

PROTOCOL

Human Health Constituents of Potential Concern

Introduction

This protocol has been developed in order to support the Savannah River Site environmental remediation program. It provides instructions for the identification of human health constituents of potential concern (HH COPCs). The protocol instructions are based on the latest available USEPA guidance and agreement from the staff of USEPA, SCDHEC, and USDOE as members of the Risk Assessment Design Team (RADT).

This protocol is considered the first step in the formal human health risk evaluation process. Ideally it is implemented after the exposure groups have been identified and the data appropriately processed in accordance with established protocols.

Preliminary remediation goals (PRGs) are risk-based tools used to evaluate potentially contaminated waste sites. PRGs are derived in accordance with the methodologies described in the Risk Assessment Guidance for Superfund (RAGS) documents published by USEPA. PRG concentrations (activities) are based on pathways for which generally accepted methods, models, and assumptions have been developed.

The most current USEPA Region 9 table is the source of the PRGs described in this protocol for nonradiological constituents; it combines current USEPA toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media that the agency considers protective of humans. More detailed information can be found at the USEPA Region 9 website: www.epa.gov/region09/waste/sfund/prg/index.htm.

USEPA does not publish screening values for radiological constituents in a standardized table as they do for nonradiological PRGs. However, the Superfund radionuclide PRG website provides a database tool with which to derive risk-based PRGs using standard default parameters and the latest toxicity values; it also allows the user to modify input parameters to create site-specific PRGs. The PRGs for radiological constituents described in this protocol are developed using the USEPA Radionuclide PRGs for Superfund Electronic Calculator. The radionuclide PRGs will be revised whenever changes to the database tool significantly impact the PRG concentration. More detailed information can be found at the USEPA PRG Radcalculator website: <http://epa-prgs.ornl.gov/radionuclides/>.

Standardized reference tables that contain PRGs can be used in all stages of the risk-decision making process. The SRS risk assessment technical staff controls and maintains the PRG tables for use by Soil and Groundwater Closures Projects (SGCP).

Details

Figure 1 is a flowchart of the HH COPC selection process described below. Table 1 is a sample HH COPC screening table.

Step 1: DATA PREPARATION

Data for each constituent should be sorted by medium as described in the Development of Exposure Groups Protocol. Data should be processed in accordance with the Unit-Source Data Processing Protocol, Unit-Background Data Processing Protocol, and Surrogates for Non-Detects Protocol. For any data which have qualifiers, determine if the qualified data should be retained. Do not eliminate data based on "J" qualifiers.

Calcium, chloride, iodine, magnesium, phosphorous, potassium and sodium are excluded from further evaluation because they are essential nutrients that are not considered toxic and do not have health-based limits.

Step 2: PRG COMPARISON

Use the residential soil PRGs for the unit soil, sediment and concrete media, and the tap water values for groundwater and surface water. (Although it is recognized that exposure to concrete media should not be the same as soil media, the soil PRGs are used as a conservative screening step.)

For carcinogenic effects, compare the maximum concentration (activity) of each constituent in each exposure group to the 1×10^{-6} PRG concentration (activity).

For non-carcinogenic effects, compare the unit maximum concentration of each constituent in each exposure group to the hazard quotient (HQ) level of 0.1.

Retain the constituent for further analysis if its maximum value exceeds the appropriate PRG screening value. The constituent is eliminated from further evaluation if its maximum value is less than the PRG screening value.

If PRG values are not available, then determine if a surrogate value can be used. If an appropriate surrogate value can be identified, then implement this step of the protocol. If no surrogate values can be determined, carry the constituent forward to the human health constituent of concern (HH COC) list.

Determine if the constituent is naturally occurring or anthropogenic. Anthropogenic constituents that exceed the PRG screen will be identified as HH COPCs (Step 5) and carried forward through a more detailed analysis of human health risk. Naturally occurring constituents that exceed the PRG screen shall proceed to Step 3.

Step 3: BACKGROUND COMPARISON

For naturally occurring inorganics and radionuclide constituents, compare the maximum concentration to two times the background average concentration (unit specific background or approved SRS background) for each exposure group.

