthwaite approximation: **4.3**

Recommended UCL: **0.0114** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)an1 56-55-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.067	0.04	0.056				3	0.47	0.1	0.0	0.09	1.58	1.24	0.11	1.96	0.01	0.1	0.1	Med	0.0885
2	IA-1-02	0.186	0.0075	0.017	0.027				3	0.49	0.0	0.0	0.06	3.59	1.85	0.11	6.63	0.01	0.0	0.0	High	0.0417
3	IA-1-03	0.006	0.076	0.079	0.29				3	0.02	0.1	0.1	0.78	5.23	2.72	2.11	14.25	0.07	0.4	0.5	High	0.4571
4	IA-1-04	0.006	0.031	0.0075	0.063				3	0.02	0.0	0.0	0.18	5.21	2.71	0.48	14.11	0.02	0.1	0.1	High	0.1039
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.01	0.05	1.41	NA	0.08	2.24	0.00	0.0	0.1	Med	0.058

df by Welch-Satterthwaite approximation: **4.2**

Recommended UCL: **0.058** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)pyr 50-32-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.071	0.04	0.058				3	0.47	0.1	0.0	0.10	1.75	1.27	0.13	2.22	0.01	0.1	0.1	Med	0.0955
2	IA-1-02	0.186	0.0075	0.016	0.031				3	0.49	0.0	0.0	0.08	4.14	2.10	0.16	8.71	0.01	0.0	0.0	High	0.0481
3	IA-1-03	0.006	0.064	0.071	0.22				3	0.02	0.1	0.1	0.56	4.71	2.41	1.34	11.34	0.05	0.3	0.3	High	0.3401
4	IA-1-04	0.006	0.034	0.0075	0.063				3	0.02	0.0	0.0	0.18	5.04	2.60	0.46	13.13	0.02	0.1	0.1	High	0.1047
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.01	0.06	1.58	NA	0.10	2.64	0.01	0.1	0.1	Med	0.062

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.062** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003530

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(b) fluoranthene 205-99-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.1	0.063	0.085				3	0.47	0.1	0.0	0.12	1.42	1.21	0.14	1.73	0.01	0.1	0.1	Med	0.1295
2	IA-1-02	0.186	0.012	0.027	0.044				3	0.49	0.0	0.0	0.10	3.66	1.87	0.19	6.86	0.01	0.1	0.1	High	0.0680
3	IA-1-03	0.006	0.088	0.12	0.31				3	0.02	0.2	0.1	0.76	4.40	2.23	1.69	9.82	0.07	0.4	0.5	High	0.4747
4	IA-1-04	0.006	0.055	0.0075	0.086				3	0.02	0.0	0.0	0.25	5.05	2.61	0.65	13.19	0.02	0.1	0.1	High	0.1490
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.1	0.01	0.08	1.35	NA	0.12	2.12	0.01	0.1	0.1	Med	0.0866

df by Welch-Satterthwaite approximation: **4.2**

Recommended UCL: **0.0866** mg/kg >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(g,h,i) 191-24-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.02	0.015	0.023				3	0.47	0.0	0.0	0.03	1.32	1.20	0.03	1.59	0.00	0.0	0.0	Med	0.0295
2	IA-1-02	0.186	0.0075	0.013	0.026				3	0.49	0.0	0.0	0.06	3.88	1.97	0.12	7.65	0.01	0.0	0.0	High	0.0394
3	IA-1-03	0.006	0.029	0.027	0.06				3	0.02	0.0	0.0	0.12	3.03	1.62	0.19	4.91	0.01	0.1	0.1	High	0.0852
4	IA-1-04	0.006	0.025	0.0075	0.033				3	0.02	0.0	0.0	0.08	3.78	1.93	0.16	7.28	0.01	0.0	0.1	High	0.0547
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.01	0.03	1.81	NA	0.06	3.40	0.00	0.0	0.0	High	0.0306

df by Welch-Satterthwaite approximation: **2.7**

Recommended UCL: **0.0306** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003532

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(k)flu‹ 207-08-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.036	0.021	0.024				3	0.47	0.0	0.0	0.05	1.86	1.29	0.06	2.40	0.00	0.0	0.0	Med	0.0470
2	IA-1-02	0.186	0.0075	0.0075	0.018				3	0.49	0.0	0.0	0.04	3.49	1.80	0.07	6.27	0.00	0.0	0.0	High	0.0263
3	IA-1-03	0.006	0.039	0.031	0.13				3	0.02	0.1	0.1	0.35	5.22	2.72	0.94	14.17	0.03	0.2	0.2	High	0.2051
4	IA-1-04	0.006	0.015	0.0075	0.036				3	0.02	0.0	0.0	0.09	4.79	2.45	0.23	11.76	0.01	0.0	0.1	High	0.0567
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.03	1.58	NA	0.05	2.47	0.00	0.0	0.0	Med	0.0319

df by Welch-Satterthwaite approximation: **4.1**

Recommended UCL: **0.0** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chrysene 218-01-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.067	0.039	0.054				3	0.47	0.1	0.0	0.09	1.66	1.25	0.11	2.08	0.01	0.1	0.1	Med	0.0886
2	IA-1-02	0.186	0.0092	0.018	0.035				3	0.49	0.0	0.0	0.08	4.00	2.03	0.17	8.13	0.01	0.0	0.1	High	0.0537
3	IA-1-03	0.006	0.075	0.078	0.27				3	0.02	0.1	0.1	0.71	5.01	2.59	1.83	12.96	0.06	0.3	0.4	High	0.4222
4	IA-1-04	0.006	0.037	0.0034	0.064				3	0.02	0.0	0.0	0.19	5.52	2.91	0.56	16.08	0.02	0.1	0.1	High	0.1112
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.01	0.06	1.56	NA	0.10	2.69	0.01	0.0	0.1	Med	0.0621

df by Welch-Satterthwaite approximation:	**4.3**

Recommended UCL:	**0.0621**	**mg/kg**	>> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dibenz(a,h): 53-70-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0075	0.0075	0.0076				3	0.47	0.0	0.0	0.00	0.05	1.13	0.00	0.05	0.00	0.0	0.0	Low	0.0076
2	IA-1-02	0.186	0.0075	0.0075	0.0075				3	0.49	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-1-03	0.006	0.01	0.012	0.032				3	0.02	0.0	0.0	0.08	4.27	2.17	0.17	9.27	0.01	0.0	0.0	High	0.0486
4	IA-1-04	0.006	0.0075	0.0075	0.0071				3	0.02	0.0	0.0	0.00	0.20	1.13	0.00	0.22	0.00	0.0	0.0	Low	0.0078
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.16	NA	0.00	0.35	0.00	0.0	0.0	Low	0.0080

df by Welch-Satterthwaite approximation:	**2.1**

Recommended UCL: **0.0080** **mg/kg** >> Student's t 95% UCL
Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003535

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluoranther 206-44-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.14	0.08	0.11				3	0.47	0.1	0.0	0.19	1.72	1.27	0.24	2.18	0.02	0.2	0.2	Med	0.1855
2	IA-1-02	0.186	0.013	0.037	0.071				3	0.49	0.0	0.0	0.18	4.57	2.33	0.43	10.64	0.02	0.1	0.1	High	0.1137
3	IA-1-03	0.006	0.13	0.12	0.51				3	0.02	0.3	0.2	1.41	5.55	2.94	4.13	16.30	0.13	0.6	0.8	High	0.8129
4	IA-1-04	0.006	0.07	0.0061	0.14				3	0.02	0.1	0.1	0.42	5.88	3.17	1.34	18.63	0.04	0.2	0.2	High	0.2406
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.1	0.02	0.13	1.69	NA	0.25	3.25	0.01	0.1	0.1	High	0.129

df by Welch-Satterthwaite approximation: **4.3**

Recommended UCL: **0.129** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003536

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluorene 86-73-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0065	0.0058	0.0058				3	0.47	0.0	0.0	0.00	0.42	1.13	0.00	0.48	0.00	0.0	0.0	Low	0.0067
2	IA-1-02	0.186	0.0075	0.0075	0.0075				3	0.49	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-1-03	0.006	0.0075	0.0075	0.0067				3	0.02	0.0	0.0	0.00	0.40	1.13	0.00	0.46	0.00	0.0	0.0	Low	0.0080
4	IA-1-04	0.006	0.0075	0.0075	0.0077				3	0.02	0.0	0.0	0.00	0.10	1.13	0.00	0.11	0.00	0.0	0.0	Low	0.0078
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.18	NA	0.00	0.20	0.00	0.0	0.0	Low	0.0071

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0071** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003537

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Indeno (1,2, 193-39-5
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.022	0.016	0.024				3	0.47	0.0	0.0	0.03	1.27	1.19	0.03	1.52	0.00	0.0	0.0	Med	0.0311
2	IA-1-02	0.186	0.0075	0.012	0.021				3	0.49	0.0	0.0	0.04	3.22	1.69	0.07	5.46	0.00	0.0	0.0	High	0.0308
3	IA-1-03	0.006	0.029	0.029	0.071				3	0.02	0.0	0.0	0.15	3.57	1.83	0.28	6.54	0.01	0.1	0.1	High	0.1040
4	IA-1-04	0.006	0.022	0.0075	0.034				3	0.02	0.0	0.0	0.08	3.96	2.01	0.17	7.99	0.01	0.0	0.1	High	0.0546
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.03	1.43	NA	0.04	2.27	0.00	0.0	0.0	Med	0.0274

df by Welch-Satterthwaite approximation: **3.3**

Recommended UCL: **0.0274** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Naphthalen 91-20-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0077	0.0073	0.0095				3	0.47	0.0	0.0	0.01	0.91	1.15	0.01	1.05	0.00	0.0	0.0	Low	0.0101
2	IA-1-02	0.186	0.007	0.0077	0.0083				3	0.49	0.0	0.0	0.00	0.54	1.13	0.00	0.61	0.00	0.0	0.0	Low	0.0088
3	IA-1-03	0.006	0.007	0.0081	0.0072				3	0.02	0.0	0.0	0.00	0.50	1.13	0.00	0.56	0.00	0.0	0.0	Low	0.0084
4	IA-1-04	0.006	0.011	0.007	0.0096				3	0.02	0.0	0.0	0.01	1.40	1.21	0.02	1.69	0.00	0.0	0.0	Med	0.0143
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.51	NA	0.00	0.59	0.00	0.0	0.0	Low	0.0088

df by Welch-Satterthwaite approximation: **3.2**

Recommended UCL: **0.0088** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Phenanthre 85-01-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.081	0.054	0.067				3	0.47	0.1	0.0	0.09	1.27	1.19	0.10	1.51	0.01	0.1	0.1	Med	0.1013
2	IA-1-02	0.186	0.0086	0.026	0.039				3	0.49	0.0	0.0	0.10	3.93	2.00	0.19	7.86	0.01	0.1	0.1	High	0.0629
3	IA-1-03	0.006	0.034	0.034	0.16				3	0.02	0.1	0.1	0.46	6.05	3.30	1.52	19.96	0.04	0.2	0.3	High	0.2591
4	IA-1-04	0.006	0.035	0.0092	0.087				3	0.02	0.0	0.0	0.25	5.73	3.06	0.77	17.55	0.02	0.1	0.1	High	0.1435
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.0	0.01	0.06	1.37	NA	0.11	2.40	0.01	0.1	0.1	Med	0.071

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.071** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003540

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Pyrene 129-00-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.097	0.057	0.083				3	0.47	0.1	0.0	0.13	1.62	1.25	0.16	2.03	0.01	0.1	0.1	Med	0.1301
2	IA-1-02	0.186	0.0087	0.026	0.05				3	0.49	0.0	0.0	0.13	4.65	2.37	0.31	11.02	0.01	0.1	0.1	High	0.0804
3	IA-1-03	0.006	0.1	0.097	0.38				3	0.02	0.2	0.2	1.03	5.34	2.80	2.88	14.96	0.09	0.5	0.6	High	0.6014
4	IA-1-04	0.006	0.047	0.0052	0.095				3	0.02	0.0	0.0	0.28	5.79	3.11	0.88	17.98	0.03	0.1	0.2	High	0.1622
	Sum:	0.376	--	--	--	--	--	--	12	1.00	0.1	0.01	0.09	1.64	NA	0.18	3.23	0.01	0.1	0.1	High	0.091

df by Welch-Satterthwaite approximation: **4.3**

Recommended UCL: **0.091** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003541

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 1
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT+
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

			Replicate field sample concentrations																	95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-1-01	0.178	0.0148	0.0107	0.0153				3	0.47	0.0	0.0	0.02	1.19	1.18	0.02	1.41	0.00	0.0	0.0	Low	0.0179
2	IA-1-02	0.186	0.0149	0.0114	0.0226				3	0.49	0.0	0.0	0.04	2.22	1.38	0.05	3.06	0.00	0.0	0.0	High	0.0307
3	IA-1-03	0.006	0.0056	0.0068	0.0059				3	0.02	0.0	0.0	0.00	0.62	1.14	0.00	0.70	0.00	0.0	0.0	Low	0.0071
4	IA-1-04	0.006	0.00675	0.255	0.0075				3	0.02	0.1	0.1	0.91	10.08	7.36	6.66	74.23	0.08	0.3	0.4	High	0.4499
	Sum:	0	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	1.51	NA	0.11	6.83	0.00	0.0	0.0	High	0.0

df by Welch-Satterthwaite approximation:	**4.6**

Recommended UCL: **0.0** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003542

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Antimony 7440-36-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.27	0.27	0.24				3	0.29	0.3	0.02	0.11	0.42	1.13	0.12	0.48	0.01	0.3	0.3	Low	0.289
2	IA-2-02	0.144	0.17	0.2	0.2				3	0.16	0.2	0.02	0.11	0.58	1.13	0.12	0.65	0.01	0.2	0.2	Low	0.219
3	IA-2-03	0.147	0.23	0.275	0.275				3	0.16	0.3	0.03	0.16	0.63	1.14	0.19	0.72	0.02	0.3	0.3	Low	0.304
4	IA-2-04	0.148	0.28	0.28	0.17				3	0.16	0.2	0.06	0.40	1.65	1.25	0.50	2.07	0.04	0.4	0.4	Med	0.403
5	IA-2-05	0.209	0.2	0.22	0.22				3	0.23	0.2	0.01	0.07	0.34	1.13	0.08	0.39	0.01	0.2	0.2	Low	0.233
	Sum:	1	--	--	--	--	--	--	15	1.00	0.2	0.01	0.08	0.34	NA	0.10	0.42	0.01	0.3	0.3	Low	0.251

df by Welch-Satterthwaite approximation: **4.3**

Recommended UCL: **0.251** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Arsenic 7440-38-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	5.2	5.2	6.8				3	0.29	5.7	0.92	5.84	1.02	1.16	6.80	1.19	0.53	7.3	8.1	Low	7.29
2	IA-2-02	0.144	2.6	2.8	2.4				3	0.16	2.6	0.20	1.26	0.49	1.13	1.43	0.55	0.12	2.9	3.1	Low	2.94
3	IA-2-03	0.147	4.2	3.9	3.7				3	0.16	3.9	0.25	1.59	0.40	1.13	1.80	0.46	0.15	4.4	4.6	Low	4.36
4	IA-2-04	0.148	6.8	5.9	8.2				3	0.16	7.0	1.16	7.33	1.05	1.17	8.56	1.23	0.67	8.9	9.9	Low	8.92
5	IA-2-05	0.209	8.2	11	10				3	0.23	9.7	1.42	8.97	0.92	1.16	10.37	1.07	0.82	12.1	13.3	Low	12.1
	Sum:	1	--	--	--	--	--	--	15	1.00	6.1	0.46	2.93	0.48	NA	3.40	0.56	0.27	6.6	7.2	Low	6.61

df by Welch-Satterthwaite approximation: **5.3**

Recommended UCL: **6.61** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Barium 7440-39-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations						Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL			
			Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6											Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	96	90	220				3	0.29	135.3	73.38	464.13	3.43	1.78	824.79	6.09	42.37	259.0	320.0	High	320.0
2	IA-2-02	0.144	61	66	64				3	0.16	63.7	2.52	15.92	0.25	1.13	17.93	0.28	1.45	67.9	70.0	Low	67.9
3	IA-2-03	0.147	56	54	56				3	0.16	55.3	1.15	7.30	0.13	1.13	8.23	0.15	0.67	57.3	58.2	Low	57.3
4	IA-2-04	0.148	49	50	47				3	0.16	48.7	1.53	9.66	0.20	1.13	10.88	0.22	0.88	51.2	52.5	Low	51.2
5	IA-2-05	0.2	67	72	70				3	0.23	69.7	2.52	15.92	0.23	1.13	17.93	0.26	1.45	73.9	76.0	Low	73.9
	Sum:	1	--	--	--	--	--	--	15	1.00	81.8	21.08	133.35	1.63	NA	236.88	2.89	12.17	117.4	134.9	Med	135

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **135** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Beryllium 7440-41-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.26	0.25	0.27				3	0.29	0.3	0.01	0.06	0.24	1.13	0.07	0.27	0.01	0.3	0.3	Low	0.277
2	IA-2-02	0.144	0.25	0.25	0.25				3	0.16	0.3	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.3	0.3	Low	0.250
3	IA-2-03	0.147	0.25	0.24	0.24				3	0.16	0.2	0.01	0.04	0.15	1.13	0.04	0.17	0.00	0.3	0.3	Low	0.253
4	IA-2-04	0.148	0.27	0.23	0.23				3	0.16	0.2	0.02	0.15	0.60	1.13	0.17	0.68	0.01	0.3	0.3	Low	0.282
5	IA-2-05	0.2	0.3	0.25	0.25				3	0.23	0.3	0.03	0.18	0.68	1.14	0.21	0.78	0.02	0.3	0.3	Low	0.315
	Sum:	1	--	--	--	--	--	--	15	1.00	0.3	0.01	0.05	0.20	NA	0.06	0.23	0.00	0.3	0.3	Low	0.265

df by Welch-Satterthwaite approximation: **4.1**

Recommended UCL: **0.265** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Cadmium 7440-43-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.25	0.29	0.31				3	0.29	0.3	0.03	0.19	0.68	1.14	0.22	0.78	0.02	0.3	0.4	Low	0.335
2	IA-2-02	0.144	0.34	0.39	0.37				3	0.16	0.4	0.03	0.16	0.43	1.13	0.18	0.49	0.01	0.4	0.4	Low	0.41
3	IA-2-03	0.147	0.17	0.16	0.15				3	0.16	0.2	0.01	0.06	0.40	1.13	0.07	0.45	0.01	0.2	0.2	Low	0.18
4	IA-2-04	0.148	0.26	0.22	0.72				3	0.16	0.4	0.28	1.76	4.39	2.23	3.92	9.80	0.16	0.9	1.1	High	1.10
5	IA-2-05	0.2	0.16	0.31	0.15				3	0.23	0.2	0.09	0.57	2.74	1.53	0.87	4.19	0.05	0.4	0.4	High	0.432
	Sum:	1	--	--	--	--	--	--	15	1.00	0.3	0.05	0.32	1.15	NA	0.67	2.42	0.03	0.3	0.4	Med	0.405

df by Welch-Satterthwaite approximation: **3.0**

Recommended UCL: **0.405** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003547

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chromium 7440-47-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	41	40	41				3	0.29	40.7	0.58	3.65	0.09	1.13	4.12	0.10	0.33	41.6	42.1	Low	41.6
2	IA-2-02	0.144	30	34	34				3	0.16	32.7	2.31	14.61	0.45	1.13	16.49	0.50	1.33	36.6	38.5	Low	36.6
3	IA-2-03	0.147	33	31	32				3	0.16	32.0	1.00	6.32	0.20	1.13	7.13	0.22	0.58	33.7	34.5	Low	33.7
4	IA-2-04	0.148	34	31	32				3	0.16	32.3	1.53	9.66	0.30	1.13	10.88	0.34	0.88	34.9	36.2	Low	34.9
5	IA-2-05	0.2	26	28	26				3	0.23	26.7	1.15	7.30	0.27	1.13	8.23	0.31	0.67	28.6	29.6	Low	28.6
	Sum:	1	--	--	--	--	--	--	15	1.00	33.4	0.57	3.58	0.11	NA	4.03	0.12	0.33	34.0	34.8	Low	34.0

df by Welch-Satterthwaite approximation: **7.3**

Recommended UCL: **34.0** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Copper 7440-50-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	79	86	84				3	0.29	83.0	3.61	22.80	0.27	1.13	25.69	0.31	2.08	89.1	92.1	Low	89.1
2	IA-2-02	0.144	200	84	86				3	0.16	123.3	66.40	419.97	3.41	1.77	742.14	6.02	38.34	235.3	290.4	High	290
3	IA-2-03	0.147	75	72	75				3	0.16	74.0	1.73	10.95	0.15	1.13	12.35	0.17	1.00	76.9	78.4	Low	76.9
4	IA-2-04	0.148	83	91	85				3	0.16	86.3	4.16	26.33	0.30	1.13	29.67	0.34	2.40	93.4	96.8	Low	93.4
5	IA-2-05	0.2	76	82	84				3	0.23	80.7	4.16	26.33	0.33	1.13	29.67	0.37	2.40	87.7	91.1	Low	87.7
	Sum:	1	--	--	--	--	--	--	15	1.00	87.9	10.64	67.28	0.77	NA	118.11	1.34	6.14	105.9	114.7	Low	106

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **106** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Lead 7439-92-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	23	27	24				3	0.29	24.7	2.08	13.17	0.53	1.13	14.90	0.60	1.20	28.2	29.9	Low	28.2
2	IA-2-02	0.144	26	27	32				3	0.16	28.3	3.21	20.33	0.72	1.14	23.18	0.82	1.86	33.8	36.4	Low	33.8
3	IA-2-03	0.147	13	12	11				3	0.16	12.0	1.00	6.32	0.53	1.13	7.15	0.60	0.58	13.7	14.5	Low	13.7
4	IA-2-04	0.148	24	19	21				3	0.16	21.3	2.52	15.92	0.75	1.14	18.18	0.85	1.45	25.6	27.7	Low	25.6
5	IA-2-05	0.2	29	33	33				3	0.23	31.7	2.31	14.61	0.46	1.13	16.49	0.52	1.33	35.6	37.5	Low	35.6
	Sum:	1	--	--	--	--	--	--	15	1.00	24.3	1.05	6.61	0.27	NA	7.50	0.31	0.60	25.4	26.9	Low	25.4

df by Welch-Satterthwaite approximation: **7.9**

Recommended UCL: **25.4** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Mercury 7439-97-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.044	0.048	0.055				3	0.29	0.0490	0.0056	0.04	0.72	1.14	0.04	0.82	0.00	0.0584	0.0630	Low	0.0584
2	IA-2-02	0.144	0.063	0.066	0.12				3	0.16	0.0830	0.0321	0.20	2.44	1.44	0.29	3.51	0.02	0.1371	0.1637	High	0.164
3	IA-2-03	0.147	0.041	0.05	0.035				3	0.16	0.0420	0.0075	0.05	1.14	1.18	0.06	1.34	0.00	0.0547	0.0610	Low	0.0547
4	IA-2-04	0.148	0.042	0.052	0.05				3	0.16	0.0480	0.0053	0.03	0.70	1.14	0.04	0.79	0.00	0.0569	0.0613	Low	0.0569
5	IA-2-05	0.2	0.039	0.049	0.046				3	0.23	0.0	0.01	0.03	0.73	1.14	0.04	0.83	0.00	0.1	0.1	Low	0.053
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.01	0.04	0.69	NA	0.05	0.95	0.00	0.1	0.1	Low	0.060

df by Welch-Satterthwaite approximation: **3.0**

Recommended UCL: **0.060** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Nickel 7440-02-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	18	19	18				3	0.29	18.3	0.6	3.65	0.20	1.13	4.11	0.22	0.33	19.3	19.8	Low	19.3
2	IA-2-02	0.144	18	20	19				3	0.16	19.0	1.0	6.32	0.33	1.13	7.13	0.38	0.58	20.7	21.5	Low	20.7
3	IA-2-03	0.147	17	17	18				3	0.16	17.3	0.6	3.65	0.21	1.13	4.11	0.24	0.33	18.3	18.8	Low	18.3
4	IA-2-04	0.148	19	18	19				3	0.16	18.7	0.6	3.65	0.20	1.13	4.11	0.22	0.33	19.6	20.1	Low	19.6
5	IA-2-05	0.2	19	21	23				3	0.23	21.0	2.00	12.65	0.60	1.13	14.35	0.68	1.15	24.4	26.0	Low	24.4
	Sum:	1	--	--	--	--	--	--	15	1.00	18.9	0.53	3.36	0.18	NA	3.80	0.20	0.31	19.7	20.3	Low	19.7

df by Welch-Satterthwaite approximation: **3.4**

Recommended UCL: **19.7** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Selenium 7782-49-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.33	0.36	0.34				3	0.29	0.3	0.0	0.10	0.28	1.13	0.11	0.32	0.01	0.4	0.4	Low	0.369
2	IA-2-02	0.144	0.28	0.31	0.32				3	0.16	0.3	0.0	0.13	0.43	1.13	0.15	0.49	0.01	0.3	0.4	Low	0.338
3	IA-2-03	0.147	0.27	0.27	0.27				3	0.16	0.3	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.3	0.3	Low	0.270
4	IA-2-04	0.148	0.26	0.27	0.27				3	0.16	0.3	0.0	0.04	0.14	1.13	0.04	0.15	0.00	0.3	0.3	Low	0.276
5	IA-2-05	0.2	0.32	0.31	0.28				3	0.23	0.3	0.02	0.13	0.43	1.13	0.15	0.49	0.01	0.3	0.4	Low	0.338
	Sum:	1	--	--	--	--	--	--	15	1.00	0.3	0.01	0.05	0.15	NA	0.05	0.17	0.00	0.3	0.3	Low	0.312

df by Welch-Satterthwaite approximation: **5.7**

Recommended UCL: **0.312** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Silver 7440-22-4
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.069	0.082	0.071				3	0.29	0.1	0.0	0.04	0.60	1.13	0.05	0.68	0.00	0.1	0.1	Low	0.086
2	IA-2-02	0.144	0.1	0.08	0.1				3	0.16	0.1	0.0	0.07	0.78	1.14	0.08	0.90	0.01	0.1	0.1	Low	0.113
3	IA-2-03	0.147	0.059	0.054	0.054				3	0.16	0.1	0.0	0.02	0.33	1.13	0.02	0.37	0.00	0.1	0.1	Low	0.061
4	IA-2-04	0.148	0.096	0.082	0.11				3	0.16	0.1	0.0	0.09	0.92	1.16	0.10	1.07	0.01	0.1	0.1	Low	0.120
5	IA-2-05	0.2	0.052	0.054	0.086				3	0.23	0.1	0.02	0.12	1.89	1.30	0.16	2.45	0.01	0.1	0.1	Med	0.112
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.01	0.04	0.47	NA	0.04	0.59	0.00	0.1	0.1	Low	0.082

df by Welch-Satterthwaite approximation: **4.8**

Recommended UCL: **0.082** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003554

