CRESP National Review Panel Report: Review of Risk Data Sheet Information for FY 1998

TABLE of CONTENTS

Appendices

A. Cross-Site Consistency Review Data Tables

B. Independent Verification

C. Database Analysis Tables

D. RDS Report Card

D1. Required Elements of Risk Data Sheets

D2. Report Card Evaluation Guidelines

D3. Report Card Evaluation Summary Tables

D4. Completed Report Card Evaluation Forms
(N = 300 -- electronic copy (MS Access Database file) available upon request)

E. National Review Panel Members and Staff

F. What is CRESP?

G. Comments Received on the Draft Final NRP Report

CRESP National Review Panel Report:
Review of Risk Data Sheet Information for FY 1998

Executive Summary

Introduction

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) was asked by the Department of Energy Office of Environmental Management (DOE/EM) to independently review the quality, completeness and utility of data submitted by its field offices in support of their FY98 budget request. These data are contained in Risk Data Sheets (RDS), a significant information element of the risk influenced decision process formally adopted by DOE/EM in 1995.

CRESP assembled a National Review Panel composed of individuals possessing expertise in relevant scientific and technical disciplines who also possess general knowledge of DOE sites and the RDS process. As requested, the primary thrust of the Panel's effort was to concentrate on the risk related portions contained in the RDSs. The Panel elected to conduct its work by focusing efforts in three broad areas: 1) independent verification of ratings, statements or conclusions contained within a subset of RDSs; 2) cross-site consistency in use of key terms and elements, including ratings, contained in the RDS evaluation matrix; and, 3). the degree to which the information within the RDS conforms with the EM budget guidance. The Panel had approximately 15 days to complete its work, a requirement that imposed practical constraints on the breadth and intensity of the review. Notwithstanding these constraints, over 400 of the 1408 RDSs were reviewed in some detail. The panel was struck by the fact that the findings from each of its different endeavors yielded similar conclusions. This uniformity of findings among panel members and across tasks gave the Panel confidence that its views are applicable to the entire data base.

General Findings

1. The RDS can be a valuable management evaluation tool because it summarizes information on a diverse range of topics. This aggregate of information spans issues most relevant to EM decision making. Quite properly it is not a formula that yields a simplistic mathematical value. Rather, it is a qualitative process that permits the consideration of quantitative information along with the views and judgments of managers, stakeholders and technical personnel. The Panel is supportive of the DOE/EM commitment to implement this risk influenced management system in a program characterized by its complexity and magnitude. The RDS process is iterative in nature and the Panel strongly recommends that it be continually revised and refined to further improve its content and utility for programs within DOE and elsewhere. Several Panel members entered the review skeptical of the value and utility of the RDS process. At the conclusion of the process the Panel held the unanimous view that the process can, and should, be a powerful tool to present information highly relevant to the EM planning and decision-making process.

1. The RDS data base the Panel reviewed can be cautiously used as an information resource by the EM Internal Review Board in its FY 1998 budget formulation activities. In general, the reviewers were

able to conclude that the RDS risk values were reasonable.[1] We report that we consistently found flaws as to the quality or completeness of information contained within a RDS. These deficiencies involved narrative or elements that are important to the evaluation matrix or in understanding how the impact level was determined. There commonly was a lack of sufficient detail in the RDS to understand what the task was and to read a narrative that satisfactorily described the nature of particular risks and the basis for assigning a High, Medium, or Low designation. Some portions of an RDS were of adequate quality and completeness; other portions of the same document were deficient. The Panel also found a lack of cross site consistency for the several activities reviewed. These shortcomings prompted the Panel to recommend cautious use of the RDSs. We suggest that the RDSs in their current state be used for general information by the Internal Review of Budget and that either operations or program office be prepared to augment the substance of the narrative when issues of major interest arise.

2. While an RDS should not be viewed as equivalent to a complete risk assessment or a mini Environmental Impact Statement; it should reference important documents and provide key summaries and quotations. An RDS should convey that there is a foundation of work available, i.e., decision documents, reports, minutes of meetings, inspections, audits, agreements etc., that serve as the basis and rationale for the descriptions and ranking of elements contained in the management evaluation matrix (MEM). It is important to note that some RDSs contained sufficient quantities of information that was of high quality and relevance. It can be done! A number of submissions from the Richland, Ohio and Oakland offices were notable in this regard. Several of the Richland submissions could well serve as a model for others at Hanford and at other DOE sites. The Panel suspects a correlation exists between RDS quality and the level of interaction with stakeholders, Indian Nations, regulators and other parties during the RDS development process. While the current RDS can have value for uses internal to DOE/EM, such as the Internal Review of Budget (IRB) activity, they are not of adequate quality to withstand scrutiny by outside groups or to effectively serve as documentary support of budget requests to either OMB or Congress. Due to inadequate narrative the RDS takes on an undesirable character of appearing to reflect arbitrary pronouncements. If left uncorrected one of the greatest values of the RDSs -- *transparency* as to what information was used, and how it was used -- in decision-making processes will be lost.[2]

3. It was the unanimous view of the Panel that some site activities are not appropriate for description and ranking using the risk elements of the RDS's Management Evaluation Matrix, for example, general management and basic site infrastructure, i.e., road maintenance, security, meteorological services, fire protection etc. It is not suggested that these activities be immune from some form of analysis, or removed from the RDS, just that more appropriate criteria be applied[3]

Review Findings

[1]The Panel did not view its task to be one of "second-guessing" the risk score within an RDS evaluation matrix or rendering judgment as to the rank ordering of an optimized site priority list. It did focus on how clearly the rationale for the matrix score was narrated, including risk scenarios, and was appropriately documented. In some instances the Panel made some general suggestions on inconsistent rankings of High, Medium, or Low for similar activities.

[2]The importance of transparency cannot be overstated. The public does not have a secure belief that DOE is managing activities in a thorough, efficient manner that is also sensitive to their interests and concerns. To gain public confidence having the right answer is not sufficient - one must also show their work.

[3]In the interest of accountability, management activity associated with a specific task should be costed with that task as contrasted with "general" management.

The broad findings of the Panel's three main review activities are presented below. Major recommendations for improving the process are also presented. The body of the Panel Report provides details as to specific approach and findings.

Independent Verification of RDS Information

For this activity the National Review Panel opted to evaluate activities relevant to plumes, landfills, and tanks. These represent activities viewed by DOE as high potential risk and high cost drivers. Within each area of focus, RDSs from two sites were selected from four candidate sites, Idaho, Oak Ridge, Richland and Savannah River Site. In a number of instances the RDSs failed to cite appropriate references. Therefore, identification was left to the knowledge of the reviewer and verbal communication with site personnel with relevant detailed knowledge. In general, the panel members were able to find documents that supported the risks characterized in the RDS. Inclusion of data from these references would enhance the quality, completeness and credibility of the statements contained within the RDS. For example, the Panel had attempted to track four typical contaminants of concern, i.e., tritium, strontium-90, carbon tetrachloride and trichlorethylene, across sites. However, information identifying these toxicants of major concern were not listed in the RDS even though they were the major drivers for risks associated with these activities. As the basic quality of the RDSs improve in future years these types of review would prove to be more relevant to program and site managers as well as the interested public.

Cross-site Consistency

The diversity, nature and magnitude of activities covered by the aggregate RDSs did not allow the Panel to draw broad conclusions. The "unit of analysis" definition should be reviewed to see if changes may improve the potential to perform cross-site analyses. Two separate types of Panel evaluations found a lack of cross-site site consistency in ranking of risks associated with similar activities. The Panel's first approach selected from a stratified random sample to ascertain if there was consistency of ranking for four topics that are specific elements in the RDS management evaluation matrix (public health, worker health, environmental and social/cultural/economic effects). Sixty RDSs were evaluated for each element. For the Public Health and Safety matrix element there was a degree of consistency in ranking of high level waste, low risk sites, and treatment, storage & disposal of low level waste. Other activities such as decommissioning and deactivation, surveillance and maintenance, plutonium stabilization and plumes were variable. In the main, the rankings of the Site Personnel Safety and Health element were considered reasonable for each site with variability observed across sites.

