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G/W/96

FACSIMILE TRANSMISSION FORM

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DATE: *10/02/96* **TIME:** *9:30 a.m.*

NUMBER OF PAGES (INCLUDING THIS COVER SHEET): *10*

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COMMENTS: *Attached are the DRAFT Eco. Workshop Notes and the Evaluation Summary. Official hardcopy to follow.*

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Ecological Risk Assessment Workshop
DoubleTree Hotel - Santa Fe, New Mexico
September 23 & 24th, 1996

Workshop Discussion Notes

Reference Material: *Ecological Risk Assessment Approach for Los Alamos National Laboratory (LA-UR-96-766)*, Ferenbaugh et. al.

Task 1: Delineate Ecological Exposure Units (EEU's).

An EEU is defined by habitat.

EEU's (or eco-zones) are comprised of one or more Potential Release Sites (PRS'). This recommendation is considered a practical approach at evaluating PRS' that share a common habitat. Therefore, it is expected that the approach would expedite the ecological risk assessment process by allowing for the process to be defined and applied (i.e., selection of assessment and measurement endpoints) to whole areas instead of PRS by PRS.

Riparian corridors that can be a habitat and source of food and water to: aquatic species, wildlife, and migratory birds should be considered as separate EEU's. See page 5, figure 2. Storm water influences to these riparian corridors should also be accounted for.

The decision to establish background concentrations should consider the following:

a) Inorganic concentrations versus organic concentrations. Is there any benefit from establishing either one or both?

b) Anthropogenic versus natural background. Should the background study consider both?

c) Is it necessary to establish Potential Release Site (PRS) specific background? What is the rationale for establishing these background concentrations?

d) What will be the background sampling locations? On-site, off-site, off the facility boundaries, and pristine versus reference site.

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Task 2: Develop Preliminary Contaminant of Potential Ecological Concern (COPEC) lists.

Should radionuclides be considered for ecological risk assessment? Are human health protective levels protective of potential ecological receptors?

Radioactive waste should be examined for the presence of daughter products.

Co-occurrence of constituents should be considered in establishing preliminary COPEC's.

Speciation of certain constituents may be required since of chemical species are much more toxic than others, e.g., chromium, mercury.

Table 2. Preliminary COPEC List for Screening. Other chemicals that should be considered (for presence/absence) are: dioxin, furan, degradation products (DCE, vinyl chloride).

Radionuclides should be considered for food chain effects from contaminants to prey.

What form of radionuclides should be considered in the ecological risk assessment?

There is a non-regulatory screening level for radionuclides. It is a value obtained from IAEA which evaluates the external dose by considering the inhalation and ingestion pathways.

Has ecological risk assessment been done on radionuclide at other sites? Yes, at INEL.

Task 3: Define Food Webs.

Aquatic food webs may go beyond the facility boundary.

Connections between the terrestrial and aquatic food webs.

The term receptor versus assessment endpoints. In establishing an assessment endpoint, an ecologically relevant receptor (or ecological resource) should be considered. The receptor is the organism that contacts the toxic agent. The assessment endpoint is the ecological value to be protected.

The measurement endpoint is the measure of effect or measure of exposure.

Task 4: Define Pathways of Exposure.

Development of site conceptual model.

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Task 5: Select Receptors.

The selection of ecologically relevant receptors (measurement endpoints) should be based on: sensitivity to COPEC's, relevance to the integrity of the ecosystem structure and function, and representative of exposure pathway.

Task 6: Locate appropriate toxicological data.

Databases, what is searched?

ARAR versus toxicity value? Both should be considered.

Task 7: Calculate Toxicity Reference Values (TRV's).

The Hazard Quotient (HQ) is the ratio of the media concentration (maximum detected concentration recommended for the initial screening phase) to the relevant toxicity or risk-based value (e.g., NOAEL or Ambient Water Quality Standard). The result is a unitless value that can be used as an indicator of whether a media concentration has exceeded a toxicity value/standard.

A separate HQ is calculated for each detected constituent (i.e., COPEC). If multiple constituents are present the screen must account for potential impacts. The summation of chemical-specific HQ's to calculate a Hazard Index (HI) should be used to account for the presence of multiple constituents. Available guidance allows for the partitioning of HI's by mode of toxicity.

An HI of 1 is used as a point of departure to evaluate the potential for adverse ecological impacts. An HI of less than 1 indicates that the contaminants present are unlikely to cause adverse ecological impacts whereas an HI greater than 1 indicates a potential for adverse effects.

The toxicity value for the calculation of the HQ can be based on the lowest available toxicity value.

Because literature toxicity values are sometimes based on mg-contaminant/kg-body weight of test organism/day (or dose), it is sometimes necessary to convert these values. EPA's **Wildlife Exposure Factors Handbook** (see Reference List provided in workshop handout) illustrates how these values can be converted from concentration (e.g., mg-chemical/kg-media) to dose (e.g., mg-chemical/kg-animal body weight/day).