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Zinc 7440-66-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	300	320	330				3	0.29	316.7	15.3	96.61	0.31	1.13	108.84	0.34	8.82	342.4	355.1	Low	342
2	IA-2-02	0.144	130	170	140				3	0.16	146.7	20.8	131.66	0.90	1.15	151.83	1.04	12.02	181.8	199.1	Low	182
3	IA-2-03	0.147	110	95	94				3	0.16	99.7	9.0	56.69	0.57	1.13	64.22	0.64	5.17	114.8	122.2	Low	115
4	IA-2-04	0.148	140	130	130				3	0.16	133.3	5.8	36.51	0.27	1.13	41.13	0.31	3.33	143.1	147.9	Low	143
5	IA-2-05	0.2	79	96	98				3	0.23	91.0	10.44	66.03	0.73	1.14	75.33	0.83	6.03	108.6	117.3	Low	109
	Sum:	1	--	--	--	--	--	--	15	1.00	172.9	6.23	39.42	0.23	NA	44.81	0.26	3.60	180.2	188.6	Low	180.2

df by Welch-Satterthwaite approximation: **5.7**

Recommended UCL: **180** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDD 72-54-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.050	0.025	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	2.100	2.400	2.200				3	0.16	2.2	0.2	0.97	0.43	1.13	1.09	0.49	0.09	2.5	2.6	Low	2.4909
3	IA-2-03	0.147	0.003	0.002	0.003				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.013	0.003	0.002				3	0.16	0.0	0.0	0.04	6.29	3.48	0.13	21.90	0.00	0.0	0.0	High	0.0204
5	IA-2-05	0.209	0.002	0.002	0.003				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0025
	Sum:	1	--	--	--	--	--	--	15	1.00	0.4	0.02	0.16	0.43	NA	0.18	0.49	0.01	0.4	0.4	Low	0.407

df by Welch-Satterthwaite approximation:	**2.1**

Recommended UCL: **0.407** **mg/kg** >> Student's t 95% UCL
Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003556

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDE 72-55-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.26	0.0310	0.0280	0.1600				3	0.29	0.1	0.1	0.48	6.53	3.67	1.75	23.94	0.04	0.2	0.3	High	0.2626
2	IA-2-02	0.14	2.7000	3.1000	3.9000				3	0.16	3.2	0.6	3.86	1.20	1.18	4.57	1.41	0.35	4.3	4.8	Low	4.2634
3	IA-2-03	0.15	0.0075	0.0130	0.0089				3	0.16	0.0	0.0	0.02	1.84	1.29	0.02	2.38	0.00	0.0	0.0	Med	0.0170
4	IA-2-04	0.15	0.0220	0.0200	0.0480				3	0.16	0.0	0.0	0.10	3.29	1.72	0.17	5.67	0.01	0.1	0.1	High	0.0693
5	IA-2-05	0.21	0.0029	0.0027	0.0034				3	0.23	0.0	0.0	0.00	0.76	1.14	0.00	0.87	0.00	0.0	0.0	Low	0.0036
	Sum:	1	--	--	--	--	--	--	15	1.00	0.5	0.10	0.63	1.16	NA	0.88	1.63	0.06	0.7	0.8	Med	0.790

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.790** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT 50-29-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.05	0.097	0.039				3	0.29	0.1	0.0	0.19	3.14	1.66	0.32	5.23	0.02	0.1	0.1	High	0.1395
2	IA-2-02	0.144	3.9	6.7	6.2				3	0.16	5.6	1.5	9.44	1.69	1.26	11.89	2.12	0.86	8.1	9.4	Med	9.3581
3	IA-2-03	0.147	0.0041	0.0045	0.0021				3	0.16	0.0	0.0	0.01	2.28	1.39	0.01	3.17	0.00	0.0	0.0	High	0.0068
4	IA-2-04	0.148	0.0125	0.0048	0.0054				3	0.16	0.0	0.0	0.03	3.58	1.84	0.05	6.59	0.00	0.0	0.0	High	0.0183
5	IA-2-05	0.2	0.0012	0.0015	0.0016				3	0.23	0.0	0.00	0.00	0.92	1.15	0.00	1.06	0.00	0.0	0.0	Low	0.00178
	Sum:	1	--	--	--	--	--	--	15	1.00	0.9	0.24	1.50	1.65	NA	1.89	2.08	0.14	1.3	1.5	Med	1.50

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **1.50** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003558

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Aldrin 309-00-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.024	0.022	0.043				3	0.29	0.0	0.0	0.07	2.47	1.44	0.11	3.57	0.01	0.0	0.1	High	0.0588
2	IA-2-02	0.144	0.115	0.0485	0.125				3	0.16	0.1	0.0	0.26	2.73	1.52	0.40	4.17	0.02	0.2	0.2	High	0.2008
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.0125	0.0025	0.0025				3	0.16	0.0	0.0	0.04	6.29	3.48	0.13	21.90	0.00	0.0	0.0	High	0.0204
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.00255
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.05	1.83	NA	0.07	2.86	0.00	0.0	0.0	Med	0.0444

df by Welch-Satterthwaite approximation: **3.1**

Recommended UCL: **0.0444** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chlordane 12789-03-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.5	0.2500	0.25				3	0.29	0.3	0.1	0.91	2.74	1.52	1.39	4.18	0.08	0.6	0.7	High	0.6966
2	IA-2-02	0.144	1.15	0.67	1.25				3	0.16	1.0	0.3	1.96	1.92	1.30	2.56	2.50	0.18	1.5	1.8	Med	1.8036
3	IA-2-03	0.147	0.013	0.024	0.025				3	0.16	0.0	0.0	0.04	2.04	1.33	0.06	2.71	0.00	0.0	0.0	Med	0.0374
4	IA-2-04	0.148	0.125	0.017	0.034				3	0.16	0.1	0.1	0.37	6.26	3.45	1.27	21.62	0.03	0.2	0.2	High	0.2048
5	IA-2-05	0.2	0.024	0.0235	0.025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.01	0.23	0.00	0.0	0.0	Low	0.0255
	Sum:	1	--	--	--	--	--	--	15	1.00	0.3	0.06	0.41	1.49	NA	0.61	2.19	0.04	0.4	0.4	Med	0.440

df by Welch-Satterthwaite approximation: **4.1**

Recommended UCL: **0.440** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	cis-Chlordane 5103-71-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.05	0.0250	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	0.115	0.14	0.125				3	0.16	0.1	0.0	0.08	0.63	1.14	0.09	0.71	0.01	0.1	0.2	Low	0.1479
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.0125	0.0025	0.0066				3	0.16	0.0	0.0	0.03	4.42	2.24	0.07	9.91	0.00	0.0	0.0	High	0.0199
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0025
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.03	0.93	NA	0.04	1.39	0.00	0.0	0.0	Low	0.038

df by Welch-Satterthwaite approximation: **3.1**

Recommended UCL: **0.038** mg/kg >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dieldrin 60-57-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	2.3	1.3	5.4				3	0.29	3.0	2.1	13.52	4.51	2.29	31.01	10.34	1.23	6.6	8.4	High	8.3799
2	IA-2-02	0.144	0.115	0.021	0.125				3	0.16	0.1	0.1	0.36	4.17	2.12	0.77	8.83	0.03	0.2	0.2	High	0.2314
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.0125	0.0021	0.0067				3	0.16	0.0	0.0	0.03	4.64	2.37	0.08	11.00	0.00	0.0	0.0	High	0.0202
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.9	0.61	3.88	4.43	NA	8.90	10.15	0.35	1.9	2.4	High	2.42

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **2.42** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Endosulfan 959-98-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.05	0.025	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	0.115	0.0485	0.125				3	0.16	0.1	0.0	0.26	2.73	1.52	0.40	4.17	0.02	0.2	0.2	High	0.2008
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.0095	0.0025	0.0025				3	0.16	0.0	0.0	0.03	5.33	2.79	0.07	14.84	0.00	0.0	0.0	High	0.0150
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.00255
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.05	1.86	NA	0.08	2.86	0.00	0.0	0.0	Med	0.0462

df by Welch-Satterthwaite approximation: **3.4**

Recommended UCL: **0.0462** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Endosulfan 33213-65-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.05	0.025	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	0.115	0.0485	0.125				3	0.16	0.1	0.0	0.26	2.73	1.52	0.40	4.17	0.02	0.2	0.2	High	0.2008
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.027	0.0017	0.0025				3	0.16	0.0	0.0	0.09	8.77	5.80	0.53	50.88	0.01	0.0	0.0	High	0.0466
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0025
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.05	1.87	NA	0.11	4.16	0.00	0.0	0.0	High	0.0

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.0479** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003564

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Endosulfan 1031-07-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.05	0.025	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	0.115	0.0485	0.125				3	0.16	0.1	0.0	0.26	2.73	1.52	0.40	4.17	0.02	0.2	0.2	High	0.2008
3	IA-2-03	0.147	0.0025	0.0024	0.0025				3	0.16	0.0	0.0	0.00	0.15	1.13	0.00	0.17	0.00	0.0	0.0	Low	0.0026
4	IA-2-04	0.148	0.012	0.0025	0.0025				3	0.16	0.0	0.0	0.03	6.16	3.37	0.12	20.77	0.00	0.0	0.0	High	0.0195
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0025
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.05	1.86	NA	0.08	2.90	0.00	0.0	0.0	Med	0.0

df by Welch-Satterthwaite approximation: **3.5**

Recommended UCL: **0.0464** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003565

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	trans-Chlor(5103-74-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
			Replicate field sample concentrations																95% UCL			
1	IA-2-01	0.261	0.05	0.025	0.025				3	0.29	0.0	0.0	0.09	2.74	1.52	0.14	4.18	0.01	0.1	0.1	High	0.0697
2	IA-2-02	0.144	0.115	0.13	0.125				3	0.16	0.1	0.0	0.05	0.39	1.13	0.05	0.44	0.00	0.1	0.1	Low	0.1362
3	IA-2-03	0.147	0.0025	0.0024	0.0037				3	0.16	0.0	0.0	0.00	1.60	1.24	0.01	1.98	0.00	0.0	0.0	Med	0.0047
4	IA-2-04	0.148	0.0069	0.0024	0.0063				3	0.16	0.0	0.0	0.02	2.97	1.60	0.02	4.76	0.00	0.0	0.0	High	0.0113
5	IA-2-05	0.2	0.0024	0.0024	0.0025				3	0.23	0.0	0.00	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.03	0.89	NA	0.04	1.33	0.00	0.0	0.0	Low	0.0383

df by Welch-Satterthwaite approximation: **2.4**

Recommended UCL: **0.0383** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003566

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	1-Methylna 90-12-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0039	0.0051	0.005				3	0.29	0.0	0.0	0.00	0.90	1.15	0.00	1.04	0.00	0.0	0.0	Low	0.0058
2	IA-2-02	0.144	0.0075	0.0075	0.0075				3	0.16	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-2-03	0.147	0.0075	0.0075	0.0075				3	0.16	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-2-04	0.148	0.0086	0.0056	0.018				3	0.16	0.0	0.0	0.04	3.81	1.94	0.08	7.41	0.00	0.0	0.0	High	0.0270
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0289
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.49	NA	0.02	2.89	0.00	0.0	0.0	Med	0.0130

df by Welch-Satterthwaite approximation: **3.5**

Recommended UCL: **0.0130** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	2-Methylna 91-57-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0053	0.0079	0.0078				3	0.29	0.0	0.0	0.01	1.33	1.20	0.01	1.60	0.00	0.0	0.0	Med	0.0107
2	IA-2-02	0.144	0.0048	0.005	0.0047				3	0.16	0.0	0.0	0.00	0.20	1.13	0.00	0.23	0.00	0.0	0.0	Low	0.0051
3	IA-2-03	0.147	0.0058	0.0046	0.0075				3	0.16	0.0	0.0	0.01	1.54	1.23	0.01	1.91	0.00	0.0	0.0	Med	0.0096
4	IA-2-04	0.148	0.0091	0.009	0.02				3	0.16	0.0	0.0	0.04	3.15	1.67	0.07	5.25	0.00	0.0	0.0	High	0.0286
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0289
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.46	NA	0.02	2.68	0.00	0.0	0.0	Med	0.0134

df by Welch-Satterthwaite approximation: **3.9**

Recommended UCL: **0.0134** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003568

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Acenaphthe 83-32-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0037	0.0098	0.005				3	0.29	0.0	0.0	0.02	3.30	1.72	0.04	5.68	0.00	0.0	0.0	High	0.0143
2	IA-2-02	0.144	0.0089	0.0059	0.011				3	0.16	0.0	0.0	0.02	1.89	1.30	0.02	2.45	0.00	0.0	0.0	Med	0.0151
3	IA-2-03	0.147	0.0052	0.0077	0.0053				3	0.16	0.0	0.0	0.01	1.48	1.22	0.01	1.80	0.00	0.0	0.0	Med	0.0096
4	IA-2-04	0.148	0.0075	0.0064	0.0075				3	0.16	0.0	0.0	0.00	0.56	1.13	0.00	0.64	0.00	0.0	0.0	Low	0.0082
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0289
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.52	NA	0.02	2.82	0.00	0.0	0.0	Med	0.0127

df by Welch-Satterthwaite approximation: **3.6**

Recommended UCL: **0.0127** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003569

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Anthracene 120-12-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0075	0.018	0.0091				3	0.29	0.0	0.0	0.04	3.10	1.65	0.06	5.12	0.00	0.0	0.0	High	0.0258
2	IA-2-02	0.144	0.015	0.0095	0.021				3	0.16	0.0	0.0	0.04	2.40	1.42	0.05	3.41	0.00	0.0	0.0	High	0.0296
3	IA-2-03	0.147	0.0061	0.012	0.0067				3	0.16	0.0	0.0	0.02	2.48	1.45	0.03	3.60	0.00	0.0	0.0	High	0.0164
4	IA-2-04	0.148	0.0054	0.0096	0.0091				3	0.16	0.0	0.0	0.01	1.81	1.28	0.02	2.32	0.00	0.0	0.0	Med	0.0138
5	IA-2-05	0.2	0.0075	0.0075	0.016				3	0.23	0.010	0.005	0.03	3.00	1.61	0.05	4.85	0.003	0.019	0.023	High	0.0227
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.34	NA	0.02	2.12	0.00	0.0	0.0	Med	0.0164

df by Welch-Satterthwaite approximation: **5.7**

Recommended UCL: **0.0164** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003570

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)ant 56-55-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.036	0.11	0.05				3	0.29	0.1	0.0	0.25	3.81	1.94	0.48	7.38	0.02	0.1	0.2	High	0.1643
2	IA-2-02	0.144	0.13	0.095	0.12				3	0.16	0.1	0.0	0.11	0.99	1.16	0.13	1.15	0.01	0.1	0.2	Low	0.1454
3	IA-2-03	0.147	0.029	0.062	0.04				3	0.16	0.0	0.0	0.11	2.43	1.43	0.15	3.49	0.01	0.1	0.1	High	0.0860
4	IA-2-04	0.148	0.014	0.027	0.026				3	0.16	0.0	0.0	0.05	2.05	1.33	0.06	2.73	0.00	0.0	0.0	Med	0.0405
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.01	0.08	1.52	NA	0.14	2.86	0.01	0.1	0.1	Med	0.081

df by Welch-Satterthwaite approximation: **2.6**

Recommended UCL: **0.081** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003571

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)pyr 50-32-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.043	0.1	0.054				3	0.29	0.1	0.0	0.19	2.91	1.58	0.30	4.61	0.02	0.1	0.1	High	0.1418
2	IA-2-02	0.144	0.13	0.1	0.12				3	0.16	0.1	0.0	0.10	0.83	1.15	0.11	0.95	0.01	0.1	0.2	Low	0.1424
3	IA-2-03	0.147	0.03	0.064	0.045				3	0.16	0.05	0.0	0.11	2.33	1.40	0.15	3.26	0.01	0.1	0.1	High	0.0892
4	IA-2-04	0.148	0.013	0.026	0.024				3	0.16	0.02	0.0	0.04	2.11	1.35	0.06	2.84	0.00	0.0	0.0	Med	0.0386
5	IA-2-05	0.2	0.0075	0.0075	0.026				3	0.23	0.01	0.01	0.07	4.94	2.54	0.17	12.58	0.01	0.032	0.041	High	0.041
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.01	0.06	1.21	NA	0.10	1.96	0.01	0.1	0.1	Med	0.076

df by Welch-Satterthwaite approximation: **3.2**

Recommended UCL: **0.076** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003572

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(b) fluoranthene 205-99-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.059	0.15	0.088				3	0.29	0.1	0.0	0.29	2.97	1.60	0.47	4.76	0.03	0.2	0.2	High	0.2160
2	IA-2-02	0.144	0.2	0.16	0.18				3	0.16	0.2	0.0	0.13	0.70	1.14	0.14	0.80	0.01	0.2	0.2	Low	0.2137
3	IA-2-03	0.147	0.043	0.1	0.055				3	0.16	0.1	0.0	0.19	2.88	1.57	0.30	4.52	0.02	0.1	0.1	High	0.1416
4	IA-2-04	0.148	0.025	0.038	0.031				3	0.16	0.0	0.0	0.04	1.31	1.20	0.05	1.57	0.00	0.0	0.0	Med	0.0477
5	IA-2-05	0.2	0.0075	0.008	0.05				3	0.23	0.0	0.02	0.15	7.07	4.12	0.64	29.12	0.01	0.1	0.1	High	0.083
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.02	0.10	1.27	NA	0.21	2.65	0.01	0.1	0.1	Med	0.117

df by Welch-Satterthwaite approximation: **3.6**

Recommended UCL: **0.117** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003573

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(g,h,i) 191-24-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.031	0.057	0.023				3	0.29	0.0	0.0	0.11	3.04	1.63	0.18	4.94	0.01	0.1	0.1	High	0.0817
2	IA-2-02	0.144	0.089	0.069	0.06				3	0.16	0.1	0.0	0.09	1.29	1.20	0.11	1.55	0.01	0.1	0.1	Med	0.1100
3	IA-2-03	0.147	0.016	0.017	0.031				3	0.16	0.0	0.0	0.05	2.49	1.45	0.08	3.60	0.00	0.0	0.0	High	0.0424
4	IA-2-04	0.148	0.0075	0.015	0.012				3	0.16	0.0	0.0	0.02	2.08	1.34	0.03	2.78	0.00	0.0	0.0	Med	0.0210
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0289
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.04	1.27	NA	0.06	2.00	0.00	0.0	0.0	Med	0.0453

df by Welch-Satterthwaite approximation: **3.7**

Recommended UCL: **0.0453** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003574

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(k)flu‹ 207-08-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.026	0.067	0.028				3	0.29	0.0	0.0	0.15	3.62	1.86	0.27	6.74	0.01	0.1	0.1	High	0.0985
2	IA-2-02	0.144	0.077	0.057	0.053				3	0.16	0.1	0.0	0.08	1.30	1.20	0.10	1.56	0.01	0.1	0.1	Med	0.0947
3	IA-2-03	0.147	0.025	0.038	0.031				3	0.16	0.0	0.0	0.04	1.31	1.20	0.05	1.57	0.00	0.0	0.0	Med	0.0477
4	IA-2-04	0.148	0.0075	0.018	0.019				3	0.16	0.0	0.0	0.04	2.72	1.52	0.06	4.12	0.00	0.0	0.0	High	0.0309
5	IA-2-05	0.2	0.0075	0.0075	0.021				3	0.23	0.0	0.01	0.05	4.11	2.08	0.10	8.56	0.00	0.0	0.0	High	0.0316
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.05	1.46	NA	0.08	2.65	0.00	0.0	0.1	Med	0.050

df by Welch-Satterthwaite approximation: **2.9**

Recommended UCL: **0.050** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chrysene 218-01-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.046	0.12	0.053				3	0.29	0.1	0.0	0.26	3.54	1.82	0.47	6.45	0.02	0.1	0.2	High	0.1758
2	IA-2-02	0.144	0.15	0.12	0.13				3	0.16	0.1	0.0	0.10	0.72	1.14	0.11	0.83	0.01	0.2	0.2	Low	0.1591
3	IA-2-03	0.147	0.031	0.066	0.046				3	0.16	0.0	0.0	0.11	2.33	1.40	0.16	3.27	0.01	0.1	0.1	High	0.0919
4	IA-2-04	0.148	0.015	0.03	0.026				3	0.16	0.0	0.0	0.05	2.08	1.34	0.07	2.78	0.00	0.0	0.0	Med	0.0432
5	IA-2-05	0.2	0.0043	0.0058	0.035				3	0.23	0.0	0.02	0.11	7.28	4.31	0.47	31.40	0.01	0.0	0.1	High	0.059
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.01	0.08	1.44	NA	0.18	3.09	0.01	0.1	0.1	High	0.090

df by Welch-Satterthwaite approximation: **3.0**

Recommended UCL: **0.090** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dibenz(a,h)a 53-70-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
			Replicate field sample concentrations																95% UCL			
1	IA-2-01	0.261	0.0073	0.015	0.0075				3	0.29	0.0	0.0	0.03	2.79	1.54	0.04	4.31	0.00	0.0	0.0	High	0.0210
2	IA-2-02	0.144	0.02	0.016	0.02				3	0.16	0.0	0.0	0.01	0.78	1.14	0.02	0.90	0.00	0.0	0.0	Low	0.0226
3	IA-2-03	0.147	0.0075	0.0075	0.0075				3	0.16	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-2-04	0.148	0.0075	0.0075	0.0075				3	0.16	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.20	NA	0.02	2.14	0.00	0.0	0.0	Med	0.016

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.016** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003577

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluoranther 206-44-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.077	0.27	0.092				3	0.29	0.1	0.1	0.68	4.64	2.37	1.61	10.99	0.06	0.3	0.4	High	0.4165
2	IA-2-02	0.144	0.29	0.19	0.21				3	0.16	0.2	0.1	0.33	1.46	1.22	0.41	1.77	0.03	0.3	0.4	Med	0.3632
3	IA-2-03	0.147	0.051	0.12	0.083				3	0.16	0.1	0.0	0.22	2.58	1.48	0.32	3.81	0.02	0.1	0.2	High	0.1716
4	IA-2-04	0.148	0.023	0.054	0.053				3	0.16	0.0	0.0	0.11	2.57	1.47	0.16	3.79	0.01	0.1	0.1	High	0.0877
5	IA-2-05	0.2	0.006	0.006	0.029				3	0.23	0.0	0.01	0.08	6.15	3.37	0.28	20.68	0.01	0.0	0.0	High	0.047
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.03	0.21	2.02	NA	0.47	4.63	0.02	0.2	0.2	High	0.185

df by Welch-Satterthwaite approximation: **2.5**

Recommended UCL: **0.185** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluorene 86-73-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0066	0.0079	0.0081				3	0.29	0.0	0.0	0.01	0.68	1.14	0.01	0.78	0.00	0.0	0.0	Low	0.0089
2	IA-2-02	0.144	0.0071	0.0062	0.013				3	0.16	0.0	0.0	0.02	2.66	1.50	0.04	4.00	0.00	0.0	0.0	High	0.0181
3	IA-2-03	0.147	0.0054	0.0074	0.0054				3	0.16	0.0	0.0	0.01	1.20	1.18	0.01	1.43	0.00	0.0	0.0	Low	0.0080
4	IA-2-04	0.148	0.0081	0.01	0.023				3	0.16	0.0	0.0	0.05	3.74	1.91	0.10	7.16	0.00	0.0	0.0	High	0.0341
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.46	NA	0.03	2.76	0.00	0.0	0.0	Med	0.015

df by Welch-Satterthwaite approximation: **4.6**

Recommended UCL: **0.015** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Indeno (1,2, 193-39-5
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.026	0.055	0.024				3	0.29	0.0	0.0	0.11	3.14	1.66	0.18	5.21	0.01	0.1	0.1	High	0.0787
2	IA-2-02	0.144	0.08	0.061	0.057				3	0.16	0.1	0.0	0.08	1.18	1.18	0.09	1.39	0.01	0.1	0.1	Low	0.0867
3	IA-2-03	0.147	0.013	0.018	0.027				3	0.16	0.0	0.0	0.04	2.32	1.40	0.06	3.25	0.00	0.0	0.0	High	0.0372
4	IA-2-04	0.148	0.0075	0.013	0.0075				3	0.16	0.0	0.0	0.02	2.15	1.36	0.03	2.92	0.00	0.0	0.0	Med	0.0173
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.01	0.04	1.30	NA	0.06	2.12	0.00	0.0	0.0	Med	0.0422

df by Welch-Satterthwaite approximation: **3.4**

Recommended UCL: **0.0422** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003580

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Naphthalen 91-20-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.0071	0.0093	0.011				3	0.29	0.0	0.0	0.01	1.35	1.20	0.01	1.63	0.00	0.0	0.0	Med	0.0141
2	IA-2-02	0.144	0.0055	0.0069	0.0058				3	0.16	0.0	0.0	0.00	0.77	1.14	0.01	0.88	0.00	0.0	0.0	Low	0.0073
3	IA-2-03	0.147	0.0065	0.0049	0.0045				3	0.16	0.0	0.0	0.01	1.26	1.19	0.01	1.51	0.00	0.0	0.0	Med	0.0080
4	IA-2-04	0.148	0.0071	0.0083	0.0091				3	0.16	0.0	0.0	0.01	0.78	1.14	0.01	0.89	0.00	0.0	0.0	Low	0.0099
5	IA-2-05	0.2	0.0075	0.0075	0.0195				3	0.23	0.0	0.01	0.04	3.81	1.94	0.09	7.40	0.00	0.0	0.0	High	0.0
	Sum:	1	--	--	--	--	--	--	15	1.00	0.0	0.00	0.01	1.28	NA	0.02	2.39	0.00	0.0	0.0	Med	0.0127

df by Welch-Satterthwaite approximation: **2.6**

Recommended UCL: **0.0127** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003581