Two matrix elements (Environmental Impact, and Social, Cultural and Economic Impact) need priority attention so they can supply a broader range of information to the RDS process. The Panel findings should not be interpreted as suggesting that these two elements are of limited utility and should be removed from the matrix. Indeed, it's views are that these are critical components of the RDS matrix, and major attention should be devoted to making them an effective venue for the presentation of such important topics. It is noted that the Panel's views are consonant with a number of other findings, including those of the National Academy of Science. The Environmental Impact element is currently defined to include any potential adverse impact on natural resources defined as air, water, land and

wildlife. Only in rare instances was information provided that was relevant to ecological risk to either flora or fauna. In the current RDS submissions statements concerning releases of radionuclides or chemicals to the air, water or soil were found, particularly groundwater. These data present information relevant to exposure, little was found that related to risk. The Panel is aware that there are data that can provide information relevant to ecological health. EM is urged to revisit the structure of this element with an eye toward broadening definitions of what should be considered in this element and providing more robust guidance. Given the diversity of EM sites as to types of contaminants and ecosystems perhaps a screening or phasing approach may have merit.

The Social Cultural and Economic matrix element was found to lack meaning in its current form. The Panel found almost no economic information in this RDS field. Further, there often was inconsistent or ineffective treatment of the social or cultural issues. For the FY98 Internal Review of Budget activity the Panel recommends that the value of information within this matrix element be evaluated on a case-by-case basis.

In a second approach to assessing cross-site consistency an activity common to several sites was selected and all RDSs (within the total of 1408 RDSs) that dealt with that activity were selected for cross-site comparison at four major sites (Idaho, Oak Ridge, Richland and Savannah River Site). The area of concern chosen was groundwater. Sixty five RDSs were reviewed. The groundwater activities dealt with: 1) monitoring and characterization; 2) pump and treat only; and 3) remediation (that may include some pump and treat). In each instance the groundwater activities were reviewed for consistency across sites with respect to rankings in the MEM field, taking into account process, contaminant, and pathway receptor differences. Consistency was not observed as there were ranking differences between sites for the risk related matrix elements, i.e., public safety, site personnel, environment. Inconsistency was also commonly observed in the social, cultural matrix element; lack of narrative made understanding the rationale for differences in ranking difficult.

Conformity of RDSs with DOE/EM Guidance

There was a notable difference in the quality of documents submitted by different Operations Offices. A "report card" was designed to facilitate assessment of three key components of the RDS: summary description, risk scenario development, and narrative support of matrix scores. A review of 300 RDSs indicated that a clear majority were not completed according to DOE Guidance. The most significant lapse, because it underpins all risk judgments, was a failure to meet the basic criteria for risk scenario development. A well reasoned and described scenario is a prerequisite for evaluating the potential impacts of activities on general public, worker health, or the environment. The scenario descriptions were incomplete, a finding that was also commonly observed for the narrative that supports the risk matrix scores. The guidance request to reference relevant documents was not heeded.[4]

General Observations and Recommendation for Improving the Process

[4]CRESP intends to provide each Operations Office with examples, selected from their RDS submissions, that reflect the Panel members view of exemplary submissions.

The review activities provided the Panel an opportunity to gain a hands-on perspective of the inherent strengths and weaknesses of the current process. Those Panel members who have had the opportunity to follow this RDS process from its inception acknowledge the progress that has been made in its implementation in complex and wide-ranging locations. While convinced of the important utility of the RDS process the Panel believes there are a number of generic improvements that could significantly enhance quality and productivity. Major observations and recommendations are summarized below; detailed recommendations are contained in the body of the report.

1. The variability in site performance leaves us with the clear impression that the potential importance, value and utility of the RDSs in budget formulation and other management activities is unevenly understood or accepted by EM operations offices. If the RDS approach is to deliver full value, mechanisms must be found that result in greater acceptance and commitment by all offices. This likely means that Operations Offices must apply a team approach to the initial drafting of an RDS; the diversity of information sought requires the utilization of a mix of skills and insights. The initial drafting of an RDS takes a fair amount of thought and work. However, once accomplished they have multi-year utility and require modest effort to periodically update for budgetary purposes. The Panel is of the firm opinion that RDSs should have a utility beyond a budget formulation process. Done thoroughly they could become "stand alone" documents and effectively serve as references for a variety of queries from government, Congress and the private sector. The Panel is aware of capable people at many of the sites with appropriate skills and experience that could prepare RDS submissions of uniform quality and completeness. There is also a need for more guidance as to the technical substance that should be used in preparing an RDS, including case examples.

2. Risk rankings for many RDS activities were based on the merits of an overall project of which the specific activity is only one part. The same scenarios and risk rankings were then cloned across many RDSs. This creates redundant documentation and presents an apparent all-or-nothing choice to the potential decision maker. It would seem desirable to have a way to assess the importance of the related activities to the achievement of the overall project. Perhaps this situation could be improved with a two-tiered ranking system. First, an overall project RDS would be prepared that examined in detail all impact categories. The existence of the project RDS would be referenced in "daughter" RDSs. where the specific activity (RDSs) would be evaluated in relationship to the importance of that activity to the overall project. Only the impact categories relevant to that activity would be addressed. This would eliminate the need to evaluate, for example, public health risk for a management task.

3. The MEM entries should be revised to permit better discrimination between differing types of effect and likelihood of occurrence. Several examples:
    - the fidelity and consistency of the risk rankings (public health, worker health and environmental impact) could be improved by expanding matrix scores to include a negligible risk category, i.e., equal to or not distinguishable from background.
    - the degree to which the current matrix fails to identify extent of impact, i.e., an individual as contrasted to a large population, should also be reassessed.
    - means for more effectively expressing the confidence level in the "occurrence of the impact."
    - it appears that worker risks are being defined primarily as risks from accidents. Cumulative occupational exposures across the total work force, even with no individual doses above regulatory limits, may be significant and should be considered.

4. Ground water and vadose zone risk appear to be somewhat difficult to rank within the current risk ranking ability of the management evaluation matrix. Specifically, the immediate health and ecological risks are often low or nonexistent and long term risks are difficult or impossible to estimate. Yet activities associated with groundwater issues appear to be critical for many stakeholder priorities. These RDSs do not generally seem to justify the cleanup or to capture the important reasons for doing such cleanups. The most significant risk seems to be "degradation of a natural resource," which may be utilized in the future. There is also often a risk associated with not performing remedial action early. That is, the resource may be much more difficult and expensive to remediate at a later time. There is a need to consider how best to treat the risks related to contaminated ground water and the vadose zone and the need for remediation and to provide guidance on this to the field offices.

5. The Panel noted that the principal risk being considered in current practice is that defined in the "before" category of the matrix. It is our recommendation that increasing attention be given to defining measures that can convey the degree of improvement realized in an RDS activity, i.e., the magnitude of the change or the relative cost associated with the increment of value as captured by a comparison of the "before" and "after" matrix elements.

CRESP National Review Panel Report:
Review of Risk Data Sheet Information for FY 1998

Introduction

In the spring of each year, the Department of Energy (DOE) begins developing its national budget for the fiscal year which begins about 18 months later. DOE's budget request has several parts reflecting the major program activities of the department (Defense Programs, Environmental Management, Energy Research, etc.), and each program's request is based on the funding needs of the various activities within that program.

The largest program within DOE is run by the Office of Environmental Management (EM). This office is responsible for the environmental legacy of past nuclear weapons development, testing, and production, as well as responsibly managing the waste generated by ongoing operations in the U.S. nuclear weapons complex. The EM program's annual budget (over $5 Billion in FY 1996) funds thousands of activities at dozens of facilities across the country. These activities range from stabilizing nuclear materials left over from past production activities and managing radioactive and hazardous wastes from those activities, to remediating contamination in soil and groundwater, to safely shutting down unneeded facilities, and to general upkeep and even electricity in necessary buildings. These activities will continue for decades and have been estimated to ultimately cost over two hundred billion dollars.

EM managers need information tools to help them ensure that an appropriate set of activities is funded in a given year and to help them explain the budget to Congress and the public. EM has been developing these tools since the program began in 1989. One of the key current tools - called a Risk Data Sheet (RDS) - was first introduced in 1995 and was partially used in developing the FY 1997 budget. Based on this experience the RDS format was modified and incorporated into the current process to prepare the FY 1998 budget request.

The RDS is a standardized form completed by project managers in the field, describing a unique set of related activities. One RDS, for example, may discuss activities associated with surveillance and maintenance of a waste storage facility, while another RDS may address remediation of a contaminated site or stabilization of nuclear materials in a given building. 1,408 RDSs were submitted on April 15 by DOE's various field offices to explain the basis for the FY 1998 budget request for EM activities.

Each RDS includes a summary of activities, budget needs, and an evaluation of seven factors important to decision makers. These factors are public safety and health, site personnel safety and health, environmental impact, compliance, mission impact, mortgage reduction, and social, cultural, and economic impacts. The activities on an RDS are evaluated for each of these factors, giving decision makers an indication of whether the RDS covers activities of High, Medium, or Low priority for each factor. This evaluation is presented in the Management Evaluation Matrix (MEM), a Table within each RDS.