The toxicity value can also be based on a selected representative ecological receptor (measurement endpoint). The test organism on which the literature toxicity value must correlated to the measurement endpoint. This requires an extrapolation or correlation of the test versus the expected value.

A decision tree for evaluating available toxicity studies to make decisions of whether they should be used in the ecological risk assessment process is needed.

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The equation for the TRV can be best represented by:

$$TRV_{food} = \frac{RfD \times BW \times CF}{I \times FS}$$

where: TRV_{food} = toxicity reference value applicable to the food ingestion pathway
RfD = literature value reference dose
BW = measurement endpoint representative body weight
CF = unit conversion factor
I = ingestion rate
FS = Fraction of soil ingested

Empirical data should be used on soil ingestion.

Water source should be considered for the water ingestion exposure pathway.

Critical effect must be the most sensitive effect.

The relation of relative concentrations and their toxicity endpoints are:
EC50/LC50>LOAEL>NOAEL.

The ecological risk assessment should protect for chronic effects, therefore, the NOAEL should be used as the toxicity value endpoint. However, some of the available literature values are based on the LOAEL and EC50/LC50 endpoints, therefore, requiring adjustments to the toxicity value. It is EPA's policy that uncertainty factors of 0.1 and 0.01 be applied to toxicity values based on the LOAEL and EC50/LC50 endpoints, respectively.

Additionally, it is common practice to apply uncertainty factors to cross species or taxa. That is, if the reference toxicity value in the literature is based on a certain species of mammal and the measurement endpoint is for another species of mammal then a uncertainty factor of 10 should be applied (another factor of ten if mammal to bird etc.).

The uncertainty factors are a means of adding a "margin of safety" to limited available toxicity values. The layering of uncertainty factors often yields extremely low TRV's. This has resulted in a recommended approach termed the Maximum Available Toxicity Concentration or MATC which is the geometric mean of the NOAEL and LOAEL.

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Task 8: Classify potential sources of contamination for acute and chronic screening assessment exposure.

The use of acute toxicity values for disturbed, i.e., highly industrialized with limited habitat, has been recommended as a practical approach to address the potential exposure of ecological receptors. It is assumed that these ecological receptors will have exposure of limited/short term duration exposures. This recommendation has been offered until such time that a more practical and technically defensible approach can be proposed.

Concerns were raised about using acute values to evaluate disturbed since they may be a source of runoff (potentially with chemical concentrations at acute toxicity levels).

The manner in which the potential receptors use the disturb areas must be examined closely, e.g., nocturnal mammals, rattlesnakes, rabbits etc.

Exceedance of an acute value (or an HI greater than 1) does not automatically trigger remediation.

Task 9: Calculate Exposure or Dose.

Mercury contaminated areas should be evaluated for the presence of methylmercury. Important in evaluating aquatic versus terrestrial receptors and habitats.

Chromium: hexavalent versus trivalent.

Exposure factors - information other than EPA's **Wildlife Exposure Factors Handbook**. Although there may be other information available, EPA's handbook is a primary source for this information.

Task 10: Calculate Hazard Quotients (HQ's).

$$HQ = \frac{\text{Exposure}}{\text{TRV}}$$

Task 11: Identify EEU's where further assessment is required.

Since not all PRS' within a EEU will be at the same stage of the environmental restoration/corrective action process it is necessary to decide what HQ or HI is acceptable within a PRS in order to propose No Further Action.

An HQ would not account for the presence of multiple constituents.

Should the screening assessment recommendation be based on an HQ or HI? The HI was regarded as the preferred value.

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To partition the HI by mode of toxicity is considered scientifically defensible. This is analogous to the human health risk assessment process.

If no partitioning by mode of toxicity is considered than perhaps an HI greater than one might consider partitioning, whereas an HI less than one would not.

The screening assessment can also be used as a tool to further eliminate constituents of concern by semi-quantitatively evaluating the chemical-specific HQ's. For example, a chemical contributing to an HI of greater 25 with an HQ of less 0.003 may be a candidate for elimination as a COPEC if the question of fate and transport and other chemical/physical properties support it.

Task 12: Identify data gaps and/or uncertainties.

Further characterization of biota may encompass revisiting the question of what species are present at a site.

Collection of key media samples may be considered.

Should fungal communities be addressed? Decomposers, detritivores are considered in the proposed food web (Figure 3). This is an issue with root uptake of nutrients, growth rate and survival of trees since fungi play an important role in the nutrient cycle for the symbiotic relationship of the fungal and tree communities. The relationship of fungal communities should then be considered when selecting assessment and measurement endpoints.

Task 13: Develop and implement plans to address data gaps and uncertainties.