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Phenanthre 85-01-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.043	0.15	0.055				3	0.29	0.1	0.1	0.37	4.48	2.28	0.85	10.23	0.03	0.2	0.2	High	0.2302
2	IA-2-02	0.144	0.12	0.073	0.11				3	0.16	0.1	0.0	0.16	1.55	1.23	0.19	1.91	0.01	0.1	0.2	Med	0.1633
3	IA-2-03	0.147	0.034	0.07	0.045				3	0.16	0.0	0.0	0.12	2.35	1.41	0.16	3.31	0.01	0.1	0.1	High	0.0961
4	IA-2-04	0.148	0.034	0.065	0.071				3	0.16	0.1	0.0	0.13	2.22	1.37	0.17	3.05	0.01	0.1	0.1	High	0.1066
5	IA-2-05	0.2	0.0035	0.0075	0.0195				3	0.23	0.0	0.01	0.05	5.18	2.69	0.14	13.94	0.00	0.0	0.0	High	0.0311
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.02	0.11	1.91	NA	0.25	4.21	0.01	0.1	0.1	High	0.104

df by Welch-Satterthwaite approximation: **2.6**

Recommended UCL: **0.104** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Pyrene 129-00-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.069	0.2	0.076				3	0.29	0.1	0.1	0.47	4.05	2.06	0.96	8.34	0.04	0.2	0.3	High	0.3005
2	IA-2-02	0.144	0.23	0.16	0.18				3	0.16	0.2	0.0	0.23	1.20	1.18	0.27	1.42	0.02	0.3	0.3	Low	0.2508
3	IA-2-03	0.147	0.045	0.1	0.064				3	0.16	0.1	0.0	0.18	2.54	1.46	0.26	3.71	0.02	0.1	0.1	High	0.1400
4	IA-2-04	0.148	0.029	0.047	0.082				3	0.16	0.1	0.0	0.17	3.24	1.70	0.29	5.50	0.02	0.1	0.1	High	0.1205
5	IA-2-05	0.2	0.0057	0.0059	0.034				3	0.23	0.0	0.02	0.10	6.77	3.87	0.40	26.21	0.01	0.0	0.1	High	0.056
	Sum:	1	--	--	--	--	--	--	15	1.00	0.1	0.02	0.15	1.69	NA	0.30	3.47	0.01	0.1	0.1	High	0.145

df by Welch-Satterthwaite approximation: **2.8**

Recommended UCL: **0.145** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003583

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Methyl acet 79-20-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																	95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	ND	ND	ND					0.29					#N/A	#VALUE!	#VALUE!				#VALUE!	#VALUE!
2	IA-2-02	0.144	ND	ND	ND					0.16					#N/A	#VALUE!	#VALUE!				#VALUE!	#VALUE!
3	IA-2-03	0.147	ND	ND	ND					0.16					#N/A	#VALUE!	#VALUE!				#VALUE!	#VALUE!
4	IA-2-04	0.148	ND	ND	ND					0.16					#N/A	#VALUE!	#VALUE!				#VALUE!	#VALUE!
5	IA-2-05	0.2	1.1	0.95	1				3	0.23	1.0	0.08	0.48	0.48	1.13	0.55	0.54	0.04	1.1	1.2	Low	1.1
	Sum:	1	--	--	--	--	--	--	3	1.00	0.2	0.02	0.11	0.48	NA	0.13	0.54	0.01	#VALUE!	0.3	Low	#VALUE!

df by Welch-Satterthwaite approximation: ######

Recommended UCL: **#VALUE!** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation	ND	= not detected
calc'd	= calculated	DU	= decision unit	SE	= standard error		
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean		

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 2
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT and metabolites
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations						Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL			
			Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6											Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-2-01	0.261	0.131	0.15	0.224				3	0.29	0.2	0.0	0.31	1.85	1.29	0.40	2.38	0.03	0.3	0.3	Med	0.2920
2	IA-2-02	0.144	8.7	12.2	12.3				3	0.16	11.1	2.1	12.97	1.17	1.18	15.31	1.38	1.18	14.5	16.2	Low	14.5230
3	IA-2-03	0.147	0.0141	0.0199	0.0135				3	0.16	0.0	0.0	0.02	1.41	1.21	0.03	1.71	0.00	0.0	0.0	Med	0.0247
4	IA-2-04	0.148	0.047	0.0273	0.0559				3	0.16	0.0	0.0	0.09	2.13	1.35	0.13	2.88	0.01	0.1	0.1	Med	0.0802
5	IA-2-05	0.2	0.0065	0.0066	0.0075				3	0.23	0.0	0.00	0.00	0.52	1.13	0.00	0.59	0.00	0.0	0.0	Low	0.00780
	Sum:	1	--	--	--	--	--	--	15	1.00	1.8	0.33	2.06	1.13	NA	2.43	1.34	0.19	2.4	2.6	Low	2.4

df by Welch-Satterthwaite approximation:	2.0

Recommended UCL: **2.36** mg/kg >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Antimony 7440-36-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.29	0.28	0.275				3	0.57	0.3	0.01	0.05	0.17	1.13	0.05	0.19	0.00	0.3	0.3	Low	0.295
2	IA-3-02	0.240	0.28	0.27	0.28				3	0.41	0.3	0.01	0.04	0.13	1.13	0.04	0.15	0.00	0.3	0.3	Low	0.286
3	IA-3-03	0.009	0.28	0.275	0.28				3	0.02	0.3	0.00	0.02	0.07	1.13	0.02	0.07	0.00	0.3	0.3	Low	0.283
4	IA-3-04	0.005	0.28	0.275	0.27				3	0.01	0.3	0.01	0.03	0.11	1.13	0.04	0.13	0.00	0.3	0.3	Low	0.283
	Sum:	1	--	--	--	--	--	--	12	1.00	0.3	0.00	0.03	0.11	NA	0.04	0.13	0.00	0.3	0.3	Low	0.286

df by Welch-Satterthwaite approximation: **3.1**

Recommended UCL: **0.286** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Arsenic 7440-38-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	1.7	1.9	2.1				3	0.57	1.9	0.20	1.26	0.67	1.14	1.44	0.76	0.12	2.2	2.4	Low	2.24
2	IA-3-02	0.240	2.5	2.6	3				3	0.41	2.7	0.26	1.67	0.62	1.14	1.90	0.70	0.15	3.1	3.4	Low	3.15
3	IA-3-03	0.009	2.2	2	3.2				3	0.02	2.5	0.64	4.07	1.65	1.25	5.09	2.06	0.37	3.6	4.1	Med	4.08
4	IA-3-04	0.005	1.8	2.3	2.3				3	0.01	2.1	0.29	1.83	0.86	1.15	2.10	0.98	0.17	2.6	2.9	Low	2.62
	Sum:	1	--	--	--	--	--	--	12	1.00	2.2	0.16	0.99	0.44	NA	1.13	0.50	0.09	2.4	2.6	Low	2.43

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **2.43** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Barium 7440-39-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	66	65	72				3	0.57	67.7	3.79	23.94	0.35	1.13	26.99	0.40	2.19	74.0	77.2	Low	74.0
2	IA-3-02	0.240	64	58	55				3	0.41	59.0	4.58	28.98	0.49	1.13	32.75	0.56	2.65	66.7	70.5	Low	66.7
3	IA-3-03	0.009	85	77	74				3	0.02	78.7	5.69	35.96	0.46	1.13	40.61	0.52	3.28	88.3	93.0	Low	88.3
4	IA-3-04	0.005	67	64	63				3	0.01	64.7	2.08	13.17	0.20	1.13	14.83	0.23	1.20	68.2	69.9	Low	68.2
	Sum:	1	--	--	--	--	--	--	12	1.00	64.3	2.85	18.03	0.28	NA	20.35	0.32	1.65	68.2	71.5	Low	68.2

df by Welch-Satterthwaite approximation: **3.9**

Recommended UCL: **68.2** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Beryllium 7440-41-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.23	0.23	0.22				3	0.57	0.2	0.01	0.04	0.16	1.13	0.04	0.18	0.00	0.2	0.2	Low	0.236
2	IA-3-02	0.240	0.21	0.22	0.19				3	0.41	0.2	0.02	0.10	0.47	1.13	0.11	0.53	0.01	0.2	0.2	Low	0.232
3	IA-3-03	0.009	0.29	0.29	0.31				3	0.02	0.3	0.01	0.07	0.25	1.13	0.08	0.28	0.01	0.3	0.3	Low	0.316
4	IA-3-04	0.005	0.23	0.25	0.24				3	0.01	0.2	0.01	0.06	0.26	1.13	0.07	0.30	0.01	0.3	0.3	Low	0.257
	Sum:	1	--	--	--	--	--	--	12	1.00	0.2	0.01	0.04	0.20	NA	0.05	0.23	0.00	0.2	0.2	Low	0.229

df by Welch-Satterthwaite approximation: **3.0**

Recommended UCL: **0.229** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Cadmium 7440-43-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.1	0.094	0.11				3	0.57	0.1	0.01	0.05	0.50	1.13	0.06	0.57	0.00	0.1	0.1	Low	0.115
2	IA-3-02	0.240	0.093	0.097	0.09				3	0.41	0.1	0.00	0.02	0.24	1.13	0.03	0.27	0.00	0.1	0.1	Low	0.099
3	IA-3-03	0.009	0.14	0.066	0.14				3	0.02	0.1	0.04	0.27	2.34	1.41	0.38	3.30	0.02	0.2	0.2	High	0.223
4	IA-3-04	0.005	0.44	0.36	0.9				3	0.01	0.6	0.29	1.84	3.25	1.71	3.15	5.55	0.17	1.1	1.3	High	1.30
	Sum:	1	--	--	--	--	--	--	12	1.00	0.1	0.01	0.03	0.34	NA	0.04	0.43	0.00	0.1	0.1	Low	0.1

df by Welch-Satterthwaite approximation: **3.6**

Recommended UCL: **0.110** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003590

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chromium 7440-47-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	24	24	26				3	0.57	24.7	1.15	7.30	0.30	1.13	8.23	0.33	0.67	26.6	27.6	Low	26.6
2	IA-3-02	0.240	26	25	23				3	0.41	24.7	1.53	9.66	0.39	1.13	10.89	0.44	0.88	27.2	28.5	Low	27.2
3	IA-3-03	0.009	20	18	22				3	0.02	20.0	2.00	12.65	0.63	1.14	14.37	0.72	1.15	23.4	25.0	Low	23.4
4	IA-3-04	0.005	20	21	20				3	0.01	20.3	0.58	3.65	0.18	1.13	4.11	0.20	0.33	21.3	21.8	Low	21.3
	Sum:	1	--	--	--	--	--	--	12	1.00	24.6	0.91	5.73	0.23	NA	6.45	0.26	0.52	25.8	26.8	Low	25.8

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **25.8** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Copper 7440-50-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	77	78	81				3	0.57	78.7	2.08	13.17	0.17	1.13	14.84	0.19	1.20	82.2	83.9	Low	82.2
2	IA-3-02	0.240	72	65	65				3	0.41	67.3	4.04	25.56	0.38	1.13	28.82	0.43	2.33	74.1	77.5	Low	74.1
3	IA-3-03	0.009	62	60	110				3	0.02	77.3	28.31	179.03	2.32	1.40	250.75	3.24	16.34	125.1	148.6	High	149
4	IA-3-04	0.005	67	61	60				3	0.01	62.7	3.79	23.94	0.38	1.13	27.00	0.43	2.19	69.0	72.2	Low	69.0
	Sum:	1	--	--	--	--	--	--	12	1.00	73.9	2.07	13.11	0.18	NA	14.95	0.20	1.20	76.7	79.1	Low	76.7

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **76.7** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Lead 7439-92-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	44	7.7	9.4				3	0.57	20.4	20.48	129.56	6.36	3.53	457.67	22.47	11.83	54.9	71.9	High	71.9
2	IA-3-02	0.240	8	7.4	6				3	0.41	7.1	1.03	6.49	0.91	1.15	7.49	1.05	0.59	8.9	9.7	Low	8.86
3	IA-3-03	0.009	4	12	4.4				3	0.02	6.8	4.51	28.51	4.19	2.13	60.65	8.92	2.60	14.4	18.1	High	18.1
4	IA-3-04	0.005	9.3	34	9.8				3	0.01	17.7	14.12	89.29	5.04	2.61	232.80	13.15	8.15	41.5	53.2	High	53.2
	Sum:	1	--	--	--	--	--	--	12	1.00	14.8	11.67	73.83	5.00	NA	260.67	17.67	6.74	34.4	44.1	High	44.1

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **44.1** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003593

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Mercury 7439-97-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.063	0.025	0.052				3	0.57	0.0467	0.0196	0.12	2.65	1.50	0.19	3.97	0.01	0.0796	0.0959	High	0.0959
2	IA-3-02	0.240	0.026	0.022	0.036				3	0.41	0.0280	0.0072	0.05	1.63	1.25	0.06	2.03	0.00	0.0402	0.0461	Med	0.0461
3	IA-3-03	0.009	0.023	0.02	0.023				3	0.02	0.0220	0.0017	0.01	0.50	1.13	0.01	0.56	0.00	0.0249	0.0264	Low	0.0249
4	IA-3-04	0.005	0.039	0.041	0.036				3	0.01	0.0387	0.0025	0.02	0.41	1.13	0.02	0.46	0.00	0.0429	0.0450	Low	0.0429
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.07	1.89	NA	0.11	2.79	0.01	0.1	0.1	Med	0.068

df by Welch-Satterthwaite approximation: 2.3

Recommended UCL: **0.068** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Nickel 7440-02-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	15	15	16				3	0.57	15.3	0.6	3.65	0.24	1.13	4.11	0.27	0.33	16.3	16.8	Low	16.3
2	IA-3-02	0.240	16	15	14				3	0.41	15.0	1.0	6.32	0.42	1.13	7.14	0.48	0.58	16.7	17.5	Low	16.7
3	IA-3-03	0.009	12	11	11				3	0.02	11.3	0.6	3.65	0.32	1.13	4.11	0.36	0.33	12.3	12.8	Low	12.3
4	IA-3-04	0.005	12	12	12				3	0.01	12.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	12.0	12.0	Low	12.0
10																						
	Sum:	1	--	--	--	--	--	--	12	1.00	15.1	0.52	3.31	0.22	NA	3.73	0.25	0.30	15.8	16.4	Low	15.8

df by Welch-Satterthwaite approximation: **3.8**

Recommended UCL: **15.8** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003595

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Selenium 7782-49-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.18	0.7	0.7				3	0.57	0.5	0.3	1.90	3.61	1.85	3.51	6.67	0.17	1.0	1.3	High	1.28
2	IA-3-02	0.240	0.19	0.2	0.7				3	0.41	0.4	0.3	1.84	5.08	2.63	4.84	13.33	0.17	0.9	1.1	High	1.10
3	IA-3-03	0.009	0.27	0.28	0.34				3	0.02	0.3	0.0	0.24	0.81	1.15	0.27	0.93	0.02	0.4	0.4	Low	0.360
4	IA-3-04	0.005	0.33	0.34	0.36				3	0.01	0.3	0.0	0.10	0.28	1.13	0.11	0.32	0.01	0.4	0.4	Low	0.369
	Sum:	1	--	--	--	--	--	--	12	1.00	0.5	0.21	1.32	2.89	NA	2.81	6.17	0.12	0.7	1.0	High	1.0

df by Welch-Satterthwaite approximation: **3.6**

Recommended UCL: **0.979** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Silver 7440-22-4
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.044	0.048	0.055				3	0.57	0.0	0.0	0.04	0.72	1.14	0.04	0.82	0.00	0.1	0.1	Low	0.058
2	IA-3-02	0.240	0.035	0.036	0.033				3	0.41	0.0	0.0	0.01	0.28	1.13	0.01	0.31	0.00	0.0	0.0	Low	0.037
3	IA-3-03	0.009	0.14	0.135	0.14				3	0.02	0.1	0.0	0.02	0.13	1.13	0.02	0.15	0.00	0.1	0.1	Low	0.143
4	IA-3-04	0.005	0.031	0.032	0.032				3	0.01	0.0	0.0	0.00	0.12	1.13	0.00	0.13	0.00	0.0	0.0	Low	0.033
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	0.46	NA	0.02	0.52	0.00	0.0	0.1	Low	0.0

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.050** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003597

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Zinc 7440-66-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	74	72	76				3	0.57	74.0	2.0	12.65	0.17	1.13	14.25	0.19	1.15	77.4	79.0	Low	77.4
2	IA-3-02	0.240	64	65	59				3	0.41	62.7	3.2	20.33	0.32	1.13	22.91	0.37	1.86	68.1	70.8	Low	68.1
3	IA-3-03	0.009	44	42	54				3	0.02	46.7	6.4	40.66	0.87	1.15	46.80	1.00	3.71	57.5	62.8	Low	57.5
4	IA-3-04	0.005	74	74	89				3	0.01	79.0	8.7	54.77	0.69	1.14	62.38	0.79	5.00	93.6	100.8	Low	93.6
	Sum:	1	--	--	--	--	--	--	12	1.00	69.0	1.74	10.99	0.16	NA	12.39	0.18	1.00	71.4	73.4	Low	71.4

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **71.4** **mg/kg** >> Student's t 95% UCL
Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDE 72-55-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

			Replicate field sample concentrations																95% UCL			
Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.0083	0.014	0.0085				3	0.57	0.0	0.0	0.02	1.99	1.32	0.03	2.63	0.00	0.0	0.0	Med	0.0184
2	IA-3-02	0.240	0.012	0.0042	0.0041				3	0.41	0.0	0.0	0.03	4.24	2.15	0.06	9.11	0.00	0.0	0.0	High	0.0182
3	IA-3-03	0.009	0.00235	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0026
4	IA-3-04	0.005	0.0091	0.0086	0.024				3	0.01	0.0	0.0	0.06	3.98	2.02	0.11	8.05	0.01	0.0	0.0	High	0.0359
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	1.88	NA	0.03	3.36	0.00	0.0	0.0	High	0.0153

df by Welch-Satterthwaite approximation: **4.0**

Recommended UCL: **0.0153** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003599

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDD 72-54-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.00215	0.011	0.0025				3	0.57	0.0	0.0	0.03	6.11	3.34	0.11	20.42	0.00	0.0	0.0	High	0.0178
2	IA-3-02	0.240	0.0047	0.0026	0.0025				3	0.41	0.0	0.0	0.01	2.49	1.45	0.01	3.60	0.00	0.0	0.0	High	0.0064
3	IA-3-03	0.009	0.00235	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0026
4	IA-3-04	0.005	0.0025	0.0025	0.0017				3	0.01	0.0	0.0	0.00	1.28	1.19	0.00	1.53	0.00	0.0	0.0	Med	0.0033
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	4.25	NA	0.06	14.00	0.00	0.0	0.0	High	0.0117

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.0117** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT 50-29-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.012	0.009	0.0032				3	0.57	0.0	0.0	0.03	3.51	1.81	0.05	6.35	0.00	0.0	0.0	High	0.0193
2	IA-3-02	0.240	0.17	0.0028	0.0024				3	0.41	0.1	0.1	0.61	10.47	7.85	4.80	82.21	0.06	0.2	0.3	High	0.3016
3	IA-3-03	0.009	0.00235	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0026
4	IA-3-04	0.005	0.0025	0.0029	0.0023				3	0.01	0.0	0.0	0.00	0.81	1.15	0.00	0.93	0.00	0.0	0.0	Low	0.0031
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.04	0.25	8.77	NA	1.95	68.75	0.02	0.1	0.1	High	0.128

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.128** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Aldrin 309-00-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.0014	0.0073	0.0022				3	0.57	0.0	0.0	0.02	5.57	2.95	0.06	16.44	0.00	0.0	0.0	High	0.0117
2	IA-3-02	0.240	0.0025	0.0012	0.0025				3	0.41	0.0	0.0	0.00	2.27	1.39	0.01	3.16	0.00	0.0	0.0	High	0.0039
3	IA-3-03	0.009	0.00235	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0026
4	IA-3-04	0.005	0.0025	0.0025	0.0023				3	0.01	0.0	0.0	0.00	0.35	1.13	0.00	0.39	0.00	0.0	0.0	Low	0.0026
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	3.95	NA	0.03	11.52	0.00	0.0	0.0	High	0.008

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.008** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dieldrin 60-57-1
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.0087	0.0065	0.011				3	0.57	0.0	0.0	0.01	1.63	1.25	0.02	2.03	0.00	0.0	0.0	Med	0.0144
2	IA-3-02	0.240	0.0028	0.0025	0.0025				3	0.41	0.0	0.0	0.00	0.46	1.13	0.00	0.52	0.00	0.0	0.0	Low	0.0029
3	IA-3-03	0.009	0.00235	0.0025	0.0025				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0026
4	IA-3-04	0.005	0.0019	0.0025	0.0044				3	0.01	0.0	0.0	0.01	2.85	1.56	0.01	4.45	0.00	0.0	0.0	High	0.0062
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	1.33	NA	0.01	1.67	0.00	0.0	0.0	Med	0.009

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.009** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003603

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	trans-Chlor(5103-74-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.00215	0.011	0.0025				3	0.57	0.0	0.0	0.03	6.11	3.34	0.11	20.42	0.00	0.0	0.0	High	0.0178
2	IA-3-02	0.240	0.0018	0.0026	0.0025				3	0.41	0.0	0.0	0.00	1.14	1.18	0.00	1.34	0.00	0.0	0.0	Low	0.0030
3	IA-3-03	0.009	0.00235	0.0035	0.0025				3	0.02	0.0	0.0	0.00	1.42	1.21	0.00	1.73	0.00	0.0	0.0	Med	0.0044
4	IA-3-04	0.005	0.0025	0.0025	0.0023				3	0.01	0.0	0.0	0.00	0.35	1.13	0.00	0.39	0.00	0.0	0.0	Low	0.0026
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.02	4.59	NA	0.06	15.32	0.00	0.0	0.0	High	0.0112

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0112** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	2-Methylna 91-57-6
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.011	0.0061	0.0075				3	0.57	0.0	0.0	0.02	1.95	1.31	0.02	2.55	0.00	0.0	0.0	Med	0.0146
2	IA-3-02	0.240	0.0046	0.004	0.0053				3	0.41	0.0	0.0	0.00	0.89	1.15	0.00	1.02	0.00	0.0	0.0	Low	0.0057
3	IA-3-03	0.009	0.0061	0.005	0.0051				3	0.02	0.0	0.0	0.00	0.71	1.14	0.00	0.81	0.00	0.0	0.0	Low	0.0064
4	IA-3-04	0.005	0.0054	0.0066	0.0048				3	0.01	0.0	0.0	0.01	1.04	1.17	0.01	1.21	0.00	0.0	0.0	Low	0.0071
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	1.38	NA	0.01	1.81	0.00	0.0	0.0	Med	0.0

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.010** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003605

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	1-Methylna 90-12-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebyshev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.0099	0.004	0.0075				3	0.57	0.0	0.0	0.02	2.63	1.49	0.03	3.92	0.00	0.0	0.0	High	0.0146
2	IA-3-02	0.240	0.0075	0.0037	0.0075				3	0.41	0.0	0.0	0.01	2.23	1.38	0.02	3.07	0.00	0.0	0.0	High	0.0118
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.0037	0.005	0.0075				3	0.01	0.0	0.0	0.01	2.26	1.39	0.02	3.14	0.00	0.0	0.0	High	0.0103
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	1.79	NA	0.02	2.62	0.00	0.0	0.0	Med	0.0116

df by Welch-Satterthwaite approximation: **3.0**

Recommended UCL: **0.012** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003606

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Acenaphthe 83-32-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.033	0.014	0.0043				3	0.57	0.0	0.0	0.09	5.40	2.83	0.26	15.31	0.01	0.0	0.1	High	0.0538
2	IA-3-02	0.240	0.0075	0.0049	0.0075				3	0.41	0.0	0.0	0.01	1.43	1.22	0.01	1.74	0.00	0.0	0.0	Med	0.0104
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.011	0.01	0.0068				3	0.01	0.0	0.0	0.01	1.50	1.23	0.02	1.84	0.00	0.0	0.0	Med	0.0148
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.05	4.17	NA	0.15	11.81	0.00	0.0	0.0	High	0.034

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.034** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Anthracene 120-12-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.037	0.02	0.0038				3	0.57	0.0	0.0	0.10	5.18	2.69	0.28	13.95	0.01	0.0	0.1	High	0.0620
2	IA-3-02	0.240	0.0075	0.0059	0.0038				3	0.41	0.0	0.0	0.01	2.05	1.33	0.02	2.73	0.00	0.0	0.0	Med	0.0104
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.021	0.013	0.015				3	0.01	0.0	0.0	0.03	1.61	1.25	0.03	2.01	0.00	0.0	0.0	Med	0.0268
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.06	4.25	NA	0.16	11.41	0.01	0.0	0.0	High	0.038

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.038** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003608

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)an1 56-55-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.075	0.046	0.014				3	0.57	0.0	0.0	0.19	4.29	2.18	0.42	9.33	0.02	0.1	0.1	High	0.1218
2	IA-3-02	0.240	0.01	0.028	0.012				3	0.41	0.0	0.0	0.06	3.74	1.91	0.12	7.16	0.01	0.0	0.0	High	0.0415
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.071	0.055	0.1				3	0.01	0.1	0.0	0.14	1.92	1.30	0.19	2.50	0.01	0.1	0.1	Med	0.1327
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.02	0.11	3.40	NA	0.24	7.36	0.01	0.1	0.1	High	0.078

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.078** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(a)pyr 50-32-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.067	0.044	0.014				3	0.57	0.0	0.0	0.17	4.03	2.05	0.34	8.26	0.02	0.1	0.1	High	0.1086
2	IA-3-02	0.240	0.011	0.028	0.013				3	0.41	0.0	0.0	0.06	3.39	1.76	0.10	5.97	0.01	0.0	0.0	High	0.0407
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.064	0.055	0.1				3	0.01	0.1	0.0	0.15	2.06	1.34	0.20	2.76	0.01	0.1	0.1	Med	0.1329
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.02	0.10	3.13	NA	0.20	6.36	0.01	0.1	0.1	High	0.071

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.071** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort	
Property/Sample ID:	Area 3	
Date of calculations:	3/29/2021	
Calculator completed by:	LT	
Analyte:	Benzo(b) fluoranthene	205-99-2
Analyte units:	mg/kg	
DU metric units:	acres	
Notes:		

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.088	0.052	0.018				3	0.57	0.1	0.0	0.22	4.20	2.13	0.47	8.97	0.02	0.1	0.1	High	0.1408
2	IA-3-02	0.240	0.016	0.04	0.018				3	0.41	0.0	0.0	0.08	3.41	1.77	0.15	6.05	0.01	0.0	0.1	High	0.0582
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.084	0.086	0.13				3	0.01	0.1	0.0	0.16	1.64	1.25	0.21	2.06	0.02	0.1	0.2	Med	0.1654
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.02	0.13	3.19	NA	0.28	6.73	0.01	0.1	0.1	High	0.093

df by Welch-Satterthwaite approximation: **2.3**

Recommended UCL: **0.093** mg/kg >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(g,h,i) 191-24-2
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.02	0.026	0.011				3	0.57	0.0	0.0	0.05	2.51	1.46	0.07	3.66	0.00	0.0	0.0	High	0.0380
2	IA-3-02	0.240	0.0075	0.011	0.0075				3	0.41	0.0	0.0	0.01	1.47	1.22	0.02	1.80	0.00	0.0	0.0	Med	0.0138
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.03	0.035	0.046				3	0.01	0.0	0.0	0.05	1.40	1.21	0.06	1.69	0.00	0.1	0.1	Med	0.0576
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.03	1.87	NA	0.04	2.71	0.00	0.0	0.0	Med	0.026