A goal of the EM program is the continued improvement of this evaluation tool as well as the overall process. In 1995, DOE's Environmental Management Advisory Board, a group of individuals from outside DOE which provides advice to senior EM officials, recommended a multi-tiered effort to assess whether

RDSs are being used consistently throughout the EM program. The recommended process includes site specific consistency of RDSs, cross site consistency of RDSs and a comprehensive review of the entire Management Evaluation Process. More recently, Thomas P. Grumbly, Assistant Secretary for Environmental Management, further stressed the need for an independent mechanism to assess the quality and utility of the RDSs prepared for the FY 1998 budget. Mr. Grumbly requested that findings be available to EM as it commences its Internal Review of the Budget in May.

In response, the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) established a National Review Panel. The activities of the National Review Panel are envisioned to fulfill both Mr. Grumbly's request and the cross-site consistency portion of EMAB's earlier recommendation. It is expected that the results of the National Review Panel will be valuable to the comprehensive review of the entire budget formulation process (an effort to be led by Dr. Arthur Upton, Director of CRESP's Independent Peer Review activities.)

Panelists

Dr. John A. Moore, *National Review Panel Chair* Institute for Evaluating Health Risks (CRESP), Washington, DC

Dr. Gerald van Belle, University of Washington (CRESP), Seattle, WA
Dr. Joanna Burger, Rutgers University (CRESP), Piscataway, NJ
Mr. Bruce Church, Desert Research Institute, University of Nevada, Logandale, NV.
Mr. Brian Costner, Energy Research Foundation, Charleston, SC
Dr. Joan M. Daisey, Lawrence Berkeley National Laboratory, Berkeley, CA
Dr. Elaine Faustman, University of Washington (CRESP), Seattle, WA
Dr. Loren Habegger, Argonne National Laboratory, Argonne, IL
Dr. Rogene Henderson, Inhalation Toxicology Research Institute, Albuquerque, NM
Mr. John Kindinger, PLG Incorporated, Newport Beach, CA
Dr. Sally O'Connor, Xavier University, New Orleans, LA
Dr. Frank Parker, Vanderbilt University, Nashville, TN
Mr. Ralph Patt, Oregon Department of Water Resources, Salem, OR
Dr. Maurice Robkin, University of Washington (CRESP), Seattle, WA

Individuals with a broad range of technical expertise were solicited for the National Review Panel. A balanced mixture of professionals expert in human health and ecological risk assessment, nuclear engineering, hydrology and health physics were assembled. In addition, several Panelists had participated in site-specific reviews of Risk Data Sheets prior to convening the Panel.

Staff

Ms. Christie Drew, Institute for Evaluating Health Risks, Washington, D.C.
Mr. Timothy Ewers, University of Washington, Seattle, WA
Ms. Karen Nakhjiri, Sanford Cohen and Associates, Seattle, WA
Mr. Walter Whimpenny, Institute for Evaluating Health Risks, Washington, D.C.

1. Overview of Panel Activities

The National Review Panel met for its inaugural gathering on Thursday, March 21, 1996. Objectives of the meeting were to: familiarize panelists with the RDS process that had occurred; understand DOE EM expectations for the panel's activities; and discuss and determine what tasks are to be completed and how the panel will complete them. Dr. Carol Henry and Mr. Mark Gilbertson of the DOE EM Office of Science and Risk Policy met with the panel to describe both the budget formulation process and how the panel might respond to the needs of the Department. The panel spent the majority of the day discussing its charge, the activities that would be undertaken, methodologies to be used, and schedule to be followed in the coming weeks. The RDS review itself commenced on April 16, the panel reconvened for the period of April 23-26. This final report was completed on May 1.

The Panel was charged with providing an evaluation of both the quality of the **content** of Risk Data Sheets submitted by sites, and the **application** of Risk Data Sheets to the budget formulation process across the DOE Complex. These aspects were originally framed by three questions.

> *How confident is the Panel that in the Management Evaluation Matrix values submitted across sites and across programs, a "High" is a high and a "Low" is low?*
>
> *On a site by site basis, to what degree does a ranking by RDS matrix values comport with the Integrated Priority Lists submitted to Headquarters?*[5]
>
> *Is there sufficient consistency in approaches across sites to permit valid comparisons?*

1.1 The National Review Panel Tasks

The work of the panel and staff was divided into four tasks. Each of these is summarized below. A more detailed description of the activities completed within each task and the conclusions of each task group are contained in later sections of this report and the appendices.

> **Cross-site Consistency Review.** The objective of this task was to assess whether the field offices comprising the EM Program completed the RDSs sufficiently and in a comparable manner so that they can support national decisions. The work of this task group was completed in two phases.
>
> In the first phase, panelists reviewed 30-60 RDSs randomly selected from the base sample of 300 RDSs (described below). Each reviewer was asked to answer several questions related to one or two of the following topics: public health and safety, site personnel health and safety, environmental

[5] The panel decided not to perform this task given its understanding that site specific interaction with stakeholders and regulatory agencies focused on the priority lists. Further, the variable format used by the field offices to describe and present their priority lists did not permit a review by the Panel within the two week review period.

impact, and social, cultural, and economic impacts. Additionally, each reviewer answered questions related to unit of analysis (i.e., how activities are grouped within an RDS) and land use.

In the second phase, completed during the April 23-26 meeting, reviewed 60 RDSs related to groundwater contamination at four sites. The purpose of this supplemental review was to assess whether the conclusions from phase I would be confirmed by an evaluation of all the RDSs related to similar projects at different sites.

Independent Verification. In this task, Panel members reviewed technical documents supporting RDSs relevant to the selected activities. The primary objectives was to ascertain whether the RDSs reflect the conclusions of supporting documents and whether data in the supporting documents were appropriately used in the RDS. The selected activities were: plumes at Hanford and INEL; landfills at INEL (Pit 9) and Oak Ridge (SWSA 6); and high-level waste tanks at Hanford and Savannah River Site.

Database Analyses. This task provided for statistical manipulations of the RDS database to identify patterns, as well as to draw conclusions about the relative importance as program drivers of the various factors discussed in the RDSs. Also this task included a comparison of site priority lists to the rankings suggested by the RDSs.

Conformity with DOE/EM Guidance (RDS "Report Card") The focus of this task was to determine whether a subset of RDSs had been completed in a manner consistent with the guidance provided by EM, and whether the RDSs appear internally consistent and generally useful. This was accomplished by reviewing a sample of 300 RDSs stratified by site and by EM Program.

1.2 Sampling Methodology

The database provided to the Panel on April 16 contained 1408 Risk Data Sheets. Only RDSs submitted by the field offices, and that pertain to activities occurring at and funded through the various sites were included (i.e., no headquarters or technology development activities). The data set used by the National Review Panel was the first complete submittal to headquarters by Operations Offices. It was fully installed on the CRESP servers April 17, 1996**.** Unfiltered, this data set contains 1435 Risk Data Sheets at a total cost of $6,045,873,000. For the purposes of the National Review Panel several filters were used[6], yielding a total of 1408 Risk Data Sheets. The Panel is aware that changes have been allowed to the database for various reasons,[7] and the most recent data set became available April 30, 1996.

Several sampling schemes were developed given the diversity of the tasks undertaken by the Panel.

1.2.1 Stratified Random Sample

A stratified random sample of 300 RDSs was used for the initial Cross-Site Comparison Activity and the RDS "Report Card". This sample is about 21% of the total database (N = 1408), and through statistical analyses was found to be representative of the database overall (see Appendix C, Table 3). The proportion

[6]RDSs with EM50, EMHQ, WAHQ in the Facility or Office fields were eliminated, as were voided RDSs.

[7] Given the scope and nature of the Panel's conclusions and recommendations, it is unlikely that the revised database would indicate the need to significantly revise our conclusions.

of the sample that represented particular field offices corresponds with expected lifecycle costs across the complex.[8] The following Table presents the estimated BEMR costs (expressed as a percentage of the total cost expected across the complex), the total number of RDSs submitted, and the number of RDSs to be reviewed from each of the top five sites.

Table 1. Estimated Lifecycle Costs, Numbers of RDSs submitted, and Numbers of RDSs reviewed by the National Review Panel.

	Estimated Lifecycle Cost (BEMR 1995)	# of RDSs submitted	# of RDSs to be reviewed by NRP
Hanford	21%	249	60
Savannah River	21%	270	60
Rocky Flats	10%	30	30
Oak Ridge	10%	202	30
Idaho	8%	152	30
All others	30%	505	90
Total	100%	1408	300

Once the RDSs from each Operations Office had been selected, the data set was further stratified within that Operations Office by EM Program Offices -- Waste Management (EM-30), Environmental Restoration (EM-40) and Facilities Transition (EM-60). A proportional random sample was thus drawn from each Program office within each site.