Data Quality Objective to address data gaps.

Should this step be eliminated since DQO's should have been established at the onset? Not necessarily, since there might be a need to revisit the DQO's in order to gather needed information to make a risk management decision, i.e., part of the iterative process of ecological risk assessment.

Task 14: Perform baseline ecological risk assessment.

It should be a multi-metric approach.

Weight-of-evidence approach may lend to a better technical recommendation and subsequent risk management decision.

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Task 15: Complete Ecological RCRA Facility Investigation (ERFI) reports.

Which has more weight ecological risk or human health risk? Both are equally important, however, the ecological risk assessment includes a component to evaluate whether ecological impacts from the remedy may outweigh the potential ecological risk from the contamination. The human health risk assessment often does not have this component, therefore, often this has been interpreted as human health risk having more weight than ecological risk.

A determination of "are we safe" includes an ecological risk assessment.

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Ecological Risk Assessment Workshop
DoubleTree Hotel - Santa Fe, New Mexico
September 23 & 24th, 1996

Workshop Evaluation Summary

The question dealing with whether the goals of the workshop were clearly defined received from good to excellent marks. The participants were involved in the process of establishing the workshop's goals by being asked for their personal goals in attending the workshop.

The regulatory requirements being clearly outlined received good to moderate marks. This could be due to the fact that the workshop did not concentrate on the specific regulatory requirements (i.e., the RFI and CMS requirements) since it was requested and designed to be a technical exchange. NMED may wish to plan an additional workshop that will focus on this goal.

The workshop materials received good to excellent marks in offering practical examples. This could have been due to the discussion paper that described a specific ecological risk assessment approach.

The application of recommendations/guidance received good to excellent marks. The workshop clearly emphasized the presentation and discussion of available and proposed technical guidance.

The clear illustration of when ecological risk assessment comes into corrective action/environmental restoration process received good to moderate marks. This, like the regulatory requirements issue, were not the main focus of the workshop. NMED may need to plan an additional workshop where the corrective action process can be the focus.

Discussion format allowed for interactive participation since it received high marks by all participants.

The overall benefit of the workshop received good to excellent marks.

The things best liked about the workshop were:

1) The use of practical examples.
2) Discussions and comments made by the participants.
3) Provided a broader understanding of ecological risk assessment.
4) Liked using the LANL paper as a basis for discussion.
5) Wide-expertise of participants.
6) Went through all procedures.
7) Information from EPA about questions NMED had about assessment/screening.
8) Discussion format - non-acrimonious exchange.
9) Like involvement of regulators with analysts.
10) The success of risk assessment lies on this (exchanges) happening more often.

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The things best liked about the workshop were (cont'd):

11) The wide range of people who attended.
12) Interactive opportunities - because got a feel of what different agencies were looking at and was more educational.
13) Presentations by Jon and Maria were well done.
14) Obviously Jon and Maria know their subject well and are able to present what they know in a meaningful manner.
15) Presenters were both well spoken and clear!
16) Actual discussion of a real site and assessment.
17) Differing and critical points of view.
18) Facility was good.
19) Open discussions of innovative proposals, which allowed to obtain information that would not ordinarily get from a traditional training course.
20) Enjoyed getting a better understanding of different viewpoints.

The recommended improvements for the workshop were:

1) Provide a (basic) course on ecological risk assessment to NMED.
2) Do not use LANL for an example.
3) The focus of this workshop was probably too advanced for those without much training.
4) Have EPA show some examples of how data is collected and evaluated.
5) I was confused at times between "workshop" on eco risk and "critique" of proposed LANL methods. It is very difficult to separate the two.
6) Work examples.
7) Can't think of any improvements to suggest.
8) The seating arrangements were cramped.
9) A more basic training for those that will be trying to review and understand how all the factors and unknowns are worked out within an eco risk study.
10) Add coffee, perks people up.
11) Do a calculation to show how/where risk is/isn't.
12) Perhaps a little more thorough explanation of the eco-risk evaluation structure.

On the question of interest in future risk assessment training and workshops the majority of participants requested additional training/workshops. The following were statements made:

1) Contact Oscar Simpson (NMED- District I, Albuquerque Office)
2) Contact Maura Hanning (NMED - Superfund Oversight Section, 505-827-2992/2911)
3) Contact Bruce Swanton/Ralph Ford-Schmid (NMED- DOE Oversight Bureau, 505-827-1536)
4) Contact Ms Lee Win (NMED- HRMB, 505-827-1558)
5) I was expecting a different format of workshop...with hands on calculating scenarios of ecological risk. The format that Region 9 had proposed. This was informative but not as in depth as I would have liked. I really would like Region 9 to come in conjunction with Region 6 and give the original 3 days of training with one day in the field at a test site discussing problems and how to attack eco risk at a real site.