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.026** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003612

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Benzo(k)flu‹ 207-08-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	Student's-t	Chebychev	CV of Increments	95% UCL
			Replicate field sample concentrations																95% UCL			
1	IA-3-01	0.336	0.048	0.032	0.0075				3	0.57	0.0	0.0	0.13	4.42	2.25	0.29	9.94	0.01	0.1	0.1	High	0.0805
2	IA-3-02	0.240	0.0075	0.015	0.0084				3	0.41	0.0	0.0	0.03	2.51	1.46	0.04	3.66	0.00	0.0	0.0	High	0.0206
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.041	0.029	0.046				3	0.01	0.0	0.0	0.06	1.43	1.22	0.07	1.74	0.01	0.1	0.1	Med	0.0607
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.07	3.49	NA	0.17	7.81	0.01	0.0	0.1	High	0.051

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.051** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Chrysene 218-01-9
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.08	0.045	0.0096				3	0.57	0.0	0.0	0.22	4.96	2.56	0.57	12.68	0.02	0.1	0.1	High	0.1335
2	IA-3-02	0.240	0.011	0.028	0.012				3	0.41	0.0	0.0	0.06	3.55	1.83	0.11	6.48	0.01	0.0	0.0	High	0.0410
3	IA-3-03	0.009	0.0075	0.0075	0.0038				3	0.02	0.0	0.0	0.01	2.16	1.36	0.02	2.93	0.00	0.0	0.0	Med	0.0116
4	IA-3-04	0.005	0.067	0.057	0.094				3	0.01	0.1	0.0	0.12	1.67	1.26	0.15	2.09	0.01	0.1	0.1	Med	0.1208
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.02	0.13	3.89	NA	0.33	9.86	0.01	0.1	0.1	High	0.085

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.085** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003614

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Dibenz(a,h)a 53-70-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.0075	0.0075	0.0075				3	0.57	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
2	IA-3-02	0.240	0.0075	0.0075	0.0075				3	0.41	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.0083	0.0097	0.016				3	0.01	0.0	0.0	0.03	2.29	1.39	0.04	3.19	0.00	0.0	0.0	High	0.0217
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.00	0.03	NA	0.00	0.04	0.00	0.0	0.0	Low	0.0076

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0076** **mg/kg** >> Student's t 95% UCL

Note: Student's-t or Chebychev 95% UCL may be appropriate.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluoranther 206-44-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.16	0.11	0.029				3	0.57	0.1	0.1	0.42	4.20	2.13	0.89	8.93	0.04	0.2	0.3	High	0.2660
2	IA-3-02	0.240	0.02	0.055	0.023				3	0.41	0.0	0.0	0.12	3.76	1.92	0.24	7.20	0.01	0.1	0.1	High	0.0815
3	IA-3-03	0.009	0.0069	0.0067	0.0083				3	0.02	0.0	0.0	0.01	0.76	1.14	0.01	0.86	0.00	0.0	0.0	Low	0.0088
4	IA-3-04	0.005	0.14	0.12	0.16				3	0.01	0.1	0.0	0.13	0.90	1.15	0.15	1.04	0.01	0.2	0.2	Low	0.1737
	Sum:	1	--	--	--	--	--	--	12	1.00	0.1	0.04	0.24	3.41	NA	0.52	7.23	0.02	0.1	0.2	High	0.168

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.168** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Fluorene 86-73-7
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.027	0.011	0.0034				3	0.57	0.0	0.0	0.08	5.52	2.92	0.22	16.10	0.01	0.0	0.0	High	0.0441
2	IA-3-02	0.240	0.005	0.0061	0.0052				3	0.41	0.0	0.0	0.00	0.68	1.14	0.00	0.78	0.00	0.0	0.0	Low	0.0064
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.0051	0.0071	0.0052				3	0.01	0.0	0.0	0.01	1.23	1.19	0.01	1.46	0.00	0.0	0.0	Low	0.0077
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.04	4.24	NA	0.13	12.37	0.00	0.0	0.0	High	0.028

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.028** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003617

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Indeno (1,2, 193-39-5
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.022	0.024	0.0075				3	0.57	0.0	0.0	0.06	3.19	1.68	0.10	5.38	0.01	0.0	0.0	High	0.0405
2	IA-3-02	0.240	0.0075	0.0094	0.0075				3	0.41	0.0	0.0	0.01	0.85	1.15	0.01	0.98	0.00	0.0	0.0	Low	0.0100
3	IA-3-03	0.009	0.0075	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.00	1.13	0.00	0.00	0.00	0.0	0.0	Low	0.0075
4	IA-3-04	0.005	0.029	0.034	0.042				3	0.01	0.0	0.0	0.04	1.18	1.18	0.05	1.40	0.00	0.0	0.1	Low	0.0461
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.01	0.03	2.35	NA	0.05	3.94	0.00	0.0	0.0	High	0.0268

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0268** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Naphthalen 91-20-3
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.013	0.0061	0.0075				3	0.57	0.0	0.0	0.02	2.60	1.48	0.03	3.86	0.00	0.0	0.0	High	0.0180
2	IA-3-02	0.240	0.0056	0.006	0.0062				3	0.41	0.0	0.0	0.00	0.33	1.13	0.00	0.37	0.00	0.0	0.0	Low	0.0064
3	IA-3-03	0.009	0.011	0.0088	0.0084				3	0.02	0.0	0.0	0.01	0.94	1.16	0.01	1.09	0.00	0.0	0.0	Low	0.0118
4	IA-3-04	0.005	0.0081	0.0094	0.0078				3	0.01	0.0	0.0	0.01	0.64	1.14	0.01	0.72	0.00	0.0	0.0	Low	0.0099
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.00	0.01	1.71	NA	0.02	2.54	0.00	0.0	0.0	Med	0.013

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.0129** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Phenanthre 85-01-8
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.17	0.089	0.025				3	0.57	0.1	0.1	0.46	4.85	2.49	1.15	12.10	0.04	0.2	0.3	High	0.2775
2	IA-3-02	0.240	0.026	0.045	0.029				3	0.41	0.0	0.0	0.06	1.94	1.31	0.08	2.54	0.01	0.1	0.1	Med	0.0590
3	IA-3-03	0.009	0.011	0.01	0.012				3	0.02	0.0	0.0	0.01	0.57	1.13	0.01	0.65	0.00	0.0	0.0	Low	0.0127
4	IA-3-04	0.005	0.093	0.065	0.058				3	0.01	0.1	0.0	0.12	1.63	1.25	0.15	2.03	0.01	0.1	0.1	Med	0.1186
	Sum:	1	--	--	--	--	--	--	12	1.00	0.1	0.04	0.26	3.85	NA	0.65	9.57	0.02	0.1	0.2	High	0.173

df by Welch-Satterthwaite approximation: **2.0**

Recommended UCL: **0.173** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003620

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	Pyrene 129-00-0
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations: Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL: Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.12	0.11	0.025				3	0.57	0.1	0.1	0.33	3.88	1.98	0.65	7.68	0.03	0.2	0.2	High	0.2164
2	IA-3-02	0.240	0.017	0.045	0.02				3	0.41	0.0	0.0	0.10	3.56	1.83	0.18	6.51	0.01	0.1	0.1	High	0.0660
3	IA-3-03	0.009	0.0048	0.0041	0.0059				3	0.02	0.0	0.0	0.01	1.16	1.18	0.01	1.37	0.00	0.0	0.0	Low	0.0065
4	IA-3-04	0.005	0.1	0.082	0.13				3	0.01	0.1	0.0	0.15	1.47	1.22	0.19	1.80	0.01	0.1	0.2	Med	0.1650
	Sum:	1	--	--	--	--	--	--	12	1.00	0.1	0.03	0.19	3.18	NA	0.38	6.26	0.02	0.1	0.1	High	0.137

df by Welch-Satterthwaite approximation: **2.2**

Recommended UCL: **0.137** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

AR-003621

Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs Having Replicate Incremental Samples

Enter information in green highlighted cells. See the "Instructions" tab for detailed instructions.

Project ID:	Caneel Bay Resort
Property/Sample ID:	Area 3
Date of calculations:	3/29/2021
Calculator completed by:	LT
Analyte:	4,4-DDT+
Analyte units:	mg/kg
DU metric units:	acres
Notes:	

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval: Area

Note: Assumes all replicates have the same number of increments

Number of increments per replicate: 40

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations						Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL			
			Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6											Student's-t	Chebychev	CV of Increments	95% UCL
1	IA-3-01	0.336	0.02245	0.034	0.0142				3	0.57	0.0	0.0	0.06	2.68	1.51	0.09	4.03	0.01	0.0	0.0	High	0.0486
2	IA-3-02	0.240	0.1867	0.0096	0.009				3	0.41	0.1	0.1	0.65	9.47	6.61	4.28	62.61	0.06	0.2	0.3	High	0.3262
3	IA-3-03	0.009	0.00705	0.0075	0.0075				3	0.02	0.0	0.0	0.00	0.22	1.13	0.00	0.25	0.00	0.0	0.0	Low	0.0078
4	IA-3-04	0.005	0.0141	0.014	0.028				3	0.01	0.0	0.0	0.05	2.72	1.52	0.08	4.14	0.00	0.0	0.0	High	0.0389
	Sum:	1	--	--	--	--	--	--	12	1.00	0.0	0.04	0.27	6.41	NA	1.74	42.00	0.02	0.1	0.1	High	0.1

df by Welch-Satterthwaite approximation: **2.1**

Recommended UCL: **0.1** **mg/kg** >> Chebyshev 95% UCL

Note: Chebychev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error

Appendix B: ProUCL Outputs

Appendix A-1: ProUCL Output – Discrete Subsurface Soil (0-6')

UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
Date/Time of Computation	ProUCL 5.14/7/2021 12:46:32 PM
From File	Input Data Area 3 Discrete.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.61	Mean	2.029
Maximum	5.7	Median	1.8
SD	1.354	Std. Error of Mean	0.303
Coefficient of Variation	0.667	Skewness	1.515

Normal GOF Test		
Shapiro Wilk Test Statistic	0.847	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level
Data appear Approximate Normal at 5% Significance Level		

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.552	95% Adjusted-CLT UCL (Chen-1995)	2.636
		95% Modified-t UCL (Johnson-1978)	2.569

Gamma GOF Test		
A-D Test Statistic	0.326	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.118	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics			
k hat (MLE)	2.852	k star (bias corrected MLE)	2.457
Theta hat (MLE)	0.711	Theta star (bias corrected MLE)	0.826
nu hat (MLE)	114.1	nu star (bias corrected)	98.29

MLE Mean (bias corrected)	2.029	MLE Sd (bias corrected)	1.294
		Approximate Chi Square Value (0.05)	76.42
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	74.89
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2.609	95% Adjusted Gamma UCL (use when n<50)	2.662
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.494	Mean of logged Data	0.522
Maximum of Logged Data	1.74	SD of logged Data	0.618
Assuming Lognormal Distribution			
95% H-UCL	2.765	90% Chebyshev (MVUE) UCL	2.9
95% Chebyshev (MVUE) UCL	3.299	97.5% Chebyshev (MVUE) UCL	3.854
99% Chebyshev (MVUE) UCL	4.943		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.526	95% Jackknife UCL	2.552
95% Standard Bootstrap UCL	2.525	95% Bootstrap-t UCL	2.794
95% Hall's Bootstrap UCL	3.056	95% Percentile Bootstrap UCL	2.541
95% BCA Bootstrap UCL	2.624		
90% Chebyshev(Mean, Sd) UCL	2.936	95% Chebyshev(Mean, Sd) UCL	3.348
97.5% Chebyshev(Mean, Sd) UCL	3.919	99% Chebyshev(Mean, Sd) UCL	5.04
Suggested UCL to Use			
95% Student's-t UCL	2.552		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	14
Number of Detects	5	Number of Non-Detects	15
Number of Distinct Detects	5	Number of Distinct Non-Detects	9
Minimum Detect	0.052	Minimum Non-Detect	0.14
Maximum Detect	0.1	Maximum Non-Detect	0.26
Variance Detects	5.3370E-4	Percent Non-Detects	75%
Mean Detects	0.0728	SD Detects	0.0231
Median Detects	0.064	CV Detects	0.317
Skewness Detects	0.46	Kurtosis Detects	-3.01
Mean of Logged Detects	-2.66	SD of Logged Detects	0.314
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0728	KM Standard Error of Mean	0.0103
KM SD	0.0207	95% KM (BCA) UCL	0.0911
95% KM (t) UCL	0.0907	95% KM (Percentile Bootstrap) UCL	0.0904
95% KM (z) UCL	0.0898	95% KM Bootstrap t UCL	0.122
90% KM Chebyshev UCL	0.104	95% KM Chebyshev UCL	0.118
97.5% KM Chebyshev UCL	0.137	99% KM Chebyshev UCL	0.176
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.517	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.261	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	12.72	k star (bias corrected MLE)	5.221
Theta hat (MLE)	0.00572	Theta star (bias corrected MLE)	0.0139
nu hat (MLE)	127.2	nu star (bias corrected)	52.21
Mean (detects)	0.0728		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0492	Mean	0.0723
Maximum	0.1	Median	0.0716
SD	0.0154	CV	0.213
k hat (MLE)	23.34	k star (bias corrected MLE)	19.88
Theta hat (MLE)	0.0031	Theta star (bias corrected MLE)	0.00364
nu hat (MLE)	933.8	nu star (bias corrected)	795.1
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (795.05, α)	730.6	Adjusted Chi Square Value (795.05, β)	725.7
95% Gamma Approximate UCL (use when n>=50)	0.0786	95% Gamma Adjusted UCL (use when n<50)	0.0792
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0728	SD (KM)	0.0207
Variance (KM)	4.2696E-4	SE of Mean (KM)	0.0103
k hat (KM)	12.41	k star (KM)	10.58
nu hat (KM)	496.5	nu star (KM)	423.4
theta hat (KM)	0.00586	theta star (KM)	0.00688
80% gamma percentile (KM)	0.0907	90% gamma percentile (KM)	0.103
95% gamma percentile (KM)	0.113	99% gamma percentile (KM)	0.135
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (423.37, α)	376.7	Adjusted Chi Square Value (423.37, β)	373.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.0818	95% Gamma Adjusted KM-UCL (use when n<50)	0.0826
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0714	Mean in Log Scale	-2.66
SD in Original Scale	0.0152	SD in Log Scale	0.209
95% t UCL (assumes normality of ROS data)	0.0773	95% Percentile Bootstrap UCL	0.0769
95% BCA Bootstrap UCL	0.0775	95% Bootstrap t UCL	0.0776
95% H-UCL (Log ROS)	0.0779		

Appendix B
Pro UCL Outputs for Subsurface Soil Samples in Area 3
Caneel Bay Resort
St. John Island, U.S. Virigin Island

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.66	KM Geo Mean	0.07
KM SD (logged)	0.281	95% Critical H Value (KM-Log)	1.838
KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	0.0819
KM SD (logged)	0.281	95% Critical H Value (KM-Log)	1.838
KM Standard Error of Mean (logged)	0.14		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.095	Mean in Log Scale	-2.382
SD in Original Scale	0.0209	SD in Log Scale	0.253
95% t UCL (Assumes normality)	0.103	95% H-Stat UCL	0.106
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0907		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Appendix C: HHRA Intake and Risk/Hazard Calculations

TABLE C-1
CALCULATION OF CANCER RISKS FOR COPCS WITH A MUTAGENIC MODE OF ACTION IN SOIL (0-0.5 FT-BGS): FUTURE RESIDENT AT AREA 1
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Exposure Point:	Area 1
Exposure Medium:	Soil (Surface) 0-0.5 ft-bgs
Receptor:	Future Resident

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**IR** (mg/day)	**FS** (unitless)	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** (mg/kg-d)-1	**ADAF** (unitless)	**Risk**
Incidental Ingestion of Soil	Benzo(a)pyrene	6.20E-02	0 through <2	15	200	1	350	2	70	1.00E-06	365	1.00E+00	10	2.3E-07
		6.20E-02	2 through <6	15	200	1	350	4	70	1.00E-06	365	1.00E+00	3	1.4E-07
		6.20E-02	6 through <16	80	100	1	350	10	70	1.00E-06	365	1.00E+00	3	3.2E-08
		6.20E-02	16-26	80	100	1	350	10	70	1.00E-06	365	1.00E+00	1	1.1E-08
		TOTAL RISK - Incidental Ingestion of Soil:Benzo(a)pyrene												*4.0E-07*
	TOTAL RISK: Incidental Ingestion of Soil													**4.0E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**SA** (cm2)	**ABSd** (unitless)	**AF** mg/cm^2	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** $(mg/kg\text{-}d)^{-1}$	**ADAF** (unitless)	**Risk**
Dermal Contact with Soil	Benzo(a)pyrene	6.20E-02	0 through <2	15	2,373	0.13	0.20	350	2	70	1.00E-06	365	1.00E+00	10	7.0E-08
		6.20E-02	2 through <6	15	2,373	0.13	0.20	350	4	70	1.00E-06	365	1.00E+00	3	4.2E-08
		6.20E-02	6 through <16	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	3	1.7E-08
		6.20E-02	16-26	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	1	5.8E-09
		TOTAL RISK - Dermal Contact with Soil:Benzo(a)pyrene													*1.4E-07*
	TOTAL RISK: Dermal Contact with Soil														**1.4E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**VF** m^3/kg	**PEF** m^3/kg	**EF** (days/year)	**ED** (years)	**ET** (hours)	**AT** (years)	**CF_2** (days/year)	**CF_3** hours/day	**IUR** $(mg/m^3)^{-1}$	**ADAF** (unitless)	**Risk**
Inhalation of Fugitive Dust	Benzo(a)pyrene	6.20E-02	0 through <2	NA	1.36E+09	350	2	24	70	365	24	6.00E-01	10	7.5E-12
		6.20E-02	2 through <6	NA	1.36E+09	350	4	24	70	365	24	6.00E-01	3	4.5E-12
		6.20E-02	6 through <16	NA	1.36E+09	350	10	24	70	365	24	6.00E-01	3	1.1E-11
		6.20E-02	16-26	NA	1.36E+09	350	10	24	70	365	24	6.00E-01	1	3.7E-12
		TOTAL RISK - Inhalation of Fugitive Dust:Benzo(a)pyrene												*2.7E-11*
	TOTAL RISK: Inhalation of Fugitive Dust													**2.7E-11**
TOTAL CANCER RISK, ALL PATHWAYS (Ingestion, Dermal, Inhalation)														**5.4E-07**

Notes:
COPC = chemical of potential concern; BW = body weight; IR = soil ingestion rate; FS = fraction soil contact at Site; EF = exposure frequency; ET = Exposure Time; ED = exposure duration; AT = averaging time; CF = units conversion factor;
SA = skin surface area; AF =skin-soil adherence factor; ABSd = dermal absorption fraction; SF = oral/dermal cancer slope factor; ADAF = age-dependent adjustment factor (USEPA 2005); EPC = exposure point concentration
VF = volatilization factor; PEF = particulate emission factor; IUR = inhalation unit risk.
Risk = Incremental lifetime cancer risk.

Equations:

Incidental Ingestion: $Risk = EPC * IR * FS * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Dermal Contact: $Risk = EPC * SA * AF * ABSd * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Inhalation: $Risk = EPCair * EF * ET * ED * ADAF * IUR * 1/AT * 1/C3 * 1/C2$

Where $EPCair = EPC_{soil} * (1/VF + 1/PEF)$

TABLE C-2
CALCULATION OF CANCER RISKS FOR COPCS WITH A MUTAGENIC MODE OF ACTION IN SOIL (0-0.5 FT-BGS): FUTURE RESIDENT AT AREA 2
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Exposure Point:	Area 2
Exposure Medium:	Soil (Surface) 0-0.5 ft-bgs
Receptor:	Future Resident

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**IR** (mg/day)	**FS** (unitless)	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** (mg/kg-d)-1	**ADAF** (unitless)	**Risk**
Incidental Ingestion of Soil	Benzo(a)pyrene	7.60E-02	0 through <2	15	200	1	350	2	70	1.00E-06	365	1.00E+00	10	2.8E-07
		7.60E-02	2 through <6	15	200	1	350	4	70	1.00E-06	365	1.00E+00	3	1.7E-07
		7.60E-02	6 through <16	80	100	1	350	10	70	1.00E-06	365	1.00E+00	3	3.9E-08
		7.60E-02	16-26	80	100	1	350	10	70	1.00E-06	365	1.00E+00	1	1.3E-08
		TOTAL RISK - Incidental Ingestion of Soil:Benzo(a)pyrene												*5.0E-07*
	TOTAL RISK: Incidental Ingestion of Soil													**5.0E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**SA** (cm2)	**ABSd** (unitless)	**AF** mg/cm^2	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** $(mg/kg\text{-}d)^{-1}$	**ADAF** (unitless)	**Risk**
Dermal Contact with Soil	Benzo(a)pyrene	7.60E-02	0 through <2	15	2,373	0.13	0.20	350	2	70	1.00E-06	365	1.00E+00	10	8.6E-08
		7.60E-02	2 through <6	15	2,373	0.13	0.20	350	4	70	1.00E-06	365	1.00E+00	3	5.1E-08
		7.60E-02	6 through <16	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	3	2.1E-08
		7.60E-02	16-26	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	1	7.1E-09
		TOTAL RISK - Dermal Contact with Soil:Benzo(a)pyrene													*1.7E-07*
	TOTAL RISK: Dermal Contact with Soil														**1.7E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**VF** m^3/kg	**PEF** m^3/kg	**EF** (days/year)	**ED** (years)	**ET** (hours)	**AT** (years)	**CF_2** (days/year)	**CF_3** hours/day	**IUR** $(mg/m^3)^{-1}$	**ADAF** (unitless)	**Risk**
Inhalation of Fugitive Dust	Benzo(a)pyrene	7.60E-02	0 through <2	0	1.36E+09	350	2	24	70	365	24	6.00E-01	10	9.2E-12
		7.60E-02	2 through <6	0	1.36E+09	350	4	24	70	365	24	6.00E-01	3	5.5E-12
		7.60E-02	6 through <16	0	1.36E+09	350	10	24	70	365	24	6.00E-01	3	1.4E-11
		7.60E-02	16-26	0	1.36E+09	350	10	24	70	365	24	6.00E-01	1	4.6E-12
		TOTAL RISK - Inhalation of Fugitive Dust:Benzo(a)pyrene												*3.3E-11*
	TOTAL RISK: Inhalation of Fugitive Dust													**3.3E-11**
TOTAL CANCER RISK, ALL PATHWAYS (Ingestion, Dermal, Inhalation)														**6.6E-07**

Notes:
COPC = chemical of potential concern; BW = body weight; IR = soil ingestion rate; FS = fraction soil contact at Site; EF = exposure frequency; ET = Exposure Time; ED = exposure duration; AT = averaging time; CF = units conversion factor;
SA = skin surface area; AF =skin-soil adherence factor; ABSd = dermal absorption fraction; SF = oral/dermal cancer slope factor; ADAF = age-dependent adjustment factor (USEPA 2005); EPC = exposure point concentration
VF = volatilization factor; PEF = particulate emission factor; IUR = inhalation unit risk.
Risk = Incremental lifetime cancer risk.

Equations:

Incidental Ingestion: $Risk = EPC * IR * FS * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Dermal Contact: $Risk = EPC * SA * AF * ABSd * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Inhalation: $Risk = EPCair * EF * ET * ED * ADAF * IUR * 1/AT * 1/C3 * 1/C2$

Where $EPCair = EPC_{soil} * (1/VF + 1/PEF)$

TABLE C-3
CALCULATION OF CANCER RISKS FOR COPCS WITH A MUTAGENIC MODE OF ACTION IN SOIL (0-0.5 FT-BGS): FUTURE RESIDENT AT AREA 3
REASONABLE MAXIMUM EXPOSURE
Caneel Bay Resort; St. John Island, U.S. Virgin Island

Exposure Point:	Area 3
Exposure Medium:	Soil (Surface) 0-0.5 ft-bgs
Receptor:	Future Resident

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**IR** (mg/day)	**FS** (unitless)	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** (mg/kg-d)-1	**ADAF** (unitless)	**Risk**
Incidental Ingestion of Soil	Benzo(a)pyrene	7.10E-02	0 through <2	15	200	1	350	2	70	1.00E-06	365	1.00E+00	10	2.6E-07
		7.10E-02	2 through <6	15	200	1	350	4	70	1.00E-06	365	1.00E+00	3	1.6E-07
		7.10E-02	6 through <16	80	100	1	350	10	70	1.00E-06	365	1.00E+00	3	3.6E-08
		7.10E-02	16-26	80	100	1	350	10	70	1.00E-06	365	1.00E+00	1	1.2E-08
		TOTAL RISK - Incidental Ingestion of Soil:Benzo(a)pyrene												*4.6E-07*
	TOTAL RISK: Incidental Ingestion of Soil													**4.6E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**BW** (kg)	**SA** (cm2)	**ABSd** (unitless)	**AF** mg/cm^2	**EF** (days/year)	**ED** (years)	**AT** (years)	**CF_1** (kg/mg)	**CF_2** (days/year)	**SF** $(mg/kg\text{-}d)^{-1}$	**ADAF** (unitless)	**Risk**
Dermal Contact with Soil	Benzo(a)pyrene	7.10E-02	0 through <2	15	2,373	0.13	0.20	350	2	70	1.00E-06	365	1.00E+00	10	8.0E-08
		7.10E-02	2 through <6	15	2,373	0.13	0.20	350	4	70	1.00E-06	365	1.00E+00	3	4.8E-08
		7.10E-02	6 through <16	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	3	2.0E-08
		7.10E-02	16-26	80	6,032	0.13	0.07	350	10	70	1.00E-06	365	1.00E+00	1	6.7E-09
		TOTAL RISK - Dermal Contact with Soil:Benzo(a)pyrene													*1.5E-07*
	TOTAL RISK: Dermal Contact with Soil														**1.5E-07**

Exposure Pathway	**COPC**	**EPC** (mg/kg)	**Age** (years)	**VF** m^3/kg	**PEF** m^3/kg	**EF** (days/year)	**ED** (years)	**ET** (hours)	**AT** (years)	**CF_2** (days/year)	**CF_3** hours/day	**IUR** $(mg/m^3)^{-1}$	**ADAF** (unitless)	**Risk**
Inhalation of Fugitive Dust	Benzo(a)pyrene	7.10E-02	0 through <2	0	1.36E+09	350	2	24	70	365	24	6.00E-01	10	8.58E-12
		7.10E-02	2 through <6	0	1.36E+09	350	4	24	70	365	24	6.00E-01	3	5.1E-12
		7.10E-02	6 through <16	0	1.36E+09	350	10	24	70	365	24	6.00E-01	3	1.3E-11
		7.10E-02	16-26	0	1.36E+09	350	10	24	70	365	24	6.00E-01	1	4.3E-12
		TOTAL RISK - Inhalation of Fugitive Dust:Benzo(a)pyrene												*3.1E-11*
	TOTAL RISK: Inhalation of Fugitive Dust													**3.1E-11**
TOTAL CANCER RISK, ALL PATHWAYS (Ingestion, Dermal, Inhalation)														**6.2E-07**

Notes:
COPC = chemical of potential concern; BW = body weight; IR = soil ingestion rate; FS = fraction soil contact at Site; EF = exposure frequency; ET = Exposure Time; ED = exposure duration; AT = averaging time; CF = units conversion factor;
SA = skin surface area; AF =skin-soil adherence factor; ABSd = dermal absorption fraction; SF = oral/dermal cancer slope factor; ADAF = age-dependent adjustment factor (USEPA 2005); EPC = exposure point concentration
VF = volatilization factor; PEF = particulate emission factor; IUR = inhalation unit risk.
Risk = Incremental lifetime cancer risk.