A list of RDSs reviewed for each topic in the Cross Site consistency evaluation is available in Appendix A2.

1.2.2 The Independent Verification of RDS Information

At least one panel member familiarized themselves with the entire RDS submission from one of four sites: Hanford, INEL, Oak Ridge and Savannah River. That individual identified RDSs from that site related to the topics of landfills, plumes and tanks. After group discussion 2-3 representative RDSs for each topic and site were selected for detailed review. A list of the Risk Data Sheets used in the Independent Verification can be found in Appendix B2.

1.2.3 Cross-Site Consistency Review of Groundwater Remediation Activities

It became evident early at the meeting that the stratified random sample did not provide panelists enough depth on one subject to compare across sites. Panelists chose groundwater monitoring and remediation activities as the topic to review across sites. Based on the knowledge gained from members of the

[8] Following the "base-case" scenario of the 1995 Baseline Environmental Management Report, it is estimated that 70% of the costs will be spent at 5 sites.[8]

Independent Verification Group, who looked at all RDSs from each of four sites (see above), sixty-five additional RDSs were initially identified for cross-site review. These were thought, upon initial glance, address groundwater remediation activities (some were later found not to be relevant). A list of these RDSs can be found in Appendix A3.

2. Cross-site Consistency Evaluation

2.1 Overview

The principal objective of the cross-site consistency element of the Panel's review was to look at several different issues across different sites to determine if broad trends of consistency exist. Each Panelist reviewed between 60-120 RDSs. Each had responsibility for looking at one of the following specific topics: public safety and health, occupational safety and health, environmental impacts, social cultural and economic impacts, unit of analysis, land use, and management activities. See Appendix A1 for a list of Panelists participating in the Cross-Site Consistency Review.

The Panelists eventually arrived at conclusion that no broad trends concerning cross-site consistency could be identified. The following sections describe in detail the findings from each of the two different sample sets (i.e, the stratified random sample, and that derived to look at groundwater activities.) First, a detailed description of the methods used by the Panelists is provided (see 2.2). The remainder of this section is organized according to the various topics addressed. Each of the sub-sections (2.3 - 2.9) contain discussions of the Stratified Random Sample activity, the Groundwater Remediation Activity, and provides recommendations.

2.2 Methods

Two activities were conducted: 1) review of a stratified random sample of RDSs; 2) review of groundwater remediation activities.

2.2.1 Review of a Stratified Random Sample of RDSs

This activity allowed the Panel to ascertain the consistency with which key topics in the RDS were addressed across sites. Four of the six topics (public health, occupational health, environment, and social - cultural - economic) are discrete elements of the management evaluation matrix (MEM). The other two topics (land use, unit of analysis) can strongly and directly influence how elements within the MEM are scored. Land use assumptions, whether implicit or explicit, provide the foundation for many decisions within the EM Program. Unit of analysis refers to the activities described within an RDS; these activities should be related to one another and be sufficiently similar to permit an accurate collective scoring within the MEM.

Using a primary and secondary reviewer format at least 60 Risk Data Sheets were reviewed for each topic. RDSs were selected from the stratified random sample of 300 RDSs. Once the stratified random sample was selected, the RDSs were hand sorted and distributed to Panelists. An attempt was made to select RDSs that would be most relevant to a particular topic. The remainder was distributed in a more random fashion. Primary reviewers prepared a written statement based on their reviews that conveyed their sense of how the

information within the RDSs addressed three generic questions plus several additional questions tailored to their assigned topic. The secondary reviewer provided comments on the same RDS data set to the primary reviewer who modified their written comments, as needed, to reflect the views of both reviewers. The generic questions addressed by all reviewers were:

1. Are the overall "before" scenarios comparable across sites for comparable activities?
2. Are the impact categories of similar activities rated the same at the different sites?
3. Are the "likelihood " designations being interpreted and used consistently across sites?

2.2.2 Cross-site Consistency Review of Groundwater Remediation Activities.

One important question is whether there is consistency in how the different DOE sites evaluated and ranked the risks associated with similar activities. The second approach used by the NRP to address this question was to select one type of activity, groundwater evaluation and remediation, and compare the rankings for the fields of Public Health and Safety, Occupational Health and Safety, Environmental Protection, and Social/Cultural/Economic impacts of the RDSs for this type of activity at several sites (Albuquerque, Idaho, Oak Ridge, Richland and Savannah River, . Within the RDSs associated with groundwater cleanup, three specific processes were chosen for analysis: 1) Monitoring and characterization of ground water, 2) Pump and treat (only), and 3) Remediation (including some pump and treat.)

RDS's from INEL, Oak Ridge, Hanford, and Savannah River that dealt with ground water were pulled from the entire data set (N=1408). There were 65 that fit into this category. Using a common set of criteria (see explanation of Tables, Section 2.2.3, below), each RDS was evaluated for each of the four major MEM impact cells. After a thorough review of the 65 RDSs it was possible to separate them into the three processes described above. The three processes were compared for consistency across the four DOE sites with respect to the rankings in each MEM field, taking into account process differences, contaminant differences, and pathway/receptor differences.

Results from each activity are described under each topic heading.

2.2.3 Explanation of Tables.

During the Cross-site Consistency review, each reviewer typically looked only at one type of impact category -- public safety and health, site personnel safety and health, environmental impacts and social/cultural/economic impacts. The reviewers generated several tables to help provide a mechanism to measure consistency across sites. Each Table contains some variation of the following:

1) a series of identifiers: operations office, facility, EM Office, RDS Number.
2) management or min-safe designation (yes, no or partially).
3) matrix values and bin scores were imported from the 4/17/96 RDS data base.
4) a qualitative indication of the reviewer's assessment of the summary description (sometimes called activity summary). This was done by assigning a value from 1 to 5 (5 being the best).
5) yes/no boxes to record if sufficient justification of the hazard was given (named); if the before, during and after risks and the hazards were described; and whether the likelihood was reasonable (these all had yes/no answers).
6) probability (P) or time to impact (T) designation was then noted

7) yes/no boxes to record if the hazard amount and exposure pathway were assessed
8) a qualitative indication of the reviewer's opinion of the RDS as a whole (again on a scale of 1-5, 5 being the best)
9) yes/no box for overall agreement with the ratings given in the RDS
10) type of activity (activity category): Monitoring; Remediation; or Remediation/Pump and Treat.

Abbreviations used in the Cross-Site Consistency Tables: 3-10 can be found in Table 2, below.

TABLE 2. Abbreviations in Cross Site Consistency Tables

Abbreviation	Meaning
Y	Yes
P	Partially
N	No
B	"before"
D	"during"
A	"after"
NA	NA Applicable
?	Unknown/Can't determine

2.3.4 List of Tables from the Cross Site Review

2.3 Public Safety and Health

2.3.1 Stratified Random Sample

In addition to the generic questions four additional questions were developed to guide the reviewers. They were:

- Is the basis for the risk assessments clearly stated and consistent among RDSs for similar activities?

- Is there consistency across sites in use of quantitative and qualitative data for risk assessment?
- How was the "public" defined, and is it defined consistently across sites?
- Do “As” (less than one year to occurrence) in the likelihood estimation deserve “As” and is this the basis for estimating a high probability or risk consistent?

These reviewers found it logical to present their findings by grouping RDSs by activity type.

2.3.1.A Administrative Activities

Nine RDSs were reviewed that dealt with administrative or support functions. Four rated the public health risks as Low, Low, Low for the before, during, after scenarios, four rated the risks as Medium, Medium, Low or Medium, N/A, Low and one ranked the risks as High, Low, Low. The basis for the higher rankings, (e.g., from PPL and HANFS), was that without the administration, the site could not operate; these RDSs then designate the during and after scenarios as both being Low. In cases where the rankings were Low, Low, Low, the RDS described little risk to the public for the whole operation.

Fitting the RDS format to administrative activities was obviously difficult and this led to some discrepancies. One RDS, (from RFP), designated the risk for the public in the before scenario as Medium and for the after scenario as Low, with no designation for during, although it should be as easy to rank the during as the after for this type of activity. Perhaps the lesson learned is that a matrix other than risk should be used for such activities.

In another case (from AMES) the operation of a low level waste storage facility is listed as presenting low risk to the public even in the before scenario, because "There is little risk to the public from collection and storage of low level waste at Ames Laboratory." In this case, the before scenario should have considered the risk to the public if the facility were not in operation.