For soils and sediments, the 0-1 foot (ft) unit maximum value is compared to two-times the background average value.

For concrete media, the surficial maximum value (typically 0-0.5 inch) may be compared to two-times the 0-1 ft background average value for soils.

For groundwater, compare the maximum concentration in each distinct aquifer to two times the unit-background average values for the same aquifer.

Retain the constituent for further analysis if its maximum value exceeds the unit-specific background screening value. The constituent is eliminated from further evaluation if its maximum value is less than the unit-specific background screening value.

Step 4: RE-INCLUSION STEP

Consider whether any previously eliminated constituent should be re-included due to historical information or other considerations including mobility, bioaccumulation, persistence, and toxicity. Also, any member of a chemical class that has other members selected as COPCs should be retained (e.g., carcinogenic PAHs, PCBs, dioxins and furans).

Step 5: FINAL HH COPC IDENTIFICATION

The constituents retained to this point in the process are identified as HH COPCs. They will be carried forward through a more detailed analysis of human health risk (i.e., Human Health Constituents of Concern Protocol). If no HH COPCs have been identified at this point, then this part of the analysis is complete.

Figure 1. Flowchart of Human Health COPC Selection Process

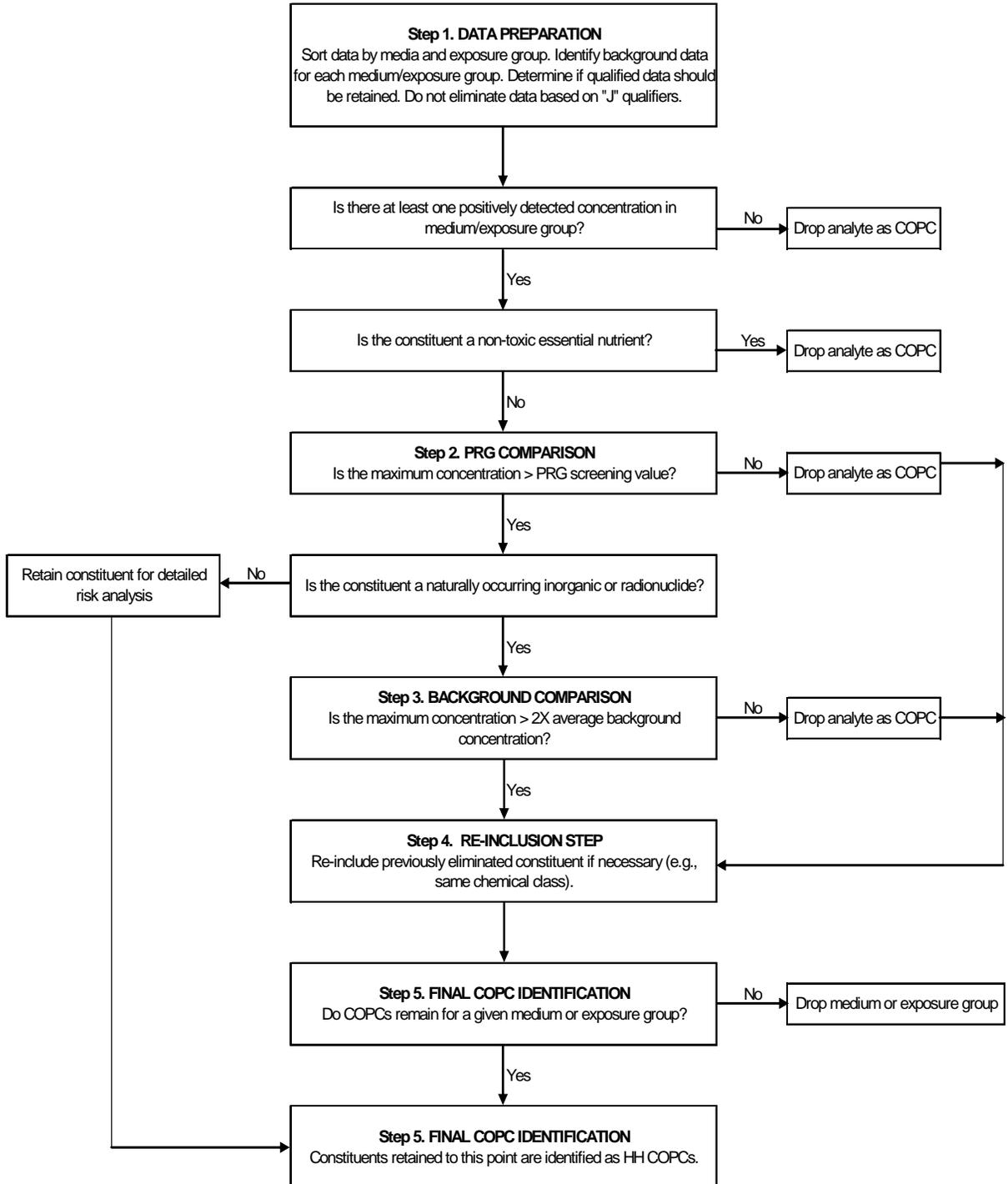


Table 1. (Sample) Human Health COPC Screening
Exposure Group Surface Soil, 0.0 to 0.3 m (0.0 to 1.0 ft)

Analyte	Detected Maximum Concentration	Human Health Screening Value	Human Health Screening Value Source ^A	Exceeds Human Health Screening Value?	2X Average Background Concentration	Exceeds 2X Average Background? ^B	COPC?