Equations:

Incidental Ingestion: $Risk = EPC * IR * FS * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Dermal Contact: $Risk = EPC * SA * AF * ABSd * EF * ED * CF_1 * SF * ADAF * 1/BW * 1/AT * 1/CF_2$

Inhalation: $Risk = EPCair * EF * ET * ED * ADAF * IUR * 1/AT * 1/C3 * 1/C2$

Where $EPCair = EPC_{soil} * (1/VF + 1/PEF)$

TABLE C-4

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE PARK/RESORT WORKER FOR AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park/Resort Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 1	Incidental Ingestion	Arsenic	5.3E+00	mg/kg	3.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.8E-07	2.7E-06	mg/kg-day	3.0E-04	mg/kg/day	9.1E-03
				Thallium	1.4E-01	mg/kg	1.7E-08	mg/kg-day	-		--	1.2E-07	mg/kg-day	1.0E-05	mg/kg/day	1.2E-02
				Benzo(a)pyrene	6.2E-02	mg/kg	7.6E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	7.6E-09	5.3E-08	mg/kg-day	3.0E-04	mg/kg/day	1.8E-04
			Exp Route Total								5.9E-07					2.1E-02
			Dermal Contact	Arsenic	5.3E+00	mg/kg	8.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-07	5.8E-07	mg/kg-day	3.0E-04	mg/kg/day	1.9E-03
				Thallium	1.4E-01	mg/kg	$^{-a}$	mg/kg-day	$^{-a}$	$(mg/kg\text{-}day)^{-1}$	--	$^{-a}$	mg/kg-day	$^{-a}$	mg/kg/day	--
				Benzo(a)pyrene	6.2E-02	mg/kg	4.2E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	4.2E-09	2.9E-08	mg/kg-day	3.0E-04	mg/kg/day	9.7E-05
			Exp Route Total								1.3E-07					2.0E-03
			Inhalation (Fugitive Dust)	Arsenic	5.3E+00	mg/kg	1.3E-10	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	5.5E-10	8.9E-10	mg/m^3	1.5E-05	mg/m^3	5.9E-05
				Thallium	1.4E-01	mg/kg	3.4E-12	mg/m^3	-		--	2.4E-11	mg/m^4	-		--
				Benzo(a)pyrene	6.2E-02	mg/kg	1.5E-12	mg/m^3	6.0E-01	$(mg/m^3)^{-1}$	8.9E-13	1.0E-11	mg/m^5	2.0E-06	mg/m^3	5.2E-06
			Exp Route Total								5.5E-10					6.5E-05
		Exposure Point Total									7.2E-07					2.3E-02
	Exposure Medium Total										7.2E-07					2.3E-02
Risk From Reference											NA					NA
Risk from Site											7.2E-07					2.3E-02
							Total of Receptor Risks Across All Media				7.2E-07					2.3E-02
							Risks from Reference				NA					NA
							Risks from Site				7.2E-07					2.3E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"$-_a$" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE PARK/RESORT WORKER FOR AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park/Resort Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 2	Incidental Ingestion	Arsenic	6.6E+00	mg/kg	4.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	7.3E-07	3.4E-06	mg/kg-day	3.0E-04	mg/kg/day	1.1E-02
				4,4'-DDD	4.1E-01	mg/kg	5.0E-08	mg/kg-day	2.4E-01	(mg/kg-day)$^{-1}$	1.2E-08	3.5E-07	mg/kg-day	3.0E-05	mg/kg/day	1.2E-02
				4,4'-DDE	7.9E-01	mg/kg	9.7E-08	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	3.3E-08	6.8E-07	mg/kg-day	3.0E-04	mg/kg/day	2.3E-03
				4,4'-DDT	1.5E+00	mg/kg	1.8E-07	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	6.2E-08	1.3E-06	mg/kg-day	5.0E-04	mg/kg/day	2.6E-03
				Aldrin	4.4E-02	mg/kg	5.4E-09	mg/kg-day	1.7E+01	(mg/kg-day)$^{-1}$	9.2E-08	3.8E-08	mg/kg-day	3.0E-05	mg/kg/day	1.3E-03
				Chlordane (technical)	4.4E-01	mg/kg	5.4E-08	mg/kg-day	3.5E-01	(mg/kg-day)$^{-1}$	1.9E-08	3.8E-07	mg/kg-day	5.0E-04	mg/kg/day	7.5E-04
				Dieldrin	2.4E+00	mg/kg	3.0E-07	mg/kg-day	1.6E+01	(mg/kg-day)$^{-1}$	4.7E-06	2.1E-06	mg/kg-day	5.0E-05	mg/kg/day	4.1E-02
				Benzo(a)pyrene	7.6E-02	mg/kg	9.3E-09	mg/kg-day	1.0E+00	(mg/kg-day)$^{-1}$	9.3E-09	6.5E-08	mg/kg-day	3.0E-04	mg/kg/day	2.2E-04
			Exp Route Total								5.7E-06					7.1E-02
			Dermal Contact	Arsenic	6.6E+00	mg/kg	1.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.5E-07	7.2E-07	mg/kg-day	3.0E-04	mg/kg/day	2.4E-03
				4,4'-DDD	4.1E-01	mg/kg	2.1E-08	mg/kg-day	2.4E-01	(mg/kg-day)$^{-1}$	5.1E-09	1.5E-07	mg/kg-day	3.0E-05	mg/kg/day	4.9E-03
				4,4'-DDE	7.9E-01	mg/kg	-[a]		-[a]		--	-[a]		-[a]		--
				4,4'-DDT	1.5E+00	mg/kg	2.3E-08	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	7.9E-09	1.6E-07	mg/kg-day	5.0E-04	mg/kg/day	3.3E-04
				Aldrin	4.4E-02	mg/kg	-[a]		-[a]		--	-[a]		-[a]		--
				Chlordane (technical)	4.4E-01	mg/kg	9.1E-09	mg/kg-day	3.5E-01	(mg/kg-day)$^{-1}$	3.2E-09	6.4E-08	mg/kg-day	5.0E-04	mg/kg/day	1.3E-04
				Dieldrin	2.4E+00	mg/kg	1.3E-07	mg/kg-day	1.6E+01	(mg/kg-day)$^{-1}$	2.0E-06	8.8E-07	mg/kg-day	5.0E-05	mg/kg/day	1.8E-02
				Benzo(a)pyrene	7.6E-02	mg/kg	5.1E-09	mg/kg-day	1.0E+00	(mg/kg-day)$^{-1}$	5.1E-09	3.6E-08	mg/kg-day	3.0E-04	mg/kg/day	1.2E-04
			Exp Route Total								2.2E-06					2.5E-02
			Inhalation (Fugitive Dust)	Arsenic	6.6E+00	mg/kg	1.6E-10	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	6.8E-10	1.1E-09	mg/m^3	1.5E-05	mg/m^3	7.4E-05
				4,4'-DDD	4.1E-01	mg/kg	9.8E-12	mg/m^3	6.9E-02	$(mg/m^3)^{-1}$	6.7E-13	6.8E-11	mg/m^4	-		--
				4,4'-DDE	7.9E-01	mg/kg	1.2E-08	mg/m^3	9.7E-02	$(mg/m^3)^{-1}$	1.2E-09	8.6E-08	mg/m^5	-		--
				4,4'-DDT	1.5E+00	mg/kg	3.6E-11	mg/m^3	9.7E-02	$(mg/m^3)^{-1}$	3.5E-12	2.5E-10	mg/m^6	-		--
				Aldrin	4.4E-02	mg/kg	8.4E-10	mg/m^3	4.9E+00	$(mg/m^3)^{-1}$	4.1E-09	5.9E-09	mg/m^7	-		--
				Chlordane (technical)	4.4E-01	mg/kg	9.4E-09	mg/m^3	1.0E-01	$(mg/m^3)^{-1}$	9.4E-10	6.6E-08	mg/m^8	7.0E-04	mg/m^3	9.4E-05
				Dieldrin	2.4E+00	mg/kg	5.8E-11	mg/m^3	4.6E+00	$(mg/m^3)^{-1}$	2.7E-10	4.1E-10	mg/m^9	-		--
				Benzo(a)pyrene	7.6E-02	mg/kg	1.8E-12	mg/m^3	6.0E-01	$(mg/m^3)^{-1}$	1.1E-12	1.3E-11	mg/m^{10}	2.0E-06	mg/m^3	6.4E-06
			Exp Route Total								7.2E-09					1.7E-04
		Exposure Point Total									7.9E-06					9.7E-02
	Exposure Medium Total										7.9E-06					9.7E-02
Risk From Reference											NA					NA
Risk from Site											7.9E-06					9.7E-02
							Total of Receptor Risks Across All Media				7.9E-06					9.7E-02
							Risks from Reference				NA					NA
							Risks from Site				7.9E-06					9.7E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"-[a]" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE PARK/RESORT WORKER FOR AREA 3

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park/Resort Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 3	Incidental Ingestion	Arsenic	2.4E+00	mg/kg	1.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.7E-07	1.2E-06	mg/kg-day	3.0E-04	mg/kg/day	4.2E-03
				Benzo(a)pyrene	7.1E-02	mg/kg	8.7E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	8.7E-09	6.1E-08	mg/kg-day	3.0E-04	mg/kg/day	2.0E-04
			Exp Route Total								2.8E-07					4.4E-03
			Dermal Contact	Arsenic	2.4E+00	mg/kg	3.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.7E-08	2.6E-07	mg/kg-day	3.0E-04	mg/kg/day	8.8E-04
				Benzo(a)pyrene	7.1E-02	mg/kg	4.8E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	4.8E-09	3.3E-08	mg/kg-day	3.0E-04	mg/kg/day	1.1E-04
			Exp Route Total								6.1E-08					9.9E-04
			Inhalation (Fugitive Dust)	Arsenic	2.4E+00	mg/kg	5.8E-11	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	2.5E-10	4.1E-10	mg/m^3	1.5E-05	mg/m^3	2.7E-05
				Benzo(a)pyrene	7.1E-02	mg/kg	1.7E-12	mg/m^3	6.0E-01	$(mg/m^3)^{-1}$	1.0E-12	1.2E-11	mg/m^5	2.0E-06	mg/m^3	6.0E-06
			Exp Route Total								2.5E-10					3.3E-05
		Exposure Point Total									3.4E-07					5.4E-03
	Exposure Medium Total										3.4E-07					5.4E-03
Risk From Reference											NA					NA
Risk from Site											3.4E-07					5.4E-03
							Total of Receptor Risks Across All Media				3.4E-07					5.4E-03
							Risks from Reference				NA					NA
							Risks from Site				3.4E-07					5.4E-03

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"$-_a$" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-7

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface (0-0.5') ISM Data	Area 1	Incidental Ingestion	Arsenic	5.3E+00	mg/kg	1.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-07	9.0E-06	mg/kg-day	3.0E-04	mg/kg/day	3.0E-02
				Thallium	1.4E-01	mg/kg	5.7E-09	mg/kg-day	-		--	4.0E-07	mg/kg-day	1.0E-05	mg/kg/day	4.0E-02
				Benzo(a)pyrene	6.2E-02	mg/kg	2.5E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	2.5E-09	1.8E-07	mg/kg-day	3.0E-04	mg/kg/day	5.8E-04
			Exp Route Total								2.0E-07					7.0E-02
			Dermal Contact	Arsenic	5.3E+00	mg/kg	2.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-08	1.4E-06	mg/kg-day	3.0E-04	mg/kg/day	4.8E-03
				Thallium	1.4E-01	mg/kg	-a		-a		--	-a		-a		--
				Benzo(a)pyrene	6.2E-02	mg/kg	1.0E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-09	7.3E-08	mg/kg-day	3.0E-04	mg/kg/day	2.4E-04
			Exp Route Total								3.2E-08					5.0E-03
			Inhalation (Fugitive Dust)	Arsenic	5.3E+00	mg/kg	1.3E-11	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	5.5E-11	8.9E-10	mg/m^3	1.5E-05	mg/m^3	5.9E-05
				Thallium	1.4E-01	mg/kg	3.4E-13	mg/m^3	-		--	2.4E-11	mg/m^4	-		--
				Benzo(a)pyrene	6.2E-02	mg/kg	1.5E-13	mg/m^3	6.0E-01	$(mg/m^3)^{-1}$	8.9E-14	1.0E-11	mg/m^5	2.0E-06	mg/m^3	5.2E-06
			Exp Route Total								5.5E-11					6.5E-05
		Exposure Point Total									2.3E-07					7.5E-02
	Exposure Medium Total										2.3E-07					7.5E-02
Risk From Reference											NA					NA
Risk from Site											2.3E-07					7.5E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"-a" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-8

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface (0-0.5') ISM Data	Area 2	Incidental Ingestion	Arsenic	6.6E+00	mg/kg	1.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.4E-07	1.1E-05	mg/kg-day	3.0E-04	mg/kg/day	3.7E-02
				4,4'-DDD	4.1E-01	mg/kg	1.6E-08	mg/kg-day	2.4E-01	(mg/kg-day)$^{-1}$	3.9E-09	1.1E-06	mg/kg-day	3.0E-05	mg/kg/day	3.8E-02
				4,4'-DDE	7.9E-01	mg/kg	3.2E-08	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	1.1E-08	2.2E-06	mg/kg-day	3.0E-04	mg/kg/day	7.4E-03
				4,4'-DDT	1.5E+00	mg/kg	6.1E-08	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	2.1E-08	4.2E-06	mg/kg-day	5.0E-04	mg/kg/day	8.5E-03
				Aldrin	4.4E-02	mg/kg	1.8E-09	mg/kg-day	1.7E+01	(mg/kg-day)$^{-1}$	3.0E-08	1.3E-07	mg/kg-day	3.0E-05	mg/kg/day	4.2E-03
				Chlordane (technical)	4.4E-01	mg/kg	1.8E-08	mg/kg-day	3.5E-01	(mg/kg-day)$^{-1}$	6.2E-09	1.2E-06	mg/kg-day	5.0E-04	mg/kg/day	2.5E-03
				Dieldrin	2.4E+00	mg/kg	9.8E-08	mg/kg-day	1.6E+01	(mg/kg-day)$^{-1}$	1.6E-06	6.8E-06	mg/kg-day	5.0E-05	mg/kg/day	1.4E-01
				Benzo(a)pyrene	7.6E-02	mg/kg	3.1E-09	mg/kg-day	1.0E+00	(mg/kg-day)$^{-1}$	3.1E-09	2.1E-07	mg/kg-day	3.0E-04	mg/kg/day	7.2E-04
			Exp Route Total								1.9E-06					2.4E-01
			Dermal Contact	Arsenic	6.6E+00	mg/kg	2.6E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	3.8E-08	1.8E-06	mg/kg-day	3.0E-04	mg/kg/day	6.0E-03
				4,4'-DDD	4.1E-01	mg/kg	5.3E-09	mg/kg-day	2.4E-01	(mg/kg-day)$^{-1}$	1.3E-09	3.7E-07	mg/kg-day	3.0E-05	mg/kg/day	1.2E-02
				4,4'-DDE	7.9E-01	mg/kg	-a		-a		--	-a		-a		--
				4,4'-DDT	1.5E+00	mg/kg	5.8E-09	mg/kg-day	3.4E-01	(mg/kg-day)$^{-1}$	2.0E-09	4.1E-07	mg/kg-day	5.0E-04	mg/kg/day	8.2E-04
				Aldrin	4.4E-02	mg/kg	-a		-a		--	-a		-a		--
				Chlordane (technical)	4.4E-01	mg/kg	2.3E-09	mg/kg-day	3.5E-01	(mg/kg-day)$^{-1}$	8.0E-10	1.6E-07	mg/kg-day	5.0E-04	mg/kg/day	3.2E-04
				Dieldrin	2.4E+00	mg/kg	3.1E-08	mg/kg-day	1.6E+01	(mg/kg-day)$^{-1}$	5.0E-07	2.2E-06	mg/kg-day	5.0E-05	mg/kg/day	4.4E-02
				Benzo(a)pyrene	7.6E-02	mg/kg	1.3E-09	mg/kg-day	1.0E+00	(mg/kg-day)$^{-1}$	1.3E-09	9.0E-08	mg/kg-day	3.0E-04	mg/kg/day	3.0E-04
			Exp Route Total								5.4E-07					6.4E-02
			Inhalation (Fugitive Dust)	Arsenic	6.6E+00	mg/kg	1.6E-11	mg/m^3	4.3E+00	(mg/m^3)$^{-1}$	6.8E-11	1.1E-09	mg/m^3	1.5E-05	mg/m^3	7.4E-05
				4,4'-DDD	4.1E-01	mg/kg	9.8E-13	mg/m^3	6.9E-02	(mg/m^3)$^{-1}$	6.7E-14	6.8E-11	mg/m^4	-		--
				4,4'-DDE	7.9E-01	mg/kg	1.2E-09	mg/m^3	9.7E-02	(mg/m^3)$^{-1}$	1.2E-10	8.6E-08	mg/m^5	-		--
				4,4'-DDT	1.5E+00	mg/kg	3.6E-12	mg/m^3	9.7E-02	(mg/m^3)$^{-1}$	3.5E-13	2.5E-10	mg/m^6	-		--
				Aldrin	4.4E-02	mg/kg	8.4E-11	mg/m^3	4.9E+00	(mg/m^3)$^{-1}$	4.1E-10	5.9E-09	mg/m^7	-		--
				Chlordane (technical)	4.4E-01	mg/kg	9.4E-10	mg/m^3	1.0E-01	(mg/m^3)$^{-1}$	9.4E-11	6.6E-08	mg/m^8	7.0E-04	mg/m^3	9.4E-05
				Dieldrin	2.4E+00	mg/kg	5.8E-12	mg/m^3	4.6E+00	(mg/m^3)$^{-1}$	2.7E-11	4.1E-10	mg/m^9	-		--
				Benzo(a)pyrene	7.6E-02	mg/kg	1.8E-13	mg/m^{10}	6.0E-01	(mg/m^3)$^{-1}$	1.1E-13	1.3E-11	mg/m^{10}	2.0E-06	mg/m^3	6.4E-06
			Exp Route Total								7.2E-10					1.7E-04
		Exposure Point Total									2.4E-06					3.0E-01
	Exposure Medium Total										2.4E-06					3.0E-01
Risk From Reference											NA					NA
Risk from Site											2.4E-06					3.0E-01

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"-$_a$" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-9

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE CONSTRUCTION WORKER AREA 3: SURFACE SOIL

REASONABLE MAXIMUM EXPOSURE: ISM DATA

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface (0-0.5') ISM Data	Area 3	Incidental Ingestion	Arsenic	2.4E+00	mg/kg	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-08	4.1E-06	mg/kg-day	3.0E-04	mg/kg/day	1.4E-02
				Benzo(a)pyrene	7.1E-02	mg/kg	2.9E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-09	2.0E-07	mg/kg-day	3.0E-04	mg/kg/day	6.7E-04
			Exp Route Total								9.1E-08					1.4E-02
			Dermal Contact	Arsenic	2.4E+00	mg/kg	9.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08	6.6E-07	mg/kg-day	3.0E-04	mg/kg/day	2.2E-03
				Benzo(a)pyrene	7.1E-02	mg/kg	1.2E-09	mg/kg-day	1.0E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-09	8.4E-08	mg/kg-day	3.0E-04	mg/kg/day	2.8E-04
			Exp Route Total								1.5E-08					2.5E-03
			Inhalation (Fugitive Dust)	Arsenic	2.4E+00	mg/kg	5.8E-12	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	2.5E-11	4.1E-10	mg/m^3	1.5E-05	mg/m^3	2.7E-05
				Benzo(a)pyrene	7.1E-02	mg/kg	1.7E-13	mg/m^3	6.0E-01	$(mg/m^3)^{-1}$	1.0E-13	1.2E-11	mg/m^3	2.0E-06	mg/m^3	6.0E-06
			Exp Route Total								2.5E-11					3.3E-05
		Exposure Point Total									1.1E-07					1.7E-02
	Exposure Medium Total										1.1E-07					1.7E-02
Risk From Reference											NA					NA
Risk from Site											1.1E-07					1.7E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"$-_a$" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

"$-_b$" = Constituent not considered volatile, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-10

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: CURRENT/FUTURE CONSTRUCTION WORKER AREA 3: SUBSURFACE SOIL

REASONABLE MAXIMUM EXPOSURE: DISCRETE DATA

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Subsurface (0-6') Discrete Data	Area 3	Incidental Ingestion	Arsenic	2.6E+00	mg/kg	6.2E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	9.3E-08	4.3E-06	mg/kg-day	3.0E-04	mg/kg/day	1.4E-02
				Thallium	9.1E-02	mg/kg	3.7E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	--	2.6E-07	mg/kg-day	1.0E-05	mg/kg/day	2.6E-02
			Exp Route Total								9.3E-08					4.0E-02
			Dermal Contact	Arsenic	2.6E+00	mg/kg	9.9E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.5E-08	6.9E-07	mg/kg-day	3.0E-04	mg/kg/day	2.3E-03
				Thallium	9.1E-02	mg/kg	$^{-a}$		$^{-a}$		--	$^{-a}$		$^{-a}$		--
			Exp Route Total								1.5E-08					2.3E-03
			Inhalation (Fugitive Dust)	Arsenic	2.6E+00	mg/kg	6.1E-12	mg/m^3	4.3E+00	(mg/m^3)$^{-1}$	2.6E-11	4.3E-10	mg/m^3	1.5E-05	mg/m^3	2.9E-05
				Thallium	9.1E-02	mg/kg	2.2E-13	mg/m^3	-		--	1.5E-11	mg/m^3	-		--
			Exp Route Total								2.6E-11					2.9E-05
		Exposure Point Total									1.1E-07					4.2E-02
	Exposure Medium Total										1.1E-07					4.2E-02
Risk From Reference											NA					NA
Risk from Site											1.1E-07					4.2E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

"-" = Not available

"$-_a$" = No dermal absorbed fraction from soil available, therefore risk was not calculated.

"$-_b$" = Constituent not considered volatile, therefore risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-11

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: FUTURE RESIDENT AT AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child and Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 1	Incidental Ingestion	Arsenic	5.3E+00	mg/kg	4.6E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.9E-06	4.1E-05	mg/kg-day	3.0E-04	mg/kg/day	1.4E-01
				Thallium	1.4E-01	mg/kg	2.0E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	--	1.8E-06	mg/kg-day	1.0E-05	mg/kg/day	1.8E-01
				Benzo(a)pyrene	6.2E-02	mg/kg	*		*		4.0E-07	7.9E-07	mg/kg-day	3.0E-04	mg/kg/day	2.6E-03
			Exp Route Total								7.3E-06					3.2E-01
			Dermal Contact	Arsenic	5.3E+00	mg/kg	6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.7E-07	4.8E-06	mg/kg-day	3.0E-04	mg/kg/day	1.6E-02
				Thallium	1.4E-01	mg/kg	-[a]	mg/kg-day	-[a]	$(mg/kg\text{-}day)^{-1}$	--	-[a]		-[a]		--
				Benzo(a)pyrene	6.2E-02	mg/kg	*		*		1.4E-07	2.4E-07	mg/kg-day	3.0E-04	mg/kg/day	8.2E-04
			Exp Route Total								1.1E-06					1.7E-02
			Inhalation (Fugitive Dust)	Arsenic	5.3E+00	mg/kg	1.4E-09	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	6.0E-09	3.7E-09	mg/m^3	1.5E-05	mg/m^3	2.5E-04
				Thallium	1.4E-01	mg/kg	3.7E-11	mg/m^3	-	$(mg/m^3)^{-1}$	--	9.9E-11	mg/m^3	-		--
				Benzo(a)pyrene	6.2E-02	mg/kg	*		*		2.7E-11	4.4E-11	mg/m^3	2.0E-06	mg/m^3	2.2E-05
			Exp Route Total								6.0E-09					2.7E-04
		Exposure Point Total									8.4E-06					3.3E-01
	Exposure Medium Total										8.4E-06					3.3E-01
Risk From Reference											NA					NA
Risk from Site											8.4E-06					3.3E-01
							Total of Receptor Risks Across All Media				8.4E-06					3.3E-01
							Risks from Reference				NA					NA
							Risks from Site				8.4E-06					3.3E-01

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

* Cancer risks for benzo(a)pyrene include a receptor-specific Age-Dependent Adjustment Factor. Derivation of cancer risk for these compounds is shown in Table C-1 and C-2 in Appendix C.