Two sites listed RDSs to maintain and fix leaks in sewer lines, but the rankings differed. One RDS from SRS listed the “before”, “during”, “after” risks to the public and the workers as Medium, Low, Low, while another from SNL, in which breaks in the sewer line had been detected, listed the public risks as Low, Low, Low and the worker as Low, Medium, Low. For the latter, the environmental protection was listed as Medium, Medium, Low with no justification for why the environment was more at risk than workers or the public in the before scenario.

2.3.1.B Surveillance and Maintenance

Surveillance and maintenance activities were also scored with apparent difficulty. Of the six RDSs reviewed in this category, two had public health risks evaluated as High in the absence of the activity (before), three as Medium and one as Low. For the during scenario, one RDS did not rank the risk, three ranked the risk to public health as Medium, and two ranked the during risk as Low. All but one RDS ranked the public risk after the activity as Low. The ranking of Medium public health risks for during and after the surveillance and maintenance activity was based not on likelihood of occurrence but on an impact if an accident occurred. This rank (1D) was based on the activities that were going on within the facilities that were being guarded and did not relate directly to the surveillance and maintenance activities, suggesting that the risk rank “during” and “after” these activities should have been Low.

In contrast, for one RDS from INEL, the before risk for surveillance and maintenance for CPP-666 fuel storage operations, was listed as 3B (Medium) even though the descriptive scenario, which included significant air contamination from overheated spent nuclear fuel, seemed to justify a High for the public. The same site listed a higher risk to the public from lack of maintenance of a museum (2B), than from the lack of maintenance of the fuel storage site (3B).

2.3.1C Decontamination and Decommissioning (D&D)

Three of the RDSs that evaluated decontamination and decommissioning (D&D) activities ranked the "before" risk as Low (ANLW, SR, and RFP), three ranked the "before" as Medium (HANFS, ETEC, SNL), and one ranked the "before" and "during" risk as High (HANFS). Inadequate justification is given to support the High designation, especially the during period. The Medium risk before and during cleanup of Thunder Range as described in a RDS from SNL, seems High in light of the isolated area to be cleaned up. The Medium risk for the ETEC RDS seems appropriate due to high volumes of sodium metal located in a populous area. One Hanford RDS is incomplete and could not be evaluated. One additional RDS on the D&D of K reactor at SRS was also too incomplete to evaluate.

2.3.1.D Handling of High Level Waste

The RDSs dealing with High Level Waste in tanks in general ranked the activities similarly. The "before", "during" and "after" scenarios for the public and the worker were High, High, Low (HHL); High, Medium, Low (HML); or Medium, Medium, Low(MML), which seems reasonable. One exception, from SRS, had the public risk ranked as 3A, 3A and 2 C (Medium, Medium, Medium). It is not clear why the impact on the public would increase from 3 to 2 because tanks had been retrofitted with waste removal equipment.

In some of the secondary RDSs reviewed there were some inconsistencies. For an SRS RDS, which requests equipment to increase vitrification activities from 200 to 250 canisters per year, the "before", "during" and "after" risks are Medium, Medium, Medium for the public and Medium, Medium, Low for workers. The Medium for the public "after" the activity is because the tanks will not have undergone decontamination and decommissioning yet. But it is hard to imagine a leak from residual material in the tanks that would reach the public and not the worker. Again, the information provided in the text did not provide an explanation for these conclusions.

2.3.1 E Stabilization of Plutonium

Five RDSs were reviewed that dealt with stabilization of Plutonium (one from HANFS, and two each from RFP and SR). Two of these seemed to describe similar activities, but Hanford ranked the risks to the public ("before", "during", "after") as Medium, Medium, Low, while Rocky Flats ranked risks as Low, Medium, Low. The equivalent risks to the worker were ranked as High, High, Medium (Hanford) and High, High, Low (Rocky Flats). Thus Hanford tended to rank a little higher, but in general the rankings were similar. The other three RDSs all had the before risk for the public and workers as Medium. Two of these dealt with stabilization of Plutonium in canyons at Savannah River and one with work at Rocky Flats that was not well described. The SR RDSs did not rank the after scenario.

2.3.1.F Construction

Three construction RDSs were reviewed (one from SR and two from RFP). All three ranked the public as NA. The SR RDS ranked the risk "before", "during" and "after" for workers as Medium, Medium, Low; while RFP ranked it as Low, Medium, Low.

Three additional RDSs for construction activities were reviewed and these RDSs ranked risks for the public based on increased risks to the public if the new facilities were not built (2 from HANFS, and one from INEL). For the two Hanford RDSs, the risks to the public were Medium, Low, Low and for the worker were either Medium, Medium, Medium, or Medium, Medium, Low. The INEL RDS ranked risk to the public and to the worker as Low, Low, Low. Again, Hanford tended to rank higher than INEL in these RDSs.

2.3.1.G Treatment, Transport, Storage and Disposal of Low Level Waste or Mixed Waste

Several RDSs were for cleanup or transport and storage of relatively small amounts of wastes (2 from HANFS and SNL, and 1 each from LANL; K25; GJPO, and INEL); many of these activities were compliance driven. All but one of these ranked the risks to the public as Low, Low, Low; the K25 RDS ranked the risk to the public as Medium, Low, Low, stating that improper storage or transport of mixed waste could result in an exposure to the public. Risks for the worker were ranked in many ways for before and during, but the after was always Low.

2.3.1.H Cleanup of Low Risk Sites (many which were compliance driven)

Three RDSs fell in this category (2 from GJPO, and one from NTS). The public and worker health risks for the NTS site are ranked Low, Low, Low and appropriate scenarios are given. The public risks for the GJPO sites are ranked Medium, Medium, Low, based on assuming that residences will be built there in the future and there will be a risk for radon exposure. No site specific land use assumptions were delineated.

2.3.1.I Ground Water Plumes:

Seven RDS in the Public health group dealt with water plumes (2 from LLNL, and 1 each from BNL, HANFS, ORNL, PADUC, Y12,). The LLNL RDS is ranked 1A for the public because VOC plumes in the ground water (mainly TCE) have already moved off-site in an a area where private wells are the main source of water for some families. The rankings seem appropriate. Likewise the PADUC RDS is ranked as a High risk to the public (2A in the "before" rank) because TCE and other contaminates have been found in the water off-site and heavy metals and PAHs have been found in the soil. The solid waste management units have been cited as the source of these off-site contamination. The PADUC and one from LLNL rank these two situations similarly except that Paducah ranks risk to the environment higher due to the heavy metals at the Paducah site. The BNL water plume is ranked as a Medium risk to the public (before scenario) because the material has not yet gone off-site. This seems appropriate and the three plume RDSs agree fairly well for the health risks. An ORNL RDS, which ranks the public risk before the activity as 2A (High) when nothing has moved off-site. No explanation is given for this impact category.

2.3.1.J Miscellaneous Notes:

- Some sites use F instead of T for the designation of likelihood choice, but do not describe the meaning of F.
- If there was little or no risk, some sites listed NA while others used Low.
- Rocky Flats used some type of scoring system the others did not use.
- Some site priorities were not interpretable: some sites listed zero; other sites listed single digit numbers; and some sites listed two or three digit numbers. One could not tell what scale was being used.
- Medium risk covers quite a broad range of events, from a leaky sewer pipe to a leaky High Level Waste tank.

Table 3, Cross-Site Consistency Evaluation from Stratified Random Sample -- Public Health follows.

Table 3. Cross Site Consistency Evaluation from Stratified Random Sample -- Public Health

