

## **Course Outline: Method 3 Risk Characterization: An Introduction for LSPs**

### **1. Introduction – 30 minutes**

A brief history of Risk Assessment and Risk Assessment Guidance; how the current guidance has developed since the 1990s.

The Risk Assessment Paradigm

- Hazard Assessment
- Dose Response
- Exposure Assessment
- Risk Characterization

Relationship of Risk Characterization, Risk Management, and Risk Communication

### **2. Hazard Assessment – 30 minutes**

#### **Selecting Contaminants of Concern (COCs) for Method 3**

Here is where you forget everything you learned about Method 1! The Method 1 Standards are not used in Method 3. They are not “screening” levels. All contaminants that you associate with the site are COCs in Method 3. Some will contribute to risk and others will not, but we have to go through the process before making that decision.

#### **Exposure Point Concentrations (EPCs) for Method 3**

What is the best estimate of exposure? It depends on the site. With a simple site and a small number of samples, you can use the arithmetic mean, following the same “rules” as for Method 1, but there are other options. The EPC is the variable in the exposure equation that contributes most to uncertainty. The Risk Assessor’s goal is to minimize uncertainty in exposure and risk calculations to ensure that the risk estimates calculated are useful and meaningful in making decisions about risk management (i.e. remediation). Minimizing uncertainty, however, has to be balanced against maximizing conservatism in the exposure and risk estimates. Conservatism in Risk Assessment implies that the estimated risk “is not underestimated”. We can live with some overestimation of risk, but if we overestimate by too much our remediation decisions are likely to be more costly than they should be, and people will not be “safer” than if we overestimated risk “slightly”.

#### **Sources, Pathways, Receptors**

Proper use of a Site Conceptual Model will ensure that you have collected adequate environmental data for Method 3.

**3. A Brief Word About Laboratory Data – 15 minutes**

Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity (The PARCCS assessment)

Check the detection limits!

**4. Dose-Response Assessment – 30 minutes**

The Dose-Response Assessment describes how the likelihood and severity of adverse health effects (the responses) are related to the amount and conditions of exposure to an agent (the dose). Dose-Response information is available in the Integrated Risk Information System (IRIS) and from a number of other sources, including MassDEP sources. The Risk Assessor must locate dose-response information for all COCs and validate that the information is the most current. The course will show how to find Reference Dose (RfD) (chronic and subchronic), Reference Concentration (RfC), Slope Factor (SF) and Inhalation Unit Risk (UR) and will briefly explain how these values are derived and used.

**5. Exposure Assessment – 30 minutes**

The Site Conceptual Model provides guidance for determining receptors at a site. The Risk Assessor must identify all actual and potential receptors given current use of a site and reasonable foreseeable use. Residential use must be considered if an Activity and Use Limitation (AUL) is not used at a site. For most uncomplicated sites, particularly residential sites with leaking USTs, residential use can be the only exposure scenario used, but at commercial sites such as gasoline stations exposure scenarios are needed for employees and for potential future residents.

**Break – 15 minutes****6. Risk Characterization – 30 minutes**

In the Risk Characterization, the results of the Exposure Assessment are compared to the Dose- Response values. This provides a quantitative estimate of risk. If the parameters of the Exposure Equation are realistic and conservative the estimate of risk will be conservative and will provide a basis for recommending remediation or other risk management.

**7. Calculating Exposure and Risk – 30 minutes**

Exposure and Risk can be calculated in Excel. In this part of the course we will use the basic equation discussed in Unit 5 and the Risk Characterization discussion in Unit 6 to show how to develop spreadsheets for calculating Exposure and Risk.

The following will be addressed:

- Systemic effects (non-cancer risk)
- Cancer risk
- Ingestion of soil
- Dermal contact with soil
- Inhalation and ingestion of airborne particulate
- Inhalation of indoor air

The following receptors will be discussed:

- Adult residents
- Children
- Adolescents
- Commercial workers
- Construction and utility workers

Other exposures will be addressed if there is time; ingestion and dermal contact with soil constitute the most common exposures to environmental contamination.

#### **8. Uncertainty Analysis – 15 minutes**

The Uncertainty Analysis addresses factors that contribute to uncertainty in the Risk Characterization. If we understand where uncertainty comes from we can evaluate its overall effect on the Risk Characterization conclusions.

Uncertainty comes from:

- Data
- Exposure unknowns
- Dose-Response limitations
- Other factors

#### **9. Other Issues – 15 minutes**

We will conclude with a brief overview of some advanced topics that could not be covered in a short course.

- Exposures to other environmental media
- Models
- Sampling biota
- Risks to safety
- Risks to public welfare