"-" = Not available

"-[a]" = No dermal absorbed fraction from soil available; therefore, risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: FUTURE RESIDENT AT AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child and Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 2	Incidental Ingestion	Arsenic	6.6E+00	mg/kg	5.7E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.6E-06	5.1E-05	mg/kg-day	3.0E-04	mg/kg/day	1.7E-01
				4,4'-DDD	4.1E-01	mg/kg	5.9E-07	mg/kg-day	2.4E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-07	5.2E-06	mg/kg-day	3.0E-05	mg/kg/day	1.7E-01
				4,4'-DDE	7.9E-01	mg/kg	1.1E-06	mg/kg-day	3.4E-01	$(mg/kg\text{-}day)^{-1}$	3.9E-07	1.0E-05	mg/kg-day	3.0E-04	mg/kg/day	3.4E-02
				4,4'-DDT	1.5E+00	mg/kg	2.2E-06	mg/kg-day	3.4E-01	$(mg/kg\text{-}day)^{-1}$	7.3E-07	1.9E-05	mg/kg-day	5.0E-04	mg/kg/day	3.8E-02
				Aldrin	4.4E-02	mg/kg	6.4E-08	mg/kg-day	1.7E+01	$(mg/kg\text{-}day)^{-1}$	1.1E-06	5.7E-07	mg/kg-day	3.0E-05	mg/kg/day	1.9E-02
				Chlordane (technical)	4.4E-01	mg/kg	6.3E-07	mg/kg-day	3.5E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-07	5.6E-06	mg/kg-day	5.0E-04	mg/kg/day	1.1E-02
				Dieldrin	2.4E+00	mg/kg	3.5E-06	mg/kg-day	1.6E+01	$(mg/kg\text{-}day)^{-1}$	5.6E-05	3.1E-05	mg/kg-day	5.0E-05	mg/kg/day	6.2E-01
				Benzo(a)pyrene	7.6E-02	mg/kg	*		*		5.0E-07	9.7E-07	mg/kg-day	3.0E-04	mg/kg/day	3.2E-03
			Exp Route Total								6.7E-05					1.1E+00
			Dermal Contact	Arsenic	6.6E+00	mg/kg	8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06	6.0E-06	mg/kg-day	3.0E-04	mg/kg/day	2.0E-02
				4,4'-DDD	4.1E-01	mg/kg	2E-07	mg/kg-day	2.4E-01	$(mg/kg\text{-}day)^{-1}$	4.0E-08	1.2E-06	mg/kg-day	3.0E-05	mg/kg/day	4.1E-02
				4,4'-DDE	7.9E-01	mg/kg	-[a]		-[a]		--	-[a]		-[a]		--
				4,4'-DDT	1.5E+00	mg/kg	2E-07	mg/kg-day	3.4E-01	$(mg/kg\text{-}day)^{-1}$	6.2E-08	1.4E-06	mg/kg-day	5.0E-04	mg/kg/day	2.7E-03
				Aldrin	4.4E-02	mg/kg	-[a]		-[a]		--	-[a]		-[a]		--
				Chlordane (technical)	4.4E-01	mg/kg	7E-08	mg/kg-day	3.5E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-08	5.3E-07	mg/kg-day	5.0E-04	mg/kg/day	1.1E-03
				Dieldrin	2.4E+00	mg/kg	1E-06	mg/kg-day	1.6E+01	$(mg/kg\text{-}day)^{-1}$	1.6E-05	7.3E-06	mg/kg-day	5.0E-05	mg/kg/day	1.5E-01
				Benzo(a)pyrene	7.6E-02	mg/kg	*		*		1.7E-07	3.0E-07	mg/kg-day	3.0E-04	mg/kg/day	1.0E-03
			Exp Route Total								1.7E-05					2.1E-01
			Inhalation (Fugitive Dust)	Arsenic	6.6E+00	mg/kg	1.7E-09	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	7.4E-09	4.7E-09	mg/m^3	1.5E-05	mg/m^3	3.1E-04
				4,4'-DDD	4.1E-01	mg/kg	1.1E-10	mg/m^3	6.9E-02	$(mg/m^3)^{-1}$	7.4E-12	2.9E-10	mg/m^4	-		--
				4,4'-DDE	7.9E-01	mg/kg	1.3E-07	mg/m^3	9.7E-02	$(mg/m^3)^{-1}$	1.3E-08	3.6E-07	mg/m^5	-		--
				4,4'-DDT	1.5E+00	mg/kg	3.9E-10	mg/m^3	9.7E-02	$(mg/m^3)^{-1}$	3.8E-11	1.1E-09	mg/m^6	-		--
				Aldrin	4.4E-02	mg/kg	9.2E-09	mg/m^3	4.9E+00	$(mg/m^3)^{-1}$	4.5E-08	2.5E-08	mg/m^7	-		--
				Chlordane (technical)	4.4E-01	mg/kg	1.0E-07	mg/m^3	1.0E-01	$(mg/m^3)^{-1}$	1.0E-08	2.8E-07	mg/m^8	7.0E-04	mg/m^3	3.9E-04
				Dieldrin	2.4E+00	mg/kg	6.3E-10	mg/m^3	4.6E+00	$(mg/m^3)^{-1}$	2.9E-09	1.7E-09	mg/m^9	-		--
				Benzo(a)pyrene	7.6E-02	mg/kg	*		*		3.3E-11	5.4E-11	mg/m^{10}	2.0E-06	mg/m^3	2.7E-05
			Exp Route Total								7.9E-08					7.3E-04
		Exposure Point Total									8.5E-05					1.3E+00
	Exposure Medium Total										8.5E-05					1.3E+00
Risk From Reference											NA					NA
Risk from Site											8.5E-05					1.3E+00
							Total of Receptor Risks Across All Media				8.5E-05					1.3E+00
							Risks from Reference				NA					NA
							Risks from Site				8.5E-05					1.3E+00

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

* Cancer risks for benzo(a)pyrene include a receptor-specific Age-Dependent Adjustment Factor. Derivation of cancer risk for these compounds is shown in Table C-1 and C-2 in Appendix C.

"-" = Not available

"-[a]" = No dermal absorbed fraction from soil available; therefore, risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-13

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS: FUTURE RESIDENT AT AREA 3

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child and Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk*		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil (0-0.5')	Area 3	Incidental Ingestion	Arsenic	2.4E+00	mg/kg	2.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-06	1.9E-05	mg/kg-day	3.0E-04	mg/kg/day	6.2E-02
				Benzo(a)pyrene	7.1E-02	mg/kg	*		*		4.6E-07	9.1E-07	mg/kg-day	3.0E-04	mg/kg/day	3.0E-03
			Exp Route Total								3.6E-06					6.5E-02
			Dermal Contact	Arsenic	2.4E+00	mg/kg	3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-07	2.2E-06	mg/kg-day	3.0E-04	mg/kg/day	7.4E-03
				Benzo(a)pyrene	7.1E-02	mg/kg	*		*		1.5E-07	2.8E-07	mg/kg-day	3.0E-04	mg/kg/day	9.3E-04
			Exp Route Total								6.0E-07					8.3E-03
			Inhalation (Fugitive Dust)	Arsenic	2.4E+00	mg/kg	6.4E-10	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	2.7E-09	1.7E-09	mg/m^3	1.5E-05	mg/m^3	1.1E-04
				Benzo(a)pyrene	7.1E-02	mg/kg	*		*		3.1E-11	5.0E-11	mg/m3	2.0E-06	mg/m^3	2.5E-05
			Exp Route Total								2.8E-09					1.4E-04
		Exposure Point Total									4.2E-06					7.4E-02
	Exposure Medium Total										4.2E-06					7.4E-02
Risk From Reference											NA					NA
Risk from Site											4.2E-06					7.4E-02
							Total of Receptor Risks Across All Media				4.2E-06					7.4E-02
							Risks from Reference				NA					NA
							Risks from Site				4.2E-06					7.4E-02

(1) EPC = Exposure Point Concentration; CSF = Cancer Slope Factor; RfD = Reference Dose; RfC = Reference Concentration

(2) Cancer risk = Intake/exposure equation * CSF or Unit Risk; Hazard Index = Intake/exposure equation / RfD or RfC.

* Cancer risks for benzo(a)pyrene include a receptor-specific Age-Dependent Adjustment Factor. Derivation of cancer risk for these compounds is shown in Table C-1 and C-2 in Appendix C.

"-" = Not available

"$-_a$" = No dermal absorbed fraction from soil available; therefore, risk was not calculated.

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

mg/L = milligrams per liter

NA = Not applicable

TABLE C-14

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT/FUTURE PARK/RESORT WORKER FOR AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park/Resort Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5')	Soil	Area 1	Arsenic	5.8E-07	5.5E-10	1.2E-07	7.1E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	9.1E-03	5.9E-05	1.9E-03	1.1E-02
			Thallium	--	--	--	--	Skin	1.2E-02	--	--	1.2E-02
			Benzo(a)pyrene	7.6E-09	8.9E-13	4.2E-09	1.2E-08	Developmental	1.8E-04	5.2E-06	9.7E-05	2.8E-04
			Chemical Total	5.9E-07	5.5E-10	1.3E-07	7.2E-07	Chemical Total	2.1E-02	6.5E-05	2.0E-03	2.3E-02
		Exposure Point Total					7.2E-07					2.3E-02
	Exposure Medium Total						7.2E-07					2.3E-02
Receptor Total						Receptor Risk Total	7.2E-07				Receptor HI Total	2.3E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-4.

Total Cardiovascular HI Across All Media=	1.1E-02
Total Skin HI Across All Media=	2.3E-02
Total Developmental HI Across All Media=	1.1E-02
Total Nervous Across All Media=	1.1E-02
Total Respiratory Across All Media=	1.1E-02

TABLE C-15

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT PARK/RESORT WORKER FOR AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park/Resort Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5')	Soil	Area 2	Arsenic	7.3E-07	6.8E-10	1.5E-07	8.8E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	1.1E-02	7.4E-05	2.4E-03	1.4E-02
			4,4'-DDD	1.2E-08	6.7E-13	5.1E-09	1.7E-08	Liver	1.2E-02	--	4.9E-03	1.7E-02
			4,4'-DDE	3.3E-08	1.2E-09	--	3.4E-08	Liver	2.3E-03	--	--	2.3E-03
			4,4'-DDT	6.2E-08	3.5E-12	7.9E-09	7.0E-08	Liver	2.6E-03	--	3.3E-04	2.9E-03
			Aldrin	9.2E-08	4.1E-09	--	9.6E-08	Liver	1.3E-03	--	--	1.3E-03
			Chlordane (technical)	1.9E-08	9.4E-10	3.2E-09	2.3E-08	Liver	7.5E-04	9.4E-05	1.3E-04	9.7E-04
			Dieldrin	4.7E-06	2.7E-10	2.0E-06	6.7E-06	Liver	4.1E-02	--	1.8E-02	5.9E-02
			Benzo(a)pyrene	9.3E-09	1.1E-12	5.1E-09	1.4E-08	Developmental	2.2E-04	6.4E-06	1.2E-04	3.4E-04
			Chemical Total	5.7E-06	7.2E-09	2.2E-06	7.9E-06	Chemical Total	7.1E-02	1.7E-04	2.5E-02	9.7E-02
		Exposure Point Total					7.9E-06					9.7E-02
	Exposure Medium Total						7.9E-06					9.7E-02
Receptor Total						Receptor Risk Total	7.9E-06				Receptor HI Total	9.7E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-5.

Total Cardiovascular HI Across All Media=	1.4E-02
Total Skin HI Across All Media=	1.4E-02
Total Developmental HI Across All Media=	1.4E-02
Total Nervous Across All Media=	1.4E-02
Total Respiratory Across All Media=	1.4E-02
Total Liver Across All Media=	8.3E-02

TABLE C-16

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT PARK/RESORT WORKER FOR AREA 3

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe:	Current/Future
Receptor Population:	Park Worker/Resort Employee
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5')	Soil	Area 3	Arsenic	2.7E-07	2.5E-10	5.7E-08	3.2E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	4.2E-03	2.7E-05	8.8E-04	5.1E-03
			Benzo(a)pyrene	8.7E-09	1.0E-12	4.8E-09	1.3E-08	Developmental	2.0E-04	6.0E-06	1.1E-04	3.2E-04
			Chemical Total	2.8E-07	2.5E-10	6.1E-08	3.4E-07	Chemical Total	4.4E-03	3.3E-05	9.9E-04	5.4E-03
		Exposure Point Total					3.4E-07					5.4E-03
	Exposure Medium Total						3.4E-07					5.4E-03
Receptor Total						Receptor Risk Total	3.4E-07				Receptor HI Total	5.4E-03

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-6.

Total Cardiovascular HI Across All Media=	5.1E-03
Total Skin HI Across All Media=	5.1E-03
Total Developmental HI Across All Media=	5.4E-03
Total Nervous Across All Media=	5.1E-03
Total Respiratory Across All Media=	5.1E-03

TABLE C-17

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5 ft-bgs)	Soil	Area 1	Arsenic	1.9E-07	5.5E-11	3.1E-08	2.2E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	3.0E-02	5.9E-05	4.8E-03	3.5E-02
			Thallium	--	--	--	--	Skin	4.0E-02	--	--	4.0E-02
			Benzo(a)pyrene	2.5E-09	8.9E-14	1.0E-09	3.5E-09	Developmental	5.8E-04	5.2E-06	2.4E-04	8.3E-04
			Chemical Total	2.0E-07	5.5E-11	3.2E-08	2.3E-07	Chemical Total	7.0E-02	6.5E-05	5.0E-03	7.5E-02
		Exposure Point Total					2.3E-07					7.5E-02
	Exposure Medium Total						2.3E-07					7.5E-02
Medium Total							2.3E-07					7.5E-02
Receptor Total						Receptor Risk Total	2.3E-07				Receptor HI Total	7.5E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-7.

Total Cardiovascular HI Across All Media=	3.5E-02
Total Skin HI Across All Media=	7.4E-02
Total Developmental HI Across All Media=	3.6E-02
Total Nervous Across All Media=	3.5E-02
Total Respiratory Across All Media=	3.5E-02

TABLE C-18

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5 ft-bgs)	Soil	Area 2	Arsenic	2.4E-07	6.8E-11	3.8E-08	2.8E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	3.7E-02	7.4E-05	6.0E-03	4.3E-02
			4,4'-DDD	3.9E-09	6.7E-14	1.3E-09	5.2E-09	Liver	3.8E-02	--	1.2E-02	5.1E-02
			4,4'-DDE	1.1E-08	1.2E-10	--	1.1E-08	Liver	7.4E-03	--	--	7.4E-03
			4,4'-DDT	2.1E-08	3.5E-13	2.0E-09	2.3E-08	Liver	8.5E-03	--	8.2E-04	9.3E-03
			Aldrin	3.0E-08	4.1E-10	--	3.1E-08	Liver	4.2E-03	--	--	4.2E-03
			Chlordane (technical)	6.2E-09	9.4E-11	8.0E-10	7.1E-09	Liver	2.5E-03	9.4E-05	3.2E-04	2.9E-03
			Dieldrin	1.6E-06	2.7E-11	5.0E-07	2.1E-06	Liver	1.4E-01	--	4.4E-02	1.8E-01
			Benzo(a)pyrene	3.1E-09	1.1E-13	1.3E-09	4.3E-09	Developmental	7.2E-04	6.4E-06	3.0E-04	1.0E-03
			Chemical Total	1.9E-06	7.2E-10	5.4E-07	2.4E-06	Chemical Total	2.4E-01	1.7E-04	6.4E-02	3.0E-01
		Exposure Point Total					2.4E-06					3.0E-01
	Exposure Medium Total						2.4E-06					3.0E-01
Medium Total							2.4E-06					3.0E-01
Receptor Total						Receptor Risk Total	2.4E-06				Receptor HI Total	3.0E-01

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-8.

Total Cardiovascular HI Across All Media=	4.3E-02
Total Skin HI Across All Media=	4.3E-02
Total Developmental HI Across All Media=	4.4E-02
Total Nervous Across All Media=	4.3E-02
Total Respiratory Across All Media=	4.3E-02
Total Liver Across All Media=	2.6E-01

TABLE C-19

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 3: SURFACE SOIL

REASONABLE MAXIMUM EXPOSURE: ISM Data

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil (0-0.5 ft-bgs)	Soil ISM Data	Area 3	Arsenic	8.8E-08	2.5E-11	1.4E-08	1.0E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	1.4E-02	2.7E-05	2.2E-03	1.6E-02
			Benzo(a)pyrene	2.9E-09	1.0E-13	1.2E-09	4.1E-09	Developmental	6.7E-04	6.0E-06	2.8E-04	9.5E-04
			Chemical Total	9.1E-08	2.5E-11	1.5E-08	1.1E-07	Chemical Total	1.4E-02	3.3E-05	2.5E-03	1.7E-02
		Exposure Point Total					1.1E-07					1.7E-02
	Exposure Medium Total						1.1E-07					1.7E-02
Medium Total							1.1E-07					1.7E-02
Receptor Total						Receptor Risk Total	1.1E-07				Receptor HI Total	1.7E-02

Total Cardiovascular HI Across All Media=	1.6E-02
Total Skin HI Across All Media=	1.6E-02
Total Developmental HI Across All Media=	1.7E-02
Total Nervous Across All Media=	1.6E-02
Total Respiratory Across All Media=	1.6E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-9.

TABLE C-20

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: CURRENT/FUTURE CONSTRUCTION WORKER FOR AREA 3: SUBSURFACE SOIL

REASONABLE MAXIMUM EXPOSURE: Discrete Data

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil (0-6 ft-bgs)	Soil Discrete Data	Area 3	Arsenic	9.3E-08	2.6E-11	1.5E-08	1.1E-07	Cardiovascular, Skin, Nervous, Respiratory, Developmental	1.4E-02	2.9E-05	2.3E-03	1.7E-02
			Thallium	--	--	--	--	Skin	2.6E-02	--	--	2.6E-02
			Chemical Total	9.3E-08	2.6E-11	1.5E-08	1.1E-07	Chemical Total	4.0E-02	2.9E-05	2.3E-03	4.2E-02
		Exposure Point Total					1.1E-07					4.2E-02
	Exposure Medium Total						1.1E-07					4.2E-02
Medium Total							1.1E-07					4.2E-02
Receptor Total						Receptor Risk Total	1.1E-07				Receptor HI Total	4.2E-02

Total Cardiovascular HI Across All Media=	1.7E-02
Total Skin HI Across All Media=	4.2E-02
Total Developmental HI Across All Media=	1.7E-02
Total Nervous Across All Media=	1.7E-02
Total Respiratory Across All Media=	1.7E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-10.

TABLE C-21

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: FUTURE RESIDENT FOR AREA 1

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-0.5')	Area 1	Arsenic	6.9E-06	6.0E-09	9.7E-07	7.8E-06	Cardiovascular, Skin, Nervous, Respiratory, Developmental	1.4E-01	2.5E-04	1.6E-02	1.5E-01
			Thallium	--	--	--	--	Skin	1.8E-01	--	--	1.8E-01
			Benzo(a)pyrene	4.0E-07	2.7E-11	1.4E-07	5.4E-07	Developmental	2.6E-03	2.2E-05	8.2E-04	3.5E-03
			Chemical Total	7.3E-06	6.0E-09	1.1E-06	8.4E-06	Chemical Total	3.2E-01	2.7E-04	1.7E-02	3.3E-01
		Exposure Point Total					8.4E-06					3.3E-01
	Exposure Medium Total						8.4E-06					3.3E-01
Medium Total							8.4E-06					3.3E-01
Receptor Total						Receptor Risk Total	8.4E-06				Receptor HI Total	3.3E-01

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-11.

Total Cardiovascular HI Across All Media=	1.5E-01
Total Skin HI Across All Media=	3.3E-01
Total Developmental HI Across All Media=	1.6E-01
Total Nervous Across All Media=	1.5E-01
Total Respiratory Across All Media=	1.5E-01

TABLE C-22

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: FUTURE RESIDENT FOR AREA 2

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-0.5')	Area 2	Arsenic	8.6E-06	7.4E-09	1.2E-06	9.8E-06	Cardiovascular, Skin, Nervous, Respiratory, Developmental	1.7E-01	3.1E-04	2.0E-02	1.9E-01
			4,4'-DDD	1.4E-07	7.4E-12	4.0E-08	1.8E-07	Liver	1.7E-01	--	4.1E-02	2.1E-01
			4,4'-DDE	3.9E-07	1.3E-08	--	4.0E-07	Liver	3.4E-02	--	--	3.4E-02
			4,4'-DDT	7.3E-07	3.8E-11	6.2E-08	8.0E-07	Liver	3.8E-02	--	2.7E-03	4.1E-02
			Aldrin	1.1E-06	4.5E-08	--	1.1E-06	Liver	1.9E-02	--	--	1.9E-02
			Chlordane (technical)	2.2E-07	1.0E-08	2.5E-08	2.6E-07	Liver	1.1E-02	3.9E-04	1.1E-03	1.3E-02
			Dieldrin	5.6E-05	2.9E-09	1.6E-05	7.1E-05	Liver	6.2E-01	--	1.5E-01	7.7E-01
			Benzo(a)pyrene	5.0E-07	3.3E-11	1.7E-07	6.6E-07	Developmental	3.2E-03	2.7E-05	1.0E-03	4.3E-03
			Chemical Total	6.7E-05	7.9E-08	1.7E-05	8.5E-05	Chemical Total	1.1E+00	7.3E-04	2.1E-01	1.3E+00
		Exposure Point Total					8.5E-05					1.3E+00
	Exposure Medium Total						8.5E-05					1.3E+00
Medium Total							8.5E-05					1.3E+00
Receptor Total						Receptor Risk Total	8.5E-05				Receptor HI Total	1.3E+00

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-12.

Total Cardiovascular HI Across All Media=	1.9E-01
Total Skin HI Across All Media=	1.9E-01
Total Developmental HI Across All Media=	1.9E-01
Total Nervous Across All Media=	1.9E-01
Total Respiratory Across All Media=	1.9E-01
Total Liver Across All Media=	1.1E+00

TABLE C-23

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs: FUTURE RESIDENT FOR AREA 3

REASONABLE MAXIMUM EXPOSURE

Caneel Bay Resort; St. John Island, U.S. Virgin Island

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 6Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-0.5')	Area 3	Arsenic	3.1E-06	2.7E-09	4.4E-07	3.6E-06	Cardiovascular, Skin, Nervous, Respiratory, Developmental	6.2E-02	1.1E-04	7.4E-03	7.0E-02
			Benzo(a)pyrene	4.6E-07	3.1E-11	1.5E-07	6.2E-07	Developmental	3.0E-03	2.5E-05	9.3E-04	4.0E-03
			Chemical Total	3.6E-06	2.8E-09	6.0E-07	4.2E-06	Chemical Total	6.5E-02	1.4E-04	8.3E-03	7.4E-02
		Exposure Point Total					4.2E-06					7.4E-02
	Exposure Medium Total						4.2E-06					7.4E-02
Medium Total							4.2E-06					7.4E-02
Receptor Total						Receptor Risk Total	4.2E-06				Receptor HI Total	7.4E-02

Notes

"--" = Risk not calculated. See calculation of chemical cancer risk and non-cancer hazards In Appendix C, Table C-13.

Total Cardiovascular HI Across All Media=	7.0E-02
Total Skin HI Across All Media=	7.0E-02
Total Developmental HI Across All Media=	7.4E-02
Total Nervous Across All Media=	7.0E-02
Total Respiratory Across All Media=	7.0E-02

Appendix D: Species Lists

Appendix D.1
Mammals of the Virgin Islands National Park
NPSpecies Database
April 2021

Park Code	Category	Scientific Name	Common Name	Occurrence	Abundance	Nativeness
VIIS	Mammal	Bos	feral cattle	Unconfirmed		Non-native
VIIS	Mammal	Capra hircus	feral goat	Present	Common	Non-native
VIIS	Mammal	Odocoileus virginianus	white-tailed deer	Present	Common	Non-native
VIIS	Mammal	Sus scrofa	feral hog	Present	Common	Non-native
VIIS	Mammal	Canis familiaris	feral dog	Present	Common	Non-native
VIIS	Mammal	Felis catus	feral cat	Present	Common	Non-native
VIIS	Mammal	Herpestes javanicus	Indian mongoose	Present	Unknown	Non-native
VIIS	Mammal	Molossus ater	black mastiff bat	Unconfirmed		Unknown
VIIS	Mammal	Molossus molossus	Pallas' free-tailed bat, Pallas's mastiff bat	Present	Rare	Native
VIIS	Mammal	Molossus sinaloae	Sinaloan mastiff bat, Sinaloan Mastiff Bat	Unconfirmed		Unknown
VIIS	Mammal	Tadarida brasiliensis	Brazilian free-tailed bat, Mexican Free-tailed Bat	Unconfirmed		Unknown
VIIS	Mammal	Noctilio leporinus	greater bulldog bat	Present	Common	Native
VIIS	Mammal	Artibeus jamaicensis	Jamaican fruit-eating bat	Present	Uncommon	Native
VIIS	Mammal	Brachyphylla cavernarum	Antillean fruit-eating bat	Present	Unknown	Native
VIIS	Mammal	Stenoderma rufum	red fruit bat	Present	Unknown	Native
VIIS	Mammal	Lasiurus ega	southern yellow bat, Southern Yellow Bat	Probably Present		Native
VIIS	Mammal	Equus asinus	feral donkey	Present	Common	Non-native
VIIS	Mammal	Mus musculus	house mouse	Present	Common	Non-native
VIIS	Mammal	Rattus norvegicus	Norway rat	Present	Common	Non-native
VIIS	Mammal	Rattus rattus	black rat	Present	Common	Non-native
VIIS	Mammal	Trichechus manatus	manatee	Not In Park		Native

Appendix D.2
Birds of the Virgin Islands National Park
NPSpecies Database
April 2021