	OPSOFFICE	Facility	EMOFFICE	RDS Number	Y	P	N	Y	P	N	B	D	A	B	D	A	Activity Summary 1-5(best)	Is Hazard Given?	Before Risks Described	During Risks Described	After Risks Described	Hazard Just-ified	Likelihood Reasonable	P/T	Hazard Amount Given	Exposure Pathway Identified	Overall Evaluation	Agree with Ratings
1	AL	LANL	40	R96E0067			X			X	3C	3C	3D	L	L	L	4.5	N	Y	Y	Y	Y	Y	P	Y	Y	4.5	Y
2	ID	INEL	60	R96B0010	X			X			3B	3C	3C	M	L	L	4	P	Y	Y	Y	Y	N	P	P	Y	3	N
3	ID	INEL	70	R96C0164	X					X	2B	2B	3C	M	M	L	4	Y	Y	Y	Y	Y	Y	P	Y	Y	3	N
4	ID	INEL	30	R96B0030		X		X			3C	3C	3C	L	L	L	4	P	N	N	N	N	Y	P	N	N	2	Y
5	ID	ANLW	40	R96A0007			X	X			3C	3B	3D	L	M	L	4.8	Y	Y	Y	Y	Y	Y	P/T	P	Y	4.5	Y
6	OR	K25	30	R96H0007	X					X	2B	3D	3D	M	L	L	3	P	Y	Y	Y	N	Y	T	N	N	3	Y
7	OR	PADUC	40	R94F0057			X			X	2A	2A	3C	H	H	L	4.5	Y	Y	Y	Y	Y	Y	P	Y	Y	4.5	Y
8	OA	LLNL	40	R96A0010		X			X		1A	3A	3D	H	M	L	4.5	Y	Y	Y	Y	Y	Y	T	Y	Y	4.5	Y
9	CH	BNL	40	R96G0021			X			X	2B	3D	2D	M	L	L	4	Y	Y	Y	Y	N	Y	T	Y	Y	4	Y
10	AL	SNL	30	R96POOO9	X					X	3C	3D	3D	L	L	L	3	P	Y	Y	Y	N	N	T	P	Y	3	Y
11		PPPL	30	R96A0008	X					X	2A	3C	3D	H	L	L	4	N	Y	Y	Y	N	Y	P/T	N	Y	3.5	N
12	AL	SNL	40	R96A0035			X			X	2B	2B	3D	M	M	L	4	Y	Y	Y	Y	N	Y	T	N	Y	3.5	N
13	OA	ETEC	60	R96A0009		X				X	2C	2C	3D	M	M	L	2	Y	Y	Y	Y	N	Y	T	Y	Y	2	Y
14	NV	NTS	40	R96A0003			X			X	3D	2D	3D	L	L	L	2.5	N	Y	Y	Y	Y	Y	P/T	N	P	2.5	Y
15	OR	ORNL	40	R95B0087			X			X	2A	1B	3D	H	H	L	4	P	Y	Y	Y	Y	Y	P	Y	Y	4.5	Y

Table 3, continued.

16	OR	ORNL	40	R96Y0011			X			X	2A	2B	3C	H	M	L	4.5	P	Y	Y	Y	Y	Y	T	N	Y	4.5	Y
17	RFP	RFP	40	R96A0032	X					X	3A	NA	3D	M	.	L	4	Y	Y	Y	Y	Y	Y	T	N	N	4	Y
•	RFP	RFP	40	R96A0036		X		X			3C	3B	3D	L	M	L	4.2	Y	Y	Y	Y	Y	Y	T	N	Y	4.2	Y
•																												
19	RFP	RFP	40	R96A0020		X				X	3B	NA	3D	M	.	L	1	N	Y	N	Y	N	Y	T	N	N	1.5	Y
20	RL	HANFS	30	R96N0102	X			X			3C	3D	3D	L	L	L	4.8	N	Y	Y	implied	Y	Y	P	P	Y	4.8	Y
21	RL	HANFS	30	R96N0293		X				X	1D	3C	3C	M	L	L	4	N	Y	Y	Y	N	Y	P	N	Y	4	Y
22	RL	HANFS	30	R96N0174		X				X	3D	.	.	L	.	.	3	N	Y	Y	Y	N	Y	P/T	N	Y	3	N
23	RL	HANFS	30	R96N0234			X			X	1C	3C	3D	M	L	L	4	N	N	N	N	N	Y	P/T	N	Y	2.5	Y
24	RL	HANFS	70	R96N0141		X			X		1B	1B	3D	H	H	L	3	N	Y	Y	Y	N	Y	P/T	N	Y	3	N
25	RL	HANFS	60	R95N0001			X			X	3B	3B	3D	M	M	L	4.8	Y	Y	Y	Y	Y	Y	P	Y	Y	4.8	Y
26	SR	SR	60	R96C0007	X					X	1A	.	3D	H	.	L	4,5	P	Y	Y	Y	N	Y	P	N	N	3.5	Y
27	SR	SR	40	R96A0138	X			X			3B	3B	3D	M	M	L	4.5	N	Y	Y	N	Y	Y	T	N	Y	3	N
28	SR	SR	30	R96A0036			X	X			3A	3A	2C	M	M	M	4.5	N	Y	Y	Y	Y	Y	T	Y	N	3	Y
29	SR	SR	60	R96A0215			X			X	2C	3B	.	M	M	.	1	N	Y	Y	N	Y	Y	T	P	N	1.5	Y
30	SR	SR	40	R96A0077			X			X	2A	2A	3D	H	H	L	4.5	Y	Y	Y	Y	Y	Y	P	P	Y	4	Y
31	SR	SR	60	R96A0189	X					X	3B	3B	.	M	M	.	3	N	N	N	N	N	N	T	N	N	2.5	N

2.3.2 Groundwater Remediation Activities

Three types of RDSs dealing with groundwater contamination were chosen for comparison across sites: pump and treat procedures, monitoring and characterization activities, and remediation activities.

2.3.2.A RDSs dealing with pump and treat procedures

Three of the four sites had RDSs that described pump and treat activities: INEL (3), Hanford (5) and SR (1).
At INEL, for two of the RDSs the risk to the public were evaluated as Low, Low, Low (3C, 3C, 3C) and one was ranked Medium, Low, Low (2C, 3C, 3C) for the before, during, and after scenarios based on the assumption that institutional controls would be in place to protect the public at all times.

- Four of the five RDSs from Hanford on this activity also ranked the pump and treat procedures as Low, Low, Low (3C, 3C, 3D) for risks to the public before, during and after the activities. These rankings were based on public contact being at the Columbia River where the material would be highly diluted. One Hanford RDS was ranked Medium, Medium, Low (3B, 3B, 3D) for the public, not because the impact was higher, but because the likely time to exposure was shorter.

- The one pump and treat RDSs from SR ranked the procedure quite differently: High, High, Low (2A, 2A, 3D). There was no reason given for the High risk evaluation for the public.

2.3.2.B RDSs for monitoring and characterization of wastes

Three of the four sites had RDSs describing monitoring and characterization of wastes: INEL (1), Hanford (6) and ORNL (2).

- The one RDS at INEL ranked the risk to the public as Low, Low, Low (3C, 3C, 3C) for the before, during and after phases of the activity due to institutional controls preventing exposure of the public.

- The six RDSs from Hanford for monitoring and characterization activities were all ranked Medium, Low, Low for public health risks. The values included impact/likelihood values of 3B, 3D, 3D (2); 2B, 3C, 3D (2); 1D, 2D, 3D; and 1C, 3D, 3D. The before evaluations were ranked higher than the during and after evaluations based on the public receiving moderate to low exposures in one to ten years if the activities were not done.

- The two RDSs from ORNL on monitoring and characterization of wastes also ranked the risk to the public as Medium, Low, Low ((2B, 3C, 3C) for the before, during and after scenarios. The "before" score reflects increased potential for releases of tritium to public water supplies.

2.3.2.C RDSs describing remediation activities for groundwater

All four sites had RDSs dealing with remediation activities: INEL (6), Hanford (5), ORNL (10), and SR (17). Because pump and treat activities are also remediation activities, the pump and treat RDSs were included in our analysis of RDSs dealing with remediation activities.

- For all of the INEL RDSs dealing with remediation, the risks to the public were evaluated either Medium, Low, Low or Low, Low, Low for the before, during, after scenarios. All of the likelihood values are C or D. All of the impact values are 2(for the Medium ranks) or 3 (for the Low ranks). The Low risks to the public are based on institutional controls preventing public access to the wastes.

- All but one of the five Hanford remediation RDSs were ranked Low, Low, Low (3C, 3C, 3D). One RDS ranked the risk to the public as Medium, Medium, Low (3B, 3B, 3D) based on a recreational user of the Columbia River having a likelihood of getting a moderate to low exposure in one to ten years if the activity were not done.

- The RDSs from ORNL evaluated public risks from remediation activities as much higher than at INEL or Hanford. All 10 RDSs evaluated public risks as High in the before scenario (2A in all cases). Seven of the ten RDSs also ranked the risks to the public as High (2A) for the during phase of the activity. Two of the RDSs ranked public risk as Medium (2B) for the during phase and one ranked this phase as having a Low (3C) risk.

All ten RDSs ranked the public risk as Low (3C) after the activities. The reason for the High rankings before and during the activity is based on a scenario in which groundwater from the site would reach drinking water supplies through White Oak Creek and through a newly found network of underground caverns. No specific site wide assumptions about land use were used to support this scenario.

- The public health risks estimates for remediation projects from SR more closely resemble those from ORNL than those from the other two sites. Of the sixteen RDSs one ranked the risks as High, High, High (all 2A), one ranked the risks as High, High, Medium (2A, 2A, 2B), ten ranked the risks High, High, Low (2A, 2A, 3C or D) and four ranked the risks as Medium, Medium, Low (2 or 3B, 2 or 3 B and 3 C or D).

