SUMMARY

This Special Technical Publication (STP) on Risk Assessment in Soil Contamination Studies serves to present a sampling of the state-of-the-art and the leading edge of research in the field. This STP was not intended to be a step by step outline of the EPAs basic rules for conducting a risk assessment; rather, it represents modifications to the basic methods that have been acceptable to the EPA at specific sites. Therefore, this STP complies with the EPAs written desire not to inhibit research in this area and stagnate the field.

The topics addressed in this publication are:

1. Site Characterization
2. Fate and Transport
3. Toxicity, Exposures, and Receptors
4. Risk Characterization/Case Studies
5. Establishing Cleanup Levels

The papers included herein, which have undergone peer review and extensive revision since their original presentation, provide state-of-the-art information on conducting risk assessments for complex sites. This collection should not be viewed as the sum total of all the method modifications suitable for risk assessment use or as a guarantee of EPA acceptance, but rather a starting point from which the environmental professional can begin to realize the wealth of variability available in assessing health risk from a site.

Site Characterization

A wide range of papers on Site Characterization were submitted for this symposium. A number of them, however, did not fit well into this theme and were rejected. The incorporation in the symposium and in this technical publication is indicative of the importance of the methods proposed in these papers in an environmental evaluation.

Cameron presented a guide for field personnel who must identify, describe, sample, and interpret site and soil characteristics of hazardous waste sites where metal contamination is suspected or known.

Anderson, Donnelly, Brown and Giam outlined a concept which used a comprehensive bioassay to direct the protocol of the site's chemical characterization. Their method was used at 29 superfund sites which included petroleum manufacturing facilities and wood-preserving facilities.
Moran, Kufs, and Messinger detailed an innovative system for logging and interpreting geologic data. These logs use a computerized program to attempt to standardize the information collected from a boring so that it can be used by a multitude of disciplines.

Clarkson, Peuler, Menzie, Crotwell, Bordenave, Metcalf, and Pahl discussed a variety of analytical screening procedures and their application to risk assessment, while Laszewski and Lehrke compared the effect of using the arithmetic and lognormal statistics on the final determination of the risk assessment.

Two papers involved the selection of indicator chemicals. Hovatter and Gibson discussed the pros and cons of the EPA prescreening procedure, while Streeter, Molholt, and Jampo presented a critical evaluation of the EPAs factors for selecting chemicals of concern. Factors discussed include: frequency of detection; presence of a chemical above a specific standard, background, or in more than one media; and environmental mobility and persistence.

Corwin outlined the use of a user friendly, functional model for the vertical movement of contaminants through the soil vadose zone.

Fate and Transport

The fate and transport of a chemical can be as important in a risk assessment as the actual concentration of the chemical in the environment. An example are chemicals that do not volatilize and are not important in the air exposure pathway.

Menzie, Morgan, Unites, and Burmaster presented an overview of two research programs directed at the use of environmental endpoints for evaluating environmental risk.

Sober and Paul described a method for predicting the fate and transport of hazardous waste constituents from hydrocarbon contaminated soil. His method employed a mathematical model to estimate the release of hazardous constituents from the soil.

Baum and Weyand outlined how the fate and transport data could be used to determine the treatability of soils and industrial residues contaminated with heavy metals.

Toxicity, Exposures, and Receptors
Toxicity, exposures, and receptors combined make the exposure assessment. No health effect is possible if one of these factors is missing. Simply, if the chemical is not toxic, if an exposure to the chemicals is impossible, or if no one exists around the site to be exposed, a health effect is not possible. Thus, a realistic estimation of these factors is essential to the value of the final risk assessment.

Hixson, Jennings, and Smith discussed the effects of childhood ingestion of contaminated soil to the overall carcinogenic risk.

Smith, Beck, and Joseph evaluated the validity of the inhalation pathway for volatile organics from the residential use of contaminated water.

Chrostowski and Wheeler compared the use of the integrated uptake biokinetic model (IU/BK) to the traditional exposure assessment approach. While the IU/BK has been used to predict lead exposure, Chrostowski made the case that the approach can be adopted for use with other site contaminants.

Ross and Lu presented a scheme for determining the toxicity values for chemicals which do not have currently accepted reference doses or carcinogenic slope factors.

Crouch, Pilkington, and Zemba outlined a mathematical approach for determining the effects of "hot spots" on the overall exposure concentration in soils.

**Risk Characterization/Case Studies**

The final step in any risk assessment is to characterize the risk. Contamination assessments, exposure assessments, and toxicity assessments are useful in themselves but their best use is in calculating what health effects could arise from the site. These papers illustrate the use of the three previous assessment in case studies at actual superfund sites.

Choudhury, Peirano, Marcus, Elias, Griffin, and DeRosa illustrate the use of the uptake biokinetic lead model at several national priority list sites.

Small presented a computer software program for characterizing risk from environmental pollutants. The method uses the Preliminary Pollutant Limit Value approach developed for public health impacts from U.S. Army installations.
Moore described and assessed the health effects from surface impoundment wastes. The assessment used the maximum credible exposure assumptions to determine a conservative estimation of risk.

Temeshy, Liedle, Sims, and Efird outlined the results of a site assessment with mixed radiological and chemical wastes and Meadows, Turnblom, Hahne, and Prendiville discussed the estimation of health effects from lead exposure to a residential neighborhood near a large industrial area.

Elliott examined the use of a business approach to the assessment of risk at a hazardous waste site. His method employed the goal of providing protection to health but also minimized future environmental liability. Huff and Tesch compared four case studies to minimize the number of potential chemicals of concern.

Linder, Callahan, and Pascoe presented the range of field and laboratory analytical methods to evaluate a site for a biological assessment.

Cura and Menzie outlined the use of the risk assessment process in assessing risk to non-human receptors from the exposure to poly-aromatic hydrocarbons in sediments of the marine and other aquatic environments.

Establishing Cleanup Levels

Lastly, a session on establishing cleanup levels was held. Lloyd, Thompson, and Burmaster presented a paper on probabilistic techniques for backcalculating soil cleanup targets.

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