Park Code	Scientific Name	Common Name	Occurrence	Abundance	Nativeness
VIIS	Accipiter striatus	Sharp-shinned Hawk	Present	Occasional	Native
VIIS	Buteo jamaicensis	Red-tailed Hawk	Present	Uncommon	Native
VIIS	Circus cyaneus	Northern Harrier	Present	Rare	Native
VIIS	Pandion haliaetus	Osprey	Present	Uncommon	Native
VIIS	Anas acuta	Northern Pintail	Present	Rare	Native
VIIS	Anas americana	American Wigeon	Present	Uncommon	Native
VIIS	Anas bahamensis	White-cheeked Pintail	Present	Common	Native
VIIS	Anas clypeata	Northern Shoveler	Present	Occasional	Native
VIIS	Anas crecca	Green-winged Teal	Present	Occasional	Native
VIIS	Anas discors	Blue-winged Teal	Present	Common	Native
VIIS	Aythya affinis	Lesser Scaup	Present	Occasional	Native
VIIS	Aythya collaris	Ring-necked Duck	Present	Occasional	Native
VIIS	Dendrocygna arborea	West Indian Whistling-Duck	Present	Rare	Native
VIIS	Lophodytes cucullatus	Hooded Merganser	Present	Rare	Native
VIIS	Mergus serrator	Red-breasted Merganser	Present	Rare	Native
VIIS	Oxyura jamaicensis	Ruddy Duck	Present	Occasional	Native
VIIS	Chaetura pelagica	Chimney Swift	Present	Rare	Native
VIIS	Anthracothorax dominicus	Antillean Mango	Present	Occasional	Native
VIIS	Eulampis holosericeus	Green-throated Carib	Present	Common	Native
VIIS	Orthorhyncus cristatus	Antillean Crested Hummingbird	Present	Common	Native
VIIS	Caprimulgus carolinensis	Chuck-will's-widow	Present	Uncommon	Native
VIIS	Chordeiles gundlachii	Antillean Nighthawk	Present	Uncommon	Native
VIIS	Chordeiles minor	Common Nighthawk	Present	Rare	Native
VIIS	Charadrius semipalmatus	Semipalmated Plover	Present	Uncommon	Native
VIIS	Charadrius vociferus	Killdeer	Present	Rare	Native
VIIS	Charadrius wilsonia	Wilson's Plover	Present	Uncommon	Native
VIIS	Pluvialis dominica	American Golden Plover, Lesser Golden-Plover	Present	Occasional	Native
VIIS	Pluvialis squatarola	Black-bellied Plover, Grey Plover	Present	Uncommon	Native
VIIS	Haematopus palliatus	American Oystercatcher	Present	Uncommon	Native
VIIS	Anous stolidus	Brown Noddy	Present	Uncommon	Native
VIIS	Chlidonias niger	Black Tern	Present	Occasional	Native
VIIS	Larus argentatus	European Herring Gull, Herring Gull	Present	Occasional	Non-native
VIIS	Larus atricilla	Laughing Gull	Present	Abundant	Native
VIIS	Larus delawarensis	Ring-billed Gull	Present	Rare	Native
VIIS	Larus ridibundus	Black-headed Gull	Present	Rare	Native
VIIS	Sterna anaethetus	Bridled Tern	Present	Uncommon	Native
VIIS	Sterna antillarum	Least Tern	Present	Occasional	Native
VIIS	Sterna dougallii	Roseate Tern	Present	Uncommon	Native
VIIS	Sterna fuscata	Sooty Tern	Present	Uncommon	Native
VIIS	Sterna hirundo	Common Tern	Present	Uncommon	Native
VIIS	Sterna maxima	Royal Tern	Present	Common	Native
VIIS	Sterna nilotica	Gull-billed Tern	Present	Uncommon	Native
VIIS	Sterna paradisaea	Arctic Tern	Present	Occasional	Native
VIIS	Sterna sandvicensis	Sandwich Tern	Present	Occasional	Native
VIIS	Himantopus mexicanus	Ae'o, Black-necked Stilt, Hawaiian Stilt	Present	Common	Native
VIIS	Actitis macularius	Spotted Sandpiper	Present	Common	Native
VIIS	Arenaria interpres	Ruddy Turnstone	Present	Rare	Native
VIIS	Bartramia longicauda	Upland Sandpiper	Present	Occasional	Native
VIIS	Calidris alba	Sanderling	Present	Rare	Native
VIIS	Calidris alpina	Dunlin	Present	Occasional	Native
VIIS	Calidris canutus	Red Knot	Present	Occasional	Native
VIIS	Calidris fuscicollis	White-rumped Sandpiper	Present	Occasional	Native
VIIS	Calidris himantopus	Stilt Sandpiper	Present	Rare	Native
VIIS	Calidris mauri	Western Sandpiper	Present	Rare	Native
VIIS	Calidris melanotos	Pectoral Sandpiper	Present	Rare	Native
VIIS	Calidris minutilla	Least Sandpiper	Present	Rare	Native
VIIS	Calidris pusilla	Semipalmated Sandpiper	Present	Rare	Native

VIIS	Catoptrophorus semipalmatus	Willet	Present	Occasional	Native
VIIS	Gallinago delicata	Wilson's Snipe	Present	Occasional	Native
VIIS	Limnodromus griseus	Short-billed Dowitcher	Present	Rare	Native
VIIS	Numenius phaeopus	Whimbrel	Present	Occasional	Native
VIIS	Tringa flavipes	Lesser Yellowlegs	Present	Common	Native
VIIS	Tringa melanoleuca	Greater Yellowlegs	Present	Rare	Native
VIIS	Tringa solitaria	Solitary Sandpiper	Present	Rare	Native
VIIS	Stercorarius pomarinus	Pomarine Jaeger, Pomarine Skua	Present	Rare	Native
VIIS	Columba livia	Common Pigeon, Rock Dove, Rock Pigeon	Present	Uncommon	Non-native
VIIS	Columbina passerina	Common Ground Dove	Present	Abundant	Native
VIIS	Geotrygon montana	Ruddy Quail-Dove	Present	Occasional	Native
VIIS	Geotrygon mystacea	Bridled Quail-Dove	Present	Uncommon	Native
VIIS	Patagioenas leucocephala	White-crowned Pigeon	Present	Uncommon	Native
VIIS	Patagioenas squamosa	Scaly-naped Pigeon	Present	Uncommon	Native
VIIS	Zenaida asiatica	White-winged Dove	Present	Uncommon	Native
VIIS	Zenaida aurita	Zenaida Dove	Present	Abundant	Native
VIIS	Ceryle alcyon	Belted Kingfisher	Present	Common	Native
VIIS	Coccyzus americanus	Yellow-billed Cuckoo	Present	Rare	Native
VIIS	Coccyzus minor	Mangrove Cuckoo	Present	Uncommon	Native
VIIS	Crotophaga ani	Smooth-billed Ani	Present	Uncommon	Native
VIIS	Falco columbarius	Merlin	Present	Uncommon	Native
VIIS	Falco peregrinus	Peregrine Falcon	Present	Uncommon	Native
VIIS	Falco sparverius	American Kestrel	Present	Common	Native
VIIS	Numida meleagris	Helmeted Guineafowl	Present	Uncommon	Non-native
VIIS	Gallus gallus	Red Junglefowl	Present	Common	Non-native
VIIS	Fulica americana	American Coot	Present	Rare	Native
VIIS	Fulica caribaea	Caribbean Coot	Present	Occasional	Native
VIIS	Gallinula chloropus	Common Moorhen	Present	Common	Native
VIIS	Porzana carolina	Sora	Present	Rare	Native
VIIS	Rallus longirostris	Clapper Rail	Present	Occasional	Native
VIIS	Passerina caerulea	Blue Grosbeak	Present	Occasional	Native
VIIS	Passerina cyanea	Indigo Bunting	Present	Occasional	Native
VIIS	Pheucticus ludovicianus	Rose-breasted Grosbeak	Present	Occasional	Native
VIIS	Piranga olivacea	Scarlet Tanager	Present	Occasional	Native
VIIS	Spiza americana	Dickcissel	Present	Occasional	Non-native
VIIS	Coereba flaveola	Bananaquit	Present	Abundant	Native
VIIS	Hirundo rustica	Barn Swallow	Present	Rare	Native
VIIS	Petrochelidon pyrrhonota	Cliff Swallow	Present	Occasional	Native
VIIS	Progne dominicensis	Caribbean Martin	Present	Rare	Native
VIIS	Riparia riparia	Bank Swallow	Present	Rare	Native
VIIS	Stelgidopteryx serripennis	Northern Rough-winged Swallow	Present	Occasional	Native
VIIS	Tachycineta bicolor	Tree Swallow	Present	Occasional	Native
VIIS	Dolichonyx oryzivorus	Bobolink	Present	Occasional	Native
VIIS	Icterus galbula	Baltimore Oriole, Northern Oriole	Present	Occasional	Native
VIIS	Icterus icterus	Troupial	Present	Occasional	Native
VIIS	Molothrus bonariensis	Shiny Cowbird	Present	Occasional	Native
VIIS	Margarops fuscatus	Pearly-eyed Thrasher	Present	Abundant	Native
VIIS	Mimus polyglottos	Northern Mockingbird	Present	Common	Native
VIIS	Dendroica caerulescens	Black-throated Blue Warbler	Present	Uncommon	Native
VIIS	Dendroica castanea	Bay-breasted Warbler	Present	Occasional	Native
VIIS	Dendroica coronata	Yellow-rumped Warbler	Present	Uncommon	Native
VIIS	Dendroica discolor	Prairie Warbler	Present	Uncommon	Native
VIIS	Dendroica dominica	Yellow-throated Warbler	Present	Occasional	Native
VIIS	Dendroica fusca	Blackburnian Warbler	Present	Occasional	Native
VIIS	Dendroica magnolia	Magnolia Warbler	Present	Uncommon	Native
VIIS	Dendroica palmarum	Palm Warbler	Present	Occasional	Native
VIIS	Dendroica pensylvanica	Chestnut-sided Warbler	Present	Occasional	Native
VIIS	Dendroica petechia	American Yellow Warbler, Yellow Warbler	Present	Common	Native
VIIS	Dendroica striata	Blackpoll Warbler	Present	Uncommon	Native
VIIS	Dendroica tigrina	Cape May Warbler	Present	Uncommon	Native
VIIS	Dendroica virens	Black-throated Green Warbler	Present	Occasional	Native
VIIS	Geothlypis trichas	Common Yellowthroat	Present	Occasional	Native

VIIS	Helmitheros vermivorum	Worm-eating Warbler	Present	Occasional	Native
VIIS	Limnothlypis swainsonii	Swainson's Warbler	Present	Uncommon	Native
VIIS	Mniotilta varia	Black-and-white Warbler	Present	Uncommon	Native
VIIS	Oporornis formosus	Kentucky Warbler	Present	Occasional	Native
VIIS	Parula americana	Northern Parula	Present	Common	Native
VIIS	Protonotaria citrea	Prothonotary Warbler	Present	Uncommon	Native
VIIS	Seiurus aurocapilla	Ovenbird	Present	Occasional	Native
VIIS	Seiurus motacilla	Louisiana Waterthrush	Present	Uncommon	Native
VIIS	Seiurus noveboracensis	Northern Waterthrush	Present	Common	Native
VIIS	Setophaga ruticilla	American Redstart	Present	Uncommon	Native
VIIS	Vermivora chrysoptera	Golden-winged Warbler	Present	Occasional	Native
VIIS	Vermivora peregrina	Tennessee Warbler	Present	Occasional	Non-native
VIIS	Vermivora pinus	Blue-winged Warbler	Present	Occasional	Native
VIIS	Wilsonia citrina	Hooded Warbler	Present	Common	Native
VIIS	Passer domesticus	House Sparrow	Present	Common	Non-native
VIIS	Loxigilla noctis	Lesser Antillean Bullfinch	Present	Common	Native
VIIS	Tiaris bicolor	Black-faced Grassquit	Present	Common	Native
VIIS	Catharus fuscescens	Veery	Present	Occasional	Non-native
VIIS	Elaenia martinica	Caribbean Elaenia	Present	Uncommon	Native
VIIS	Myiarchus antillarum	Puerto Rican Flycatcher	Present	Uncommon	Native
VIIS	Tyrannus dominicensis	Gray Kingbird, Grey Kingbird	Present	Abundant	Native
VIIS	Vireo altiloquus	Black-whiskered Vireo	Present	Uncommon	Native
VIIS	Vireo flavifrons	Yellow-throated Vireo	Present	Uncommon	Native
VIIS	Vireo griseus	White-eyed Vireo	Present	Occasional	Native
VIIS	Vireo olivaceus	Red-eyed Vireo	Present	Occasional	Non-native
VIIS	Ardea alba	Great Egret	Present	Common	Native
VIIS	Ardea herodias	Great Blue Heron	Present	Common	Native
VIIS	Botaurus lentiginosus	American Bittern	Present	Occasional	Native
VIIS	Bubulcus ibis	Cattle Egret	Present	Common	Native
VIIS	Butorides virescens	Green Heron	Present	Common	Native
VIIS	Egretta caerulea	Little Blue Heron	Present	Common	Native
VIIS	Egretta rufescens	Reddish Egret	Present	Occasional	Native
VIIS	Egretta thula	Snowy Egret	Present	Uncommon	Native
VIIS	Egretta tricolor	Tricolored Heron	Present	Uncommon	Native
VIIS	Ixobrychus exilis	Least Bittern	Present	Occasional	Native
VIIS	Nyctanassa violacea	Yellow-crowned Night Heron	Present	Uncommon	Native
VIIS	Nycticorax nycticorax	Black-crowned Night-Heron	Present	Uncommon	Native
VIIS	Pelecanus occidentalis	Brown Pelican	Present	Abundant	Native
VIIS	Plegadis falcinellus	Glossy Ibis	Present	Occasional	Non-native
VIIS	Phaethon aethereus	Red-billed Tropicbird	Present	Uncommon	Native
VIIS	Phaethon lepturus	White-tailed Tropicbird	Present	Occasional	Native
VIIS	Sphyrapicus varius	Yellow-bellied Sapsucker	Present	Occasional	Native
VIIS	Podilymbus podiceps	Pied-billed Grebe	Present	Uncommon	Native
VIIS	Tachybaptus dominicus	Least Grebe	Present	Uncommon	Native
VIIS	Oceanites oceanicus	Wilson's Storm Petrel, Wilson's Storm-Petrel	Present	Occasional	Native
VIIS	Oceanodroma leucorhoa	Leach's Storm Petrel, Leach's Storm-Petrel	Present	Occasional	Native
VIIS	Puffinus gravis	Greater Shearwater	Present	Occasional	Non-native
VIIS	Puffinus lherminieri	Audubon's Shearwater	Present	Rare	Native
VIIS	Aratinga pertinax	Brown-throated Parakeet	Probably Present		Non-native
VIIS	Megascops nudipes	Puerto Rican Screech-Owl	Present	Rare	Native
VIIS	Fregata magnificens	Magnificent Frigatebird	Present	Abundant	Native
VIIS	Phalacrocorax auritus	Double-crested Cormorant	Present	Uncommon	Native
VIIS	Sula dactylatra	Masked Booby	Present	Occasional	Native
VIIS	Sula leucogaster	Brown Booby	Present	Abundant	Native
VIIS	Sula sula	Red-footed Booby	Present	Occasional	Native

Appendix D.3
Threatened and Endangered Species on St. John

ST. JOHN

SCIENTIFIC NAME	COMMON NAME	COMMON NAME SPANISH	GROUP	STATUS	DISTRIBUTION
Calyptranthes thomasiana	No Common Name	No Tiene Nombre Comun	Plant	E	Bordeaux Mountain
Eretmochelys imbricata	Hawksbill Sea Turtle	Carey	Reptile	E, CH	Coastal Zones
Pelecanus occidentalis	Brown Pelican	Pelicano Pardo	Bird	D, MP	Coastal Zones, No Nesting
Sterna dougallii	Roseate Tern	Palometa	Bird	T	Coastal Areas and Offshore Cays, Nesting
Zanthoxylum thomasianum	St. Thomas Prickly Ash	No Tiene Nombre Comun	Plant	E	Gift Hill, South Pond Bay

Status
E=Endangered
T=Threatened
CH=Critical Habitat
D=Delisted due to Recovery
MP= Monitoring Plan

BACK

Source:

US Fish and Wildlife Service, Southeast Region webpage. https://www.fws.gov/southeast/pdf/map/caribbean-listed-species-2017.pdf

Threatened and endangered species and critical habitats under the jurisdiction of the U. S. Fish and Wildlife Service

Puerto Rico and U. S. Virgin Islands

Animals

Scientific Name	Common Name	Status	Date Listed	Reference
Amphibians				
Eleutherodactylus cooki	Puerto Rican rock frog	Threatened	6/11/1997	62 FR 31757
Eleutherodactylus jasperi	Golden coquí	Threatened	11/11/1977	42 FR 58756
Eleutherodactylus juanariveroi	Coquí llanero	Endangered	10/04/2012	77 FR 60778
Peltophryne lemur	Puerto Rican crested toad	Threatened	8/4/1987	52 FR 28828
Reptiles				
Ameiva polops	St. Croix ground lizard	Endangered	6/3/1977	42 FR 28543
Anolis roosevelti	Culebra giant anole	Endangered	7/21/1977	42 FR 37371
Caretta caretta	Loggerhead sea turtle	Threatened	7/28/1978	43 FR32800
Chelonia mydas	Green sea turtle	Threatened	7/28/1978	43 FR 32800
Cyclura cornuta stejnegeri	Mona ground iguana	Threatened	2/3/1978	43 FR 4618
Dermochelys coriacea	Leatherback sea turtle	Endangered	6/2/1970	35 FR 8491
Epicrates inornatus (now known as Chilabothrus inornatus)	Puerto Rican boa	Endangered	10/13/1970	35 FR 16047
Epicrates monensis granti (now known as Chilabothrus granti)	Virgin Islands tree boa	Endangered	10/13/1970	35 FR 16047
Epicrates monensis monensis (now known as Chilabothrus monensis)	Mona boa	Threatened	2/3/1978	43 FR 4618
Eretmochelys imbricata	Hawksbill sea turtle	Endangered	6/2/1970	35 FR 8491
Sphaerodactylus micropithecus	Monito gecko	Delisted due to Recovery	10/03/2019	84 FR 52791
Birds				
Accipiter striatus venator	Puerto Rican sharp-shinned hawk	Endangered	9/9/1994	59 FR 46710
Agelaius xanthomus	Yellow-shouldered blackbird	Endangered	11/19/1976	41 FR 51019
Amazona vittata vittata	Puerto Rican parrot	Endangered	3/11/1967	32 FR 4001
Buteo platypterus brunnescens	Puerto Rican Broad-winged hawk	Endangered	9/9/1994	59 FR 46710
Calidris canutus rufa	Rufa Red Knot	Threatened	12/11/2014	79 FR 73706
Caprimulgus noctitherus (now known as Antrostomus noctitherus)	Puerto Rican nightjar	Endangered	6/4/1973	38 FR 14678
Charadrius melodus	Piping plover	Threatened	12/11/1985	50 FR 50726

Columba inornata wetmorei (now known as Patagioenas inornata wetmorei)	Puerto Rican plain pigeon	Endangered	10/13/1970	35 FR 16047
Corvus leucognaphalus	White-necked crow	Endangered	4/3/1991	56 FR 13598
Pelecanus occidentalis	Brown pelican	Delisted due to Recovery	77/17/2009	74 FR 59444
Pterodroma hasitata	Black-capped petrel	Proposed Threatened	10/09/2018	83 FR 50560
Setophaga angelae	Elfin-woods warbler	Threatened	6/22/2016	81 FR 40534
Sterna dougallii dougallii	Roseate tern	Threatened	11/2/1987	52 FR 42064
Insects				
Atlantea tulita	Puerto Rican harlequin butterfly	Candidate	5/31/2011	76 FR 31282
Mammals				
Trichechus manatus	Antillean manatee	Endangered	3/11/1967 12/02/1970	32 FR 4001[1] 35 FR 18319[2]

[1]Listed only for Florida manatees, [2]Includes Caribbean and South America's manatees

Plants

Scientific Name	Common Name	Status	Listed Date	Reference
Trees and Shrubs				
Auerodendron pauciflorum		Endangered	3/2/1994	59 FR 9935
Banara vanderbiltii	Palo de Ramón	Endangered	1/14/1987	52 FR 1459
Buxus vahlii	Vahl's boxwood	Endangered	8/13/1985	50 FR 32572
Callicarpa ampla	Capá rosa	Endangered	4/22/1992	57 FR 14782
Calyptranthes thomasiana (now known as Myrcia neothomasiana		Endangered	2/18/1994	59 FR 8138
Calyptronoma rivalis	Palma manaca	Threatened	2/6/1990	55 FR 4157
Catesbaea melanocarpa		Endangered	3/17/1999	64 FR 13116
Chamaecrista glandulosa var. mirabilis		Endangered	4/5/1990	55 FR 12788
Cordia bellonis (now known as Varronia bellonis)		Endangered	1/10/1997	62 FR 1644
Cornutia obovata	Palo de Nigua	Endangered	4/7/1988	53 FR 11610
Crescentia portoricensis	Higuero de sierra	Endangered	12/4/1987	52 FR 46085
Daphnopsis helleriana		Endangered	6/23/1988	53 FR 23740
Eugenia haematocarpa	Uvillo	Endangered	11/25/1994	59 FR 60565
Eugenia woodburyana		Endangered	9/9/1994	59 FR 46715
Goetzea elegans	Beautiful goetzea	Endangered	4/19/1985	50 FR 15564
Gonocalyx concolor		Endangered	9/9/2014	79 FR 53303
Ilex cookii	Cook's holly	Endangered	6/16/1987	52 FR 22936
Ilex sintenisii		Endangered	4/22/1992	57 FR 14782

Juglans jamaicensis	West Indian walnut	Endangered	1/13/1997	62 FR 1691
Lyonia truncata var. proctorii		Endangered	4/27/1993	58 FR 25755
Mitracarpus polycladus		Endangered	9/9/1994	59 FR 46715
Mitracarpus maxwelliae		Endangered	9/9/1994	59 FR 46715
Myrcia paganii		Endangered	2/18/1994	59 FR 8128
Ottoschulzia rhodoxylon		Endangered	4/10/1990	55 FR 13488
Pleodendron macranthum	Chupacallos	Endangered	11/25/1994	59 FR 60565
Schoepfia arenaria		Threatened	4/19/1991	56 FR 16021
Solanum conocarpum	Marron bacora	Proposed Endangered	8/26/2020	85 FR 52516
Solanum drymophilum	Erubia	Endangered	8/26/1988	53 FR 32827
Stahlia monosperma (now known as Libidibia monosperma)	Cobana negra	Threatened	4/5/1990	55 FR 12790
Styrax portoricensis	Palo de jazmín	Endangered	4/22/1992	57 FR 14782
Ternstroemia luquillensis	Palo Colorado	Endangered	4/22/1992	57 FR 14782
Ternstroemia subsessilis		Endangered	4/22/1992	57 FR 14782
Trichilia triacantha	Bariaco	Endangered	2/5/1988	53 FR 3565
Varonia rupicola		Threatened	9/9/2014	79 FR 53303
Vernonia proctorii		Endangered	4/27/1993	58 FR 25755
Zanthoxylum thomasianum	St. Thomas prickly ash	Endangered	12/20/1985	50 FR 51867
Ferns				
Adiantum vivesii		Endangered	6/9/1993	58 FR 32308
Cyathea dryopteroides	Elfin tree fern	Endangered	6/16/1987	52 FR 22936
Elaphoglossum serpens		Endangered	6/9/1993	58 FR 32308
Polystichum calderonense		Endangered	6/9/1993	58 FR 32308
Tectaria estremerana		Endangered	6/9/1993	58 FR 32308
Thelypteris inabonensis		Endangered	7/2/1993	58 FR 35887
Thelypteris verecunda		Endangered	7/2/1993	58 FR 35887
Thelypteris yaucoensis		Endangered	7/2/1993	58 FR 35887
Cacti				
Harrisia portoricensis	Higo chumbo	Threatened	8/8/1990	55 FR 32252
Leptocereus grantianus		Endangered	2/26/1993	58 FR 11550
Orchids				
Cranichis ricartii		Endangered	11/29/1991	56 FR 60933
Lepanthes eltoroensis		Endangered	11/29/1991	56 FR 60933
Herbaceous plants and Herbs				
Agave eggersiana		Endangered	9/9/2014	79 FR 53303
Aristida chaseae		Endangered	4/27/1993	58 FR 25755
Aristida portoricensis	Pelos del diablo	Endangered	8/8/1990	55 FR 32255
Gesneria pauciflora		Threatened	3/7/1995	60 FR 12483
Peperomia wheeleri	Wheeler's peperomia	Endangered	1/14/1987	52 FR 1459

Species with Designated Critical Habitat

Scientific Name/ Common Name	Publication Date	Reference
Agave eggersiana (No common name)	09/09/2014	79 FR 53315
Agelaius xanthomus (Yellow-shouldered blackbird)	09/22/1977	42 FR 47840
Ameiva polops (St. Croix ground lizard)	09/22/1977	42 FR 47840
Anolis roosevelti (Culebra giant anole)	09/22/1977	42 FR 47840
Catesbaea melanocarpa (No common name)	08/28/2007	72 FR 49212
Chelonia mydas (Green sea turtle)[1]	09/02/1998	63 FR 46693
Cyclura cornuta stejnegeri (Mona ground iguana)	02/03/1978	43 FR 4618
Dermochelys coriacea (Leatherback sea turtle)	09/26/1978	43 FR 43688
Eleutherodactylus cooki (Puerto Rican rock frog)	10/23/2007	72 FR 60068
Eleutherodactylus jasperi (Golden coqui)	11/11/1977	42 FR 58756
Eleutherodactylus juanariveroi (Coquí llanero)	10/04/2012	77 FR 60778
Epicrates monensis monensis *(Chilabothrus monensis)* (Mona boa)	02/03/1978	43 FR 4618
Eretmochelys imbricata (Hawksbill sea turtle)	06/24/1982	47 FR 27295
Gonocalyx concolor	9/9/2014	79 FR 53315
Setophaga angelae (elfin-woods warbler)	6/30/2020	85 FR 39077
Solanum conocarpum (marron bacora)[2]	8/26/2020	85 FR 52516
Sphaerodactylus micropithecus (Monito gecko)	10/15/1982	47 FR 46090
Varronia rupicola	9/9/2014	79 FR 533015

[1] Designation of critical habitat by NOAA, it only includes aquatic habitat; [2] Proposed critical habitat

For further information, visit our website at:
http://www.fws.gov
http://www.fws.gov/southeast/caribbean
http://ecos.fws.gov

Updated: August 2020

Appendix E: Ecological Soil Screening Level Calculator Tables

APPENDIX E.1.a.
CALCULATION OF LOEL-BASED SOIL SCREENING LEVELS : PEARLY-EYED THRASHER

The equations below describe the method for calculating wildlife-based soil cleanup values, using the equations and exposure parameters for the pearly-eyed thrasher. In these equations, soil concentrations are adjusted to obtain an HQ of 1.0, based on LOEL TRVs.