  The scenario for public risks in the RDS ranked High, High, High did not match the ranking. The scenario stated that current contamination of the Savannah River is below all health and safety levels and, if the remediation does not occur, institutional controls would protect the public. The same lack of concordance with the rank and the test of the scenario is found throughout the SR RDSs. The text says the contaminants in most cases have not reached the public waters and if they reach those waters, the contaminants would be greatly diluted. Also institutional controls are mentioned that should protect the public. The same type of words were used by INEL and Hanford to explain much lower risk ratings.

Table 4. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Public Health Follows[9].

[9]Please note that two reviewers collaborated on Table 4. It therefore yields the benefit of two perspectives.

Table 4. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Public Health

	OPS OFFICE	Facility	EM OFFICE	RDS Number	Y	P	N	Y	P	N	B	D	A	B	D	A	Activity Summary 1-5(best)	Is Hazard Given?	Before Risks Described	During Risks Described	After Risks Described	Hazard Ident. Impact	Likelihood Reasonable	P/T	Hazard Amount Given	Exposure Pathway Identified	Overall Evaluation	Agree with Ratings	
1	AL	LANL	40	R96E0018			X			X																			
2	ID	INEL	30	R96C0142		X			X																				
3	ID	INEL	30	R96C0164	X					X	NA	NA	NA	NA	NA	NA	4	N	N	N	N	N	NA	NA	NA	NA	4	NA	
4	ID	INEL	40	R96C0032			X	X			3C	3C	3C	L	L	L	3	P	Y	Y	Y	N	Y	P	N	Y	3	Y	
5	ID	INEL	40	R96C0035	X					X	3C	3C	3C	L	L	L	4	N	P	P	P	N	P	P	N	Y	3	?	LF
6	ID	INEL	40	R96C0036		x		x			3c	3c	3c	l	l	l	3	y	y	y	y	y	y	p	n	y	3	Y	
7	ID	INEL	40	R96C0040			X	X			3C	3C	3C	L	L	L	3	P	Y	Y	Y	Y	Y	P	N	P	3.5	Y	
8	ID	INEL	40	R96C0041			X	X			3C	3C	3C	L	L	L	4	P	Y	Y	Y	N	Y	P	N	N	4	Y	
9	ID	INEL	40	R96C0045		X		X			2C	3C	3C	M	L	L	4	P	Y	Y	Y	N	Y	P	P	Y	4	Y	
10	ID	INEL	40	R96D0149		X		X			1D	3D	3D	M	L	L	3.8	P	Y	Y	Y	Y	Y	P	P	Y	4	Y	
11	OR	K25	40	R94A0018			X			X	2A	3C	3C	H	L	L	2.5	N	P	P	P	N	N		N	Y	2	?	GW
12	OR	K25	40	R94A0022		X				X	2A	2A	3C	H	H	L	3.5	N	Y	Y	Y	N	Y	T	N	Y	3	can't tell	
13	OR	K25	40	R96W0004		X				X	2A	2A	3C	H	H	L	1	N	N	P	Y	P	P	P	N	Y	1.8	N	GW
14	OR	K25	40	R96W0005		X				X	2B		3D	M		L	4	N	Y	Y	Y	N	Y	T	N	Y	4	Y	

Table 4, continued.

15	OR	K25	40	R96W0006			X			X	2B	3B	3D	M	M	L	1	N	P	P	Y	Y/P	P	P/T	N	Y	2	?	SLUDGET
16	OR	OR	40	R96G0020	X					X	2A	3C	3C	H	L	L	3	N	N	N	N	N	not given	-	N	N	1.5	N	
17	OR	OR	40	R96G0021	X					X	2A	3C	3C	H	L	L	3	N	N	N	N	N	N		N	N	0	?	PRIORITY/M
18	OR	ORNL	30	R96D0006	X					X	2B	3D	3D	M	L	L	3	N	Y	Y	Y	N	Y	T	N	N	3.5	Y	
19	OR	ORNL	30	R96D0007		X				X	2B	3D	3D	M	L	L	3.9	Y	P-	P-	P-	P	P	T	N	P	3	?	LF,LLW,WS,M
20	OR	ORNL	40	R94A0011		?				X	2A	2A	3C	H	H	L	4	Y	Y	N	N	N	Y	?	Y	Y	4	Y	
21	OR	ORNL	40	R94H0012			X			X	2A	2A	3C	H	H	L	3	P	Y	Y/P	Y	Y/P	Y	P/T	Y	Y	4	N/TL	R,WC,AA,I
22	OR	ORNL	40	R94H0016			X			X	2A	2A	3C	H	H	L	3	Y	Y	Y	Y	P	Y	T	Y	Y	3.5	data	
23	OR	ORNL	40	R94H0019			X			X	2A	2A	3C	H	H	L	2	N	N	N	N	Y/P	N		N	Y/P	1	?	GW,WT,AA,R
24	OR	ORNL	40	R94H0023		X				X	2B	3C	3C	M	L	L	3	Y	Y	Y	Y	Y	Y	?	Y	Y	3.8	Y	
25	OR	ORNL	40	R95M0063		X				X	2A	2B	3C	H	M	L	3.4	N	P+	P+	P+	P	P	P/T	N	P	2.9	Y	MIX GW/LF
26	OR	ORNL	40	R96Y0001		?				X	2A	2A	3C	H	H	L	4	Y	Y	N	N	N	Y	?	Y	Y	4	Y	
27	OR	ORNL	40	R96Y0010			X			X	2B	3C	3C	M	L	L	2	P	Y	P	P	P	P		P	Y	2.8	P	GW/LF,M
28	OR	ORNL	40	R96Y0011			X			X	2A	2B	3C	H	M	L	4.5	N	Y	Y	Y	Y	Y	T	N	Y	4.5	N	

Table 4, continued.

29	OR	Y12	30	R96B 0003			X			X	2B	1C	3D	M	M	L	4.2	P	P-	P-	P-	P	N	T	P	P	2	?	LF/GW,WS
30	OR	Y12	30	R96B 0004		X				X	2B	1C	3D	M	M	L	0.5	N	Y	Y	Y	N	N	T	N	N	0.5	N	
31	OR	Y12	30	R96B 0009			X			X	2B	3D	3D	M	L	L	4	Y	P	P	P	N	P	T	P	N	3	?	LF,WS
32	OR	Y12	30	R96B 0010		X				X	2B	3D	3D	M	L	L	4.8	P	Y	Y	Y	N	Y	T	P	N	4.5	N	
33	RL	HAN FS	30	R96N 0108			X			X	1D	2D	3D	M	L	L	4.8	N	P	P	P	N	N		N	Y	2	N/TL	GW,M
34	RL	HAN FS	30	R96N 0120		X				X	1C	3D	3D	M	L	L	3	N	Y	Y	Y	N	N	T	N	Y	3	N	
35	RL	HAN FS	30	R96N 0174			X			X	3D			L			5	Y	P	P	P	Y	N		Y	Y	4	3,Y-	WT,R
36	RL	HAN FS	30	R96N 0232		X				X	2B	3C	3D	M	L	L	4	N	N	N	N	N	not given	?	N	Y	1	can't tell	
37	RL	HAN FS	40	R96N 0071			X	X			3B	3D	3D	M	L	L	4	P	P	P	P	P	P	T	Y, QL	Y	3.9	4	GW,M.MS,LU
38	RL	HAN FS	40	R96N 0072		X				X	3C	3C	3D	L	L	L	4.5	Y	Y	Y	Y	Y	Y	T	N	Y	4.5	Y	
39	RL	HAN FS	40	R96N 0073			X	X			3B	3D	3D	M	L	L	4.2	Y	Y	Y	Y	P	P	T	P	Y	4	Y	GW,MS
40	RL	HAN FS	40	R96N 0074			X			X	3C	3C	3D	L	L	L	4.2	Y	Y	Y	Y	Y	Y	P	Y, QL	Y	4.3	4.5	GW,LU,H
41	RL	HAN FS	40	R96N 0075			X			X	3B	3B	3D	M	M	L	4.2	Y	Y	Y	Y	Y	Y	T	Y, QL	Y	4.3	4.5	GW,P&T,LU
42	RL	HAN FS	40	R96N 0086		X				X	3C	3C	3D	L	L	L	4.5	Y	Y	Y	Y	Y	Y	T	Y, QL	Y	4.5	Y	
43	RL	HAN FS	40	R96N 0087			X			X	3C	3C	3D	L	L	L	4	P	Y	Y	Y	P	P	T	Y, QL	Y	4	Y	LF/R,A,M,LU

Table 4, continued.