Inorganics (mg/kg)							
Constituent A	1.05E+04	7.61E+03	0.1xPRG	YES	1.30E+04	no	COPC
Constituent B	3.98E+00	3.90E-01	PRG	YES	2.60E+00	YES	COPC
Constituent C	3.82E+01	5.37E+02	0.1xPRG	no	4.58E+01	no	no
Constituent D	9.30E-01	1.54E+01	0.1xPRG	no	ND	YES	no
Constituent E	5.92E+02	NA	Nutrient	no ^C	4.88E+02	YES	no
Constituent F	4.32E+01	2.11E+02	PRG	no	2.96E+01	YES	no
Constituent G	4.30E+00	3.13E+02	0.1xPRG	no	6.16E+00	no	no
Organics (mg/kg)							
Constituent H	7.23E+02	1.24E+01	0.1xPRG	YES	7.25E+02	NA	COPC
Constituent I	1.35E-01	1.57E+02	0.1xPRG	no	ND	NA	no
Constituent J	6.54E+01	9.11E+00	PRG	YES	1.55E-02	NA	COPC
Constituent K	4.16E-02	7.33E+02	0.1xPRG	no	ND	NA	no
Constituent L	3.36E-03	1.51E+00	PRG	no	1.08E-03	NA	no
Pesticides/PCBs (mg/kg)							
Constituent M	4.89E+01	1.72E+00	PRG	YES	9.04E-04	NA	COPC
Constituent N	1.22E-03	1.83E+01	PRG	no	1.60E-03	NA	no
Radionuclides (pCi/g)							
Constituent O	1.35E+00	7.32E+02	PRG	no	2.14E+00	no	no
Constituent P	8.47E-01	8.19E+03	PRG	no	1.43E+00	no	no
Constituent Q	4.99E+02	2.79E+02	PRG	YES	1.06E+00	YES	COPC
Constituent R	1.94E+01	6.05E-02	PRG	YES	8.02E-01	YES	COPC
Constituent S	9.55E-01	4.63E+04	PRG	no	1.53E+00	no	no
Constituent T	1.38E+00	1.38E-01	PRG	YES	2.94E+00	no	no
Constituent U	8.47E-01	1.31E-02	PRG	YES	1.43E+00	no	no

A - Nonradiological PRGs are residential soil values from the EPA Region IX PRG table; radiological PRGs are residential soil values from the Engineering Calculation XXX.

B - For screening purposes, maximum concentration of only the naturally-occurring (nonanthropogenic) constituents are compared to 2X average background Background concentration of anthropogenic constituents are presented for information purposes only.

C - Essential nutrients are not identified as COPCs.

NA - Not available

ND- Not detected