HQ = (((SSL * P_s * FIR) + (C_e * P_e * FIR))* AUF) / TRV

Source: Eq. 4-1, p. 4-2 of EPA, 2005, Guidance for Developing Ecological Soil Screening Levels

HQ = Hazard Quotient (unitless)
SSL = Soil Screening Level, mg/kg
P_s = proportion soil in diet (unitless)
FIR = Food ingestion rate (kg food [dry wt]/ kg BW [wet wt]/day
C_e = concentration in earthworms, mg/kg dry wt.
P_e proportion of earthworms in diet (unitless)
TRV = toxicity reference value (mg/kg BW/day)

BAF = bioaccumulation factor
C_s = concentration in soils, mg/kg
NOEC = no observed effect level (mg/kg)
LOEC = lowest observed effect level (mg/kg)
ln = natural logarithm
AUF = area use factor

Cs Linked to Bioaccumulation Model
Ce Linked from Bioaccumulation Model

EPA Soil Screening Level Terrestrial Bird Model for Pearly-eyed Thrasher

SSL RECEPTOR	Contaminant	Level	AUF	HQ	SSL Cs	Ps	FIR	Ce	Pe	TRV	TRV Basis
Avian invertivore (thrasher)	Cadmium	LOEL	1.0	1.0	5.5	0.164	0.201	32.11	1	6.35	EPA 2005. TRV is geomean of growth and reproduction LOELS in SSL database
Avian invertivore (thrasher)	Chromium	LOEL	1.0	1.0	173	0.164	0.201	52.938	1	15.63	EPA 2008. The SSL TRV is the geomean of growth and reproduction LOEL TRVs.
Avian invertivore (thrasher)	Copper	LOEL	1.0	1.0	180	0.164	0.201	92.7	1	25.2	EPA 2007. 20th percentile of growth and reproduction LOELs in SSL database; values close to highest mortality LOEL removed.
Avian invertivore (thrasher)	Lead	LOEL	1.0	1.0	140	0.164	0.201	43.4	1	13.3	EPA 2005. The TRV SSL is the 20th percentile of LOELs in SSL database; values close to highest mortality LOEL removed.
Avian invertivore (thrasher)	Mercury	LOEL	1.0	1.0	13	0.164	0.201	2.6	1	0.9	Hill and Schaffner, 1976, as reported by Sample et al. 1996. LOEL concentrations in food converted to dose by Sample et al. 1996.
Avian invertivore (thrasher)	Zinc	LOEL	1.0	1.0	400	0.164	0.201	610.5	1	141.5	EPA 2007. The TRV SSL is the geomean of LOEL values for growth and reproduction
Avian invertivore (thrasher)	DDT and metabolites	LOEL	1.0	1.0	0.25	0.164	0.201	2.8	1	0.563	EPA 2007. TRV is the 20th percentile of LOELs for reproduction and growth.
Avian invertivore (thrasher)	Chlordane (technical)	LOEL	1.0	1.0	2.55	0.164	0.201	55.3	1	10.70	TRV from LANL database, Tier 4 TRV based on red-winged blackbird study by Stickel et al, 1983. Based on a mix of alpha and gamma.
Avian invertivore (thrasher)	Dieldrin	LOEL	1.0	1.0	0.08	0.164	0.201	1.2	1	0.24	EPA 2005. TRV is 20th percentile of EPA SSL data on reproduction and survival

Source for Thrasher Exposure Parameters:

Parameter	Value	Units	Source
Ps	16.4%	%	EPA Eco-SSL Ps for avian ground insectivore (woodcock)
FIR	0.201	kg/kg/d	Calculated using Nagy 1987 Equation 3-4 for passerines: FI (g/day) = $0.398Wt^{0.850}$ (g) from Wildlife Factors Handbook
Body Weight	0.95	kg	Average body mass based on coastal species (range 90-100 g) from Arendt 2006

Notes:
Concentrations in mg/kg
Ps for woodcock used to represent soil ingestion by the thrasher

Sources:

Arendt, W. J. (August 2006). Adaptations of an Avian Supertramp: Distribution, Ecology, and Life History of the Pearly-Eyed Thrasher (Margarops fuscatus) (Publication). United States Department of Agriculture. doi:https://www.fs.fed.us/global/iitf/pubs/iitf-gtr27a.pdf
EPA 2005. Guidance for developing Ecological Soil Screening Levels (Eco-SSLs). OSWER Directive 9285.7-55. Washington, D.C.
EPA, 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187
Sample, B.E. et al. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory ES/ER/TM-86/R3
Stickel, LF, WH Stickel, RA Dyrland and DL Hughes.1983. Oxychlordane, HCS-3260, and Nonachlor in Birds: Lethal Residues and Loss Rates. J Toxicol Environ Health 12:611-622.

EPA SSL Documents:

USEPA, 2005. Ecological Soil Screening Level for Cadmium. OSWER Directive 9285.7-65.
USEPA, 2008. Ecological Soil Screening Level for Chromium. OSWER Directive 9285.7-66.
USEPA, 2007. Ecological Soil Screening Level for Copper. OSWER Directive 9285.7-68.
USEPA, 2007. Ecological Soil Screening Level for DDT and Metabolites. OSWER Directive 9285.7-57.
USEPA, 2007. Ecological Soil Screening Level for Dieldrin. OSWER Directive 9285.7-56.
USEPA, 2005. Ecological Soil Screening Level for Lead. OSWER Directive 9285.7-70
USEPA, 2007. Ecological Soil Screening Level for Zinc . OSWER Directive 9285.7-73.

APPENDIX E.1.b.

Concentration in Earthworms

Bioaccumulation equations from EPA 2007. Guidance for Developing Ecological Soil Screening Levels. OSWER Directive 9285.7-55; Table 4a and 4b, except where noted.

BAF = bioaccumulation factor
C_e = conc. in earthworm, mg/kg dry wt.
C_s = conc. in soil, mg/kg dry wt.
ln = natural logarithm

I. BIOACCUMULATION INTO EARTHWORMS

Cadmium — ln(Ce) = 0.795 * ln(Cs) + 2.114 — Concentration in earthworms

Ce	ln(Ce)	factor	Cs	ln(Cs)	intercept
32.11	3.46927473	0.795	5.5	1.7047	2.114

Chromium

Ce = 0.306 *Cs — Concentration in earthworms

Cs	Ce	Comments
173	52.938	

Copper

Ce = 0.515*Cs — Concentration in earthworms

Cs	Ce
180	92.7

Lead

Lead: ln(Ce) = 0.807 * ln(Cs) - 0.218 — Concentration in earthworms

Ce	ln(Ce)	coefficient	Cs	ln(Cs)	intercept
43.376	3.770	0.807	140.00	4.942	-0.218

Mercury

ln(Ce) = 0.682 * ln(Cs) - 0.809 — Sample, et al 1998 — Concentration in earthworms

Ce	ln(Ce)	coefficient	Cs	ln(Cs)	intercept
2.561	0.940	0.682	13.00	2.565	-0.809

Zinc — Concentration in earthworms

ln(Ce) = 0.328 * ln(Cs)+ 4.449

Ce	ln(Ce)	coeffcient	Cs	ln(Cs)	intercept
610.5	6.41420037	0.328	400.00	5.991	4.449

DDT, DDD, and DDE Combined

Ce = 11.2 *Cs — Concentration in earthworms

Cs	Ce
0.25	2.8

Chlordane, technical

Ce = 21.7 *Cs — Concentration in earthworms
Source: Los Alamos National Laboratory EcoRisk database Version 4.2, November 2020
Value based on cis-Chlordane; no Chlordane equation available.

Cs	Ce
2.55	55.335

Dieldrin

Ce = 14.7 *Cs — Concentration in earthworms

Cs	Ce
0.08	1.2054

APPENDIX E.2.a.
CALCULATION OF LOEL-BASED SOIL SCREENING LEVELS : JAMAICAN FRUIT-EATING BAT

The equations below describe the method for calculating wildlife-based soil cleanup values, using the equations and exposure parameters for the Jamaican fruit-eating bat. In these equations, soil concentrations are adjusted to obtain an HQ of 1, based on LOEL TRVs.

$HQ = (((SSL * P_s * FIR) + (C_p * P_p * FIR))* AUF) / TRV$

Source: Eq. 4-1, p. 4-2 of EPA, 2005, Guidance for Developing Ecological Soil Screening Levels

HQ = Hazard Quotient (unitless)
SSL = Soil Screening Level, mg/kg
P_s = proportion soil in diet (unitless)
FIR = Food ingestion rate (kg food [dry wt]/ kg BW [wet wt]/day
C_p = concentration in plants, mg/kg dry wt.
P_p = proportion of plants in diet (unitless)
TRV = toxicity reference value (mg/kg BW/day)

BAF = bioaccumulation factor
C_s = concentration in soils, mg/kg
NOEL = no observed effect level (mg/kg)
LOEL = lowest observed effect level (mg/kg)
ln = natural logarithm
AUF = area use factor

Cs Linked to Bioaccumulation Model
Ce Linked from Bioaccumulation Model

Jamaican Fruit bat Model

SSL RECEPTOR	Contaminant	Level	AUF	HQ	SSL Cs (mg/kg)	Ps	FIR (kg/kd/day)	Cp	Pp	TRV (mg/kg/day)	TRV Basis
Mammalian herbivore (Jamaican fruit bat)	Antimony	LOEL	1.0	1.00	54	0	0.29232	1.66	1	0.4838	EPA 2005, SSL TRV = 20th percentile of EPA LOAELs for growth and reproduction
Mammalian herbivore (Jamaican fruit bat)	Cadmium	LOEL	1.0	1.00	787	0	0.29232	23.71	1	6.9	EPA 2005, EPA Eco-SSL dataset; geomean of values for growth and reproduction
Mammalian herbivore (Jamaican fruit bat)	Chromium	LOEL	1.0	1.00	806	0	0.29232	33.05	1	9.62	LOAEL value from Zahid et al. 1990; all data as cited by EPA 2008; OSWER 9285.7-66.
Mammalian herbivore (Jamaican fruit bat)	Copper	LOEL	1.0	1.00	2210	0	0.29232	40.53	1	11.8	EPA 2007; LOEL = 20th ptile of LOEL for growth and reproduction in EPA SSL dataset. NOEL is EPA Eco-SSL NOEL
Mammalian herbivore (Jamaican fruit bat)	Zinc	LOEL	1.0	1.00	7025	0	0.29232	653.21	1	190.1	EPA 2007; Geomean of growth and reproduction LOELs in SSL database. Elevated values close to mortality LOELs removed from dataset.
Mammalian herbivore (Jamaican fruit bat)	DDT and metabolites	LOEL	1.0	1.00	94	0	0.29232	2.48	1	0.725	EPA 2007; 20th percentile of LOELs for reproduction and growth.
Mammalian herbivore (Jamaican fruit bat)	Aldrin	LOEL	1.0	1.00	33.5	0	0.29232	3.42	1	1	LANL Ecorisk database 4.2 Tier 4 TRV- comes from secondary data source-ORNL. primary toxicity study ref = Treon, JF, and FP Cleveland. 1955. Toxicity of Certain Chlorinated Hydrocarbon Insecticides for Lab Animals, with special reference to Aldrin and Dieldrin. Agriculture and Food Chemistry, 3:402-408.
Mammalian herbivore (Jamaican fruit bat)	Chlordane (alpha or gamma)	LOEL	1.0	1.00	62	0	0.29232	40.36	1	11.8	LANL EcoRisk Databse 4.2; Tier 4 TRV- comes from secondary data source. Chronic NOAEL of 1.175 mg/kg/d for effects on mortality is based on a study that exposed male rats to a mixture of alpha- and gamma- chlordane orally. UF of 10 applied by LANL to obtain LOEL from study NOEL.
Mammalian herbivore (Jamaican fruit bat)	Dieldrin	LOEL	1.0	0.10	0.3	0	0.29232	0.12	1	0.3756	EPA 2007; 20th percentile of LOELs for reproduction and growth

Source for Jamaican Fruit-eating Bat Exposure Parameters:

Parameter	Value	Unit	Source
Ps	0	percent	
FIR	0.29232	kg food [dry wt]/kg BW [wet wt]/day	Thomas, D.W. 1984. Fruit intake and energy budgets of frugivorous bats. Physiological and Biochem. Zoology, 57(4). July-August.
Body Mass	0.05	kg	Univ. Michigan Museum of Zoology Animal Diversity Web. Available at https://animaldiversity.org/accounts/Artibeus_jamaicensis/

Notes:
Jamaican Fruit-eating bat diet is assumed as 100% figs. Moisture content of figs for calculations is 76.8%, based on average of yellow (72.6%) and purple (81%) figs.
Source: Kamiloglu S. and E. Capanoglu 2015. Polyphenol content in figs (Ficus carica L.): Effect of Sun-Drying. Int'l. J. Food Prop. 18(3).

Sources:
Doucette, W., Shunthirasingham, C., Dettenmaier, E.M., Zaleski, R.T., Fantke, P., and Arnot, J.A. 2018. A review of measured bioaccumulation data on terrestrial plants for organic chemicals:Metrics, variability, and the need for standardized measurement
Nagy, KA. 2001. Food requirements for wild animals: predictive equations for free-living mammals, reptiles and birds. Nutrition Abstracts and Reviews, Series B 71, 21R-31R.
EPA 2007. Guidance for developing Ecological Soil Screening Levels (Eco-SSLs). OSWER Directive 9285.7-55. Washington, D.C.
EPA, 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187
Sample, B.E. et al. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory ES/ER/TM-86/R3

HSDB = EPA Hazardous Substance Database
UF = uncertainty factor

EPA SSL Documents:
USEPA, 2005. Ecological Soil Screening Level for Antimony OSWER Directive 9285.7-61.
USEPA, 2005. Ecological Soil Screening Level for Arsenic. OSWER Directive 9285.7-62.
USEPA, 2005. Ecological Soil Screening Level for Cadmium. OSWER Directive 9285.7-65.
USEPA, 2008. Ecological Soil Screening Level for Chromium. OSWER Directive 9285.7-66.
USEPA, 2007. Ecological Soil Screening Level for Copper. OSWER Directive 9285.7-68.
USEPA, 2007. Ecological Soil Screening Level for DDT and Metabolites. OSWER Directive 9285.7-57.
USEPA, 2007. Ecological Soil Screening Level for Dieldrin. OSWER Directive 9285.7-56.
USEPA, 2007. Ecological Soil Screening Level for Zinc . OSWER Directive 9285.7-73.

APPENDIX E.2.b.

Concentration in Terrestrial Plants

BAF = bioaccumulation factor
C_p = conc. in plant, mg/kg dry wt.
C_s = conc. in soil, mg/kg dry wt.
ln = natural logarithm

Antimony					
ln(Cp) = 0.938 * ln(Cs) - 3.233					
Cp	ln(Cp)	coeffcient	Cs	ln(Cs)	intercept
1.663	0.50866704	0.938	54	3.989	-3.233

Cadmium					
ln(Cp) = 0.546 * ln(Cs) - 0.475					
Cp	ln(Cp)	coeffcient	Cs	ln(Cs)	intercept
23.709	3.16585262	0.546	787	6.668	-0.475

Chromium	
Cp = 0.041 * Cs	
Cs	Cp
806	33.046

Copper					
ln(Cp) = 0.394 * ln(Cs) + 0.668					
Cp	ln(Cp)	coeffcient	Cs	ln(Cs)	intercept
40.532	3.70209463	0.394	2210	7.701	0.668

Zinc					
ln(Cp) = 0.554*ln(Cs) + 1.575					
Cp	ln(Cp)	coeffcient	Cs	ln(Cs)	intercept
653.215	6.48190569	0.554	7025	8.857	1.575

Aldrin	
Cp = 0.102 * Cs	
Cs	Cp
34	3.417

Chlordane	
Cp = 0.651 * Cs	
Cs	Cp
62	40.362

Dieldrin	
Cp = 0.41 * Cs	
Cs	Cp
0.3	0.123

Sum DDT/DDE/DDD					
ln(Cp) = 0.7524 * ln(Cs) - 2.5119					
Cp	ln(Cp)	coeffcient	Cs	ln(Cs)	intercept
2.476	0.90647499	0.7524	94	4.543	-2.5119

Plant Bioaccumulation Notes:

1. Unless otherwise noted below, plant tissue concentrations were estimated from soil concentrations using equations provided in Tables 4a and 4b of USEPA 2007 Guidance for Developing Ecological Soil Screening Levels Attachment 4-1.

Aldrin: Mean soil-plant bioconcentration factor for corn husks and leaves. (Data presented in dry weight basis obtained from Doucette et al., 2018. Original data source is Weisgerber et al. 1974)

Chlordane: Maximum reported soil-plant bioconcentration factor for whole zucchini fruit (Data presented in dry weight basis obtained from Doucette et al., 2018. Original data source is White et al., 2002)

Sources:

USEPA 2007. Updated Attachment 4-1 to USEPA's 2005 Guidance for Developing Ecological soil screening Levels (EcoSSLs): Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response, Washington

Doucette, W., Shunthirasingham, C., Dettenmaier, E.M., Zaleski, R.T., Fantke, P., and Arnot, J.A. 2018. A review of measured bioaccumulation data on terrestrial plants for organic chemicals: Metrics, variability, and the need for standardized measurement protocols. Env. Tox. & Chem., V37, No.1. pp 21-33.

Appendix E.3
Selected EPA LOEL Toxicity Reference Values

= selected TRV

Data obtained from EPA Eco-Soil Screening Level documents.

= LOEL - NOEL(L:N) ratio

USEPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.

Copper

Excluded	COPPER-mammal Included Data	Excluded	COPPER - Bird Included Data
Repro	6.79	Repro	12.1
	136		19.5
	136		23.3
	5.51		34
	41.2		25.5
Growth	9.34		28
	19.6		29
	26.9		30.7
	27.6		44.8
	51.6		45
	45.7		29.9
	101		54.4
	99.6		40.6
	64		47.5
	165		40.1
	183		50
	293		318
	358		19.7
	400		22.6
	988	Growth	
	1740	max = 536	4.68
	1.47		7.67
	3		46.6
	5.78		42.9
	7.46		42.9
	15.5		19
	23.5		51.6
	39.8		24.3
	39.8		26.6
	106		28.7
	122		28.7
	274		28.7
	285		28.7
geomean:	53.9		28.7
			25.8
			25.8
20th ptile	11.8		25.8
too close to NOEL			25.8
values close to highest			25.8
mortality value removed.			25.8
highest mortality = 3400			25.8
			25.8
			25.8
Percntile rank of NOEL			25.8
study LOEL of 9.34:	0.187		25.8
			25.8
EPA SSL TRV:	5.6		25.8
			25.8
L:N ratio:	9.6		25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
	13.22		25.8
	79.32		25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8
			25.8

Lead

Excluded	LEAD-mammal Included Data	Excluded	LEAD- bird Included Data
Repro	7	Repro	1.94
	5		3.26
	26		4.04
	6		126
	10		135
	74.9		0.11
	45		0.194
	170		3.26
	180		11.8
	63.2		93.1
	111		377
	54.6	Growth	15.6
	82		59.3
	285		61.4
	270		71
	150		111
	1440		112
	506		126
	506		67.4
	552		125
	587		123
	1500		38.2
	2		53.1
	2.49		64.3
	2.94		76.3
	3.62		124
	5.5		152
	6.76		163
	16.6		200
	46.4		262
	49.6		270
	50		273
	55.5		282
	61.2	geomean	44.6
	78.6	20 ptile	13.32
	99.8		
	137	No values higher than	
	139	highest mortality LOEL of 625	
	154		
	171	EPA SSL TRV:	1.63
	175		
	178	L:N ratio:	8.2
	198		
	200		
	218		
	221		
	222		
	230		
	258		
	330		
	354		
	360		
	360		
	362		
	364		
	381		
	381		
	381		
	404		
	420		
	437		
	579		
	600		
	635		
	646		
	651		
	750		
	762		
	828		
	833		
	991		
	1370		
	1770		
	1990		
2570			
2570			
2570			
2840			

Zinc

Excluded	ZINC-mammal Included Data	Zinc- birds Excluded	Included Data
Repro	82.3		98.8
	75.9		105
	452		66.5
	2541		76.7
4927			123
4878			84.8
	12.2		31.2
	81.1		88
	232		101
	326		205
	326		367
	353	988	
	424	988	
Growth	103	Growth	86.6
	87.1		105
	2514		111
4927			106
4878			111
	2838		112
	8.71		150
	16.1		114
	28.2		172
	75.7		174
	81.1		185
	89.1		145
	424		149
	667		194
	956		286
	968		297
Geomean:	190.1		232
20th ptile:	75.9		237
values close to highest			354
mortality value removed.			503
highest mortality = 4927			480
			21.6
EPA TRV:	75.4		31
			39
L:N ratio:	2.5		65.7
			88
			101
			126
			132
			143
			252
			190
			284
			315
			433
			757
		914	
		988	
		1370	
		geomean:	141.5
		20th pile:	88.0
		values close to highest	
		mortality value removed.	
		highest mortality = 803	
		EPA TRV	66.1
		L:N ratio:	2.1

Antimony

Mammal Excluded Data	Mammal Included Data	Birds Excluded Data	Birds Included Data
Repro			
	0.59		
Growth	42		
	161		
	0.059		
	0.678		
Geomean	2.758048		
20th	0.4838		
Percentile			
NOEL TRV:	0.059		
L:N ratio:	8.2		

Notes:
Max Survival LOAEL = 835
All reproduction and growth LOAEL are below the max survival LOAEL

SEE HERE FOR SB TRV:
https://www.sciencedirect.com/science/article/pii/B97801280

Cadmium

Mammal Excluded Data	Mammal Included Data	Birds Excluded Data	Birds Included Data
Repro		Reproduction	
	15.6		2.37
	4.88		2.37
	10		2.4
	10		21.1
	2.28		21.1
	4.5		2.4
	40		3.71
	54		7.65
	10		10.4
	18.4	Growth	7.08
	75		3.3
	0.661		4.66
	1.42		3.44
	1.45		3.44
	1.87		37.6
	2.14		1.05
	3.93		4.26
	4.61		4.8
	5.59		4.9
	5.82		5.63
	6.3		9.57
	7.28		9.75
	236		12.2
Growth	1		12.8
	1		13
	1.6		13.8
	1.3		14.7
	4		
	0.909		
	1.2	GEOMEAN	6.35
	1.6	20th Percentile	3.328
	7.7		
	10	L:N ratio:	4.3
	5.2		
	10.8		
	6.13	Notes:	
	10.6		
	10	NOEL TRV	1.47
	15.4		
	12.1	Max Survival LOAEL = 66.9	
	8.71		
	44.4		
	54	All reproduction and growth	
	15.2	LOAEL are below survival	
	17.1	LOAEL - Use all data	
	85.9		
	100		
	0.0744		
	0.143		
	1		
	1.97		
	3.01		
	3.21		
	3.43		
	3.88		
	4.06		
	4.58		
	5.08		
	5.18		
	5.44		
	5.74		
	5.82		
	6.13		
	6.89		
	9.54		
	9.7		
	10		
	10.4		
	13.2		
	14.7		
	16.8		
	20.7		
	75.8		
	103		
	571		
GEOMEAN	6.902		

Chromium 3+

Mammal Excluded Data	Mammal Included Data	Birds Excluded Data	Birds Included Data
Reproduction			2.78
	9.62		75.4
	36.2		9.91
	91.1		28.7
	228		
Growth	92.1	Geomean:	15.63
Geomean	58.17	20th ptile	7.058
20th ptile	30.884		
TOO HIGH		NOEL SSL	
		TRV:	2.66
Lowest			
LOEL:	9.62	Avian SSL	
L:N ratio:	4.0	below background.	
NOEL		L:N ratio:	5.9
TRV:	2.4		
(geomean)			

Notes:
Max Survival LOAEL = 2.82
All the LOAEL for reproduction and growth are above the max Survival LOAEL.

DDT

Mammal Excluded Data	Mammal Included Data	Birds Excluded Data	Birds Included Data
Reproduct	0.274		0.396
	0.694		0.281
	0.735		0.754
	1.79		1.13
	17.1		1.97
	19		0.494
	99		1.892
	50		5.2
	85.3		6.07
	38.8		21.1
	95.6		32.5
	0.02		46.9
	0.02		42.5
	0.636		29
	0.7		37.5
	0.731		51.5
	1		0.211
	2		0.281
	2		0.294
	3		0.366
	3.82		0.473
	4.22		0.494
	6.6		0.494
	9.9		0.562
	16.2		0.563
	25.3		0.563
200			0.563
Growth	4.19		0.563
	33.7		0.563
	96.5		0.563
137			1.12
	0.2		1.13
	1.75		1.14
	7.5		1.14
	15		1.24
	47.3		1.36
	62.9		1.44
Geomean	4.58		1.68
20th p-tile	0.725		2.25
L:N ratio:	4.9		2.2
			2.25
			2.25
			2.25
			2.25
			2.25
			2.25
Notes:			2.41
Max survival			2.41
LOEL	137		2.73
			2.8
SSL NOEL			2.81
TRV	0.147		4.22
			4.57
			4.58
			4.94
			5.19
			6.02
			6.29
			12.5
			13
			13
			13.8
			14.8
			36
		Growth	2.27
			2.79
			2.95
			42.5
			0.592
			0.713
			1.04
			3.08
			6.02
			6.02
			13
			18.9
			42.5
		Geomean	2.699502

Dieldrin

Mammal Excluded Data	Mammal Included Data	Birds Excluded Data	Birds Included Data
Reproduct	0.03	Reproduct	0.223
	0.72		0.519
	0.228		0.675
	0.278		1.7
	0.564		1.51
	0.646		2.6
Growth	1.96		0.0445
	2		0.122
	1.74		0.226
	2.05		0.403
	5.22		0.674
	5.22		1.18
	18		1.52
	0.14		2.6
	0.4	Growth	3.78
	0.7		0.519
	2.64		10.1
	4.31		5.93
	5		0.236
	16.5		0.439
			0.96
Geomean	1.273499	Geomean	0.8010059
20th p-tile	0.3756	20th p-tile	0.236
L:N Ratio	25.04	L:N Ratio:	3.33
NOEL TR	0.015	SSL NOEL	0.0709

Selected EPA LOEL Toxicity Reference Values = selected TRV

Data obtained from EPA Eco-Soil Screening Level documents. = LOEL - NOEL(L:N) ratio

USEPA 2003-2008. Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response. https://www.epa.gov/chemical-research/ecological-soil-screening-level See constituent-specific documents.

Copper				Lead			
	COPPER-mammal	COPPER - Bird		LEAD-mammal		LEAD- bird	
Excluded	Included Data	Excluded	Included Data	Excluded	Included Data	Excluded	Included Data
			25.8	3630			
			25.8	6170			
			25.8		5		
			25.8		13		
			25.8		8.9		
			25.8		28.2		
			25.8		29		
			25.8		532		
			25.8		50.4		
			25.8		163		
			25.8		180		
			25.8		178		
		geomean	25.8		225		
		20 ptile	25.8		383		
					1360		
		No values higher than			508		
		highest mortality LOEL of 536			373		
					460		
		NOEL SSL TRV:	4.05		800		
					800		
		L:N ratio:	6.4		1264		
				2530			
					3.3		
					15		
					28.7		
					29		
					29		
					29.5		
					29.9		
					30.4		
					46.4		
					50		
					61.5		
					100		
					173		
					200		
					272		
					328		
					354		
					371		
					400		
					400		
					404		
					442		
					638		
					748		
					991		
					1000		
					1430		
					1600		
				2390			
				2400			
				2650			
				Geomean	148.6		
				20thptile	30.40		

values close to highest mortality value removed. highest mortality = 2400

Percentile rank of NOEL study LOEL of 8.9: 0.091

EPA TRV: 4.7

L:N ratio: 6.5

Zinc				Antimony			
ZINC-mammal		Zinc- birds		Mammal		Birds	
Excluded	Included Data	Excluded	Included Data	Excluded Data	Included Data	Excluded Data	Included Data

Cadmium			
Mammal		Birds	
Excluded Data	Included Data	Excluded Data	Included Data
20th Percentile	2.106		
L:N ratio:	8.96		
NOEL TRV:	0.77		

Notes

Max Survival LOAEL = 2160

All reproduction and growth LOAEL are below survival LOAEL - Use all data

Chromium 3+			
Mammal		Birds	
Excluded Data	Included Data	Excluded Data	Included Data

DDT			
Mammal		Birds	
Excluded Data	Included Data	Excluded Data	Included Data
		20th p-tile	0.563
		L:N ratio:	2.5

Notes:
Max survival
LOEL = 200
All reproduction and growth LOAEL are below survival

SSL NOEL TRV: 0.227

Dieldrin			
Mammal		Birds	
Excluded Data	Included Data	Excluded Data	Included Data