44	RL	HANFS	40	R96N0088		X				X	3C	3C	3D	L	L	L	4.2	Y	Y	Y	Y	Y	Y	Y	Y, QL	Y	4.5	Y	
45	RL	HANFS	40	R96N0090							3C	3C	3D	L	L	L													
46	RL	HANFS	40	R96N0137		X				X	3C	3C	3D	L	L	L	4.8	Y	Y	Y	Y	P	Y	T	Y, QL	Y	4.5	Y	
47	RL	HANFS	40	R96N0251	X			X			2B	3C	3D	M	L	L	2	N	P	N	P	P	Y	T	Y, QL	Y		N	GW, WC, S,A, M
48	RL	HANFS	40	R96N0252		X		X			1C	3C	3D	M	L	L	4.5	N	Y	Y	Y	N	Y	T	N	Y	3.5	Y	
49	SR	SR	40	R96A0018			X			X	2A	2A	3D	H	H	L	4.3	Y	P	P	P	N	Y	T	Y, QL	P	3.6	Y,3	GW, P,R, P&T
50	SR	SR	40	R96A0064		X				X	2A	2A	3C	M	H	L	4	Y	Y	Y	Y	N	Y	T	GL	Y	4	Y	
51	SR	SR	40	R96A0065			X			X	2A	2A	3D	H	H	L	4.5	Y	N	N	N	N	N	P	P	P	2.3	P,3	GW, RA,S
52	SR	SR	40	R96A0066							2A	2A	2A	H	H	H	4.5	P	Y	Y	Y	Y	Y	P	Y	Y	4	N	
53	SR	SR	40	R96A0067																									
54	SR	SR	40	R96A0074			X			X	2A	2A	3C	H	H	L	4	P	Y	Y	Y	N	N	P	N	Y	3	N	
55	SR	SR	40	R96A0075																									
56	SR	SR	40	R96A0076		X				X	2A	2A	3D	H	H	L	4	P	Y	Y	Y	N	Y	T	N	Y	3.5	can't tell	
57	SR	SR	40	R96A0078																									
58	SR	SR	40	R96A0080		X				X	2B	2B	3D	M	M	L	3.8	Y	Y	Y	Y	N	Y	T	Y, QL	Y	4	N	
59	SR	SR	40	R96A0098																									
60	SR	SR	40	R96A0100		?	X			X	3B	3B	3D	M	M	L	4.5	Y	Y	Y	Y	Y	Y	T	Y, QL	Y	4.3	N	
61	SR	SR	40	R96A0101																									

Table 4, continued.

62	SR	SR	40	R96A 0102			X			X	2A	2A	2D	H	H	L	3	P	Y	Y	Y	Y	Y	P	Y, QL	Y	3	N
63	SR	SR	40	R96A 0103																								
64	SR	SR	40	R96A 0104			X			X	2A	2A	3D	H	H	L	4.8	P	Y	Y	Y	N	N	T	N	Y	4	N
65	SR	SR	40	R96A 0106																								

2.3.3 Conclusions/Recommendations to Improve Public Health Risk Portion of RDSs

1. RDSs need to identify the specific hazard or hazardous substance of concern. Many of the RDSs reviewed failed to do this, citing only "Contamination" or "radioactivity" or "VOCs." These must be specifically identified.

2. The RDSs need to specify the amount of toxicant or agent involved. Dose makes the poison, and without documentation of the amount of a toxicant to which the public would be exposed, one cannot evaluate the health risks.

3. The RDS should indicate the number of people who are likely to be exposed and should use this information in characterizing the risk. In the current RDSs, the risk is judged to be the same if one fisherman or one exploring teenager might be exposed as if a whole city might be exposed. Obviously this situation will need to be clarified in future guidance for RDSs.

4. The RDSs need to consider health risks other than cancer in the risk evaluations. Guidance for the public health categories seem to emphasize cancer risks. The matrix also needs to be able to account for and express non-cancer effects.

5. Include dose or intake values if available.

6. Use documentation of scenarios and risk estimations when available and include citations.

2.4 Site Personnel Safety and Health

2.4.1 Stratified Random Sample

Sixty RDSs from the stratified random sample were reviewed for this impact category. Findings are presented in a formatat that responds to the thre generic questions and four additional questions specific to this topic.

Are the overall "before" scenarios comparable across sites for comparable activities?

The question of whether the "before" scenarios were comparable across sites for comparable activities cannot be answered totally satisfactorily on the basis of the reviewed RDSs because there were relatively few directly comparable activities in the sample reviewed. However, activities could be grouped by general type, and for those groupings the before scenarios were fairly comparable. Two major types of scenarios could be described, those that resulted in system failure and consequent exposure of workers, and those that resulted in an alternative action to the proposed action, which usually resulted in only incremental increases in worker hazards and/or exposures.

Are the impact categories of similar activities rated the same at the different sites?

Cross site consistency in the site personnel impacts for similar activities was also difficult to assess from the RDSs in this sample because of the wide variety of activities. It was necessary to compare types of activities and for similar types of activities the MEM scores were generally comparable. Scores that stood out as being High were almost always for activities of clearly elevated risk. For scenarios that resulted in no exposure and/or no activity on the part of workers risks were uniformly scored Low. Most “before” risks resulted from worker exposure to released contamination. These were most often scored Medium. “during” risks resulted most often from industrial type accidents, followed by excessive exposures to hazardous substances. Such risks were also most often scored Medium, although the actual MEM cell selection varied significantly within the Medium range. The industrial type accidents were most often associated with the operation of heavy equipment. The “after” risks were almost always scored as Low. The most frequent, but far from predominant, sequence of risk scores was Low - Medium - Low, as might be expected. Often, however, both the "before" and "during" risks were scored the same, usually Medium, but for different types of risks and different affected workers. The before risks predominantly affected the site workers, while the "during" risks affected the workers involved in the action. There was inconsistency in the stated impact for activities such as monitoring where sometimes reported consequences included risks from non-monitoring activities (e.g., remediation of the groundwater being monitored).

Are the “likelihood ” designations being interpreted and used consistently across sites?

There was generally inconsistent use of the likelihood designations for SP impacts, primarily because of the lack of use of any designation as prescribed in the guidance. Only about half of the reviewed evaluations gave any basis for the likelihood score. Of the those that did, the basis cited appeared to be provided as an afterthought, done without a defined rationale. Some RDSs, though, did reference technical documents or otherwise explain the rationale for the likelihood estimate. The problem probably has its origin in the generally non-specific nature of the associated evaluation scenarios. If the scenarios were properly developed, the likelihood scores would readily fall out. Such scores would be generally more credible than the mostly unsubstantiated ones in the current evaluations.

Are the risks of doing the activity (the “during” risks) addressed in a consistent manner across sites?

The "during" risks were predominated by scores in the Medium range, although MEM cell scores varied considerably within this range. These outcomes along with a fairly consistent scoring of activities of similar types (as best they can be grouped) would indicate that the answer to this question is a fairly unqualified yes. Basically, two types of risks were reported during activities, industrial type accidents and exposures to hazardous substances. If either of these types of risks were present the resultant risk scores were almost always Medium. When neither of these risks were present the scores were consistently in the Low range. There were four scores in the High range. Two seemed to be out of line with the others, as the risks involved did not appear to be particularly acute (e.g., one was an RDS for updating documentation). The other two were risks for workers unfamiliar with the area entering facilities undergoing D&D or surveillance and maintenance activities. The evaluation scoring was highly qualitative for both accidents and exposures. When quantitative data were used it was usually in the form of a reference to calculated risks from a risk assessment, or to accident rates from a safety analysis report. Occasionally, exposure guidelines were cited as a gauge of exposure levels expected. The use of personal protective equipment was inconsistently discussed, and when it was, generally very little detail was provided.

Is the basis for the risk assessments clearly stated?

The bases for the risk and hazard assessments were clearly not consistently stated. Roughly half of the assessments reported no basis at all for either severity or likelihood (see Table 5*)*. When a basis was given, it was often done in a matter-of-fact manner without any supporting development. As suggested above, any activity involving construction or heavy equipment was consistently scored in the Medium range. Similarly, risks to site workers from not remediating contaminated sites, i.e., the "before" risks, were also consistently in the Medium range. When activities did not involve workers in remedial actions or did not pose a threat of exposure, scores were consistently in the Low range.

Is there consistency across sites in use of quantitative and qualitative data for risk assessment?

As mentioned above, about half of the evaluations used no data at all in the risk and hazard assessments. The half that did use data used predominantly qualitative data. Moreover, the data appeared to be selected to support a predetermined outcome. A few of the evaluations referred to risk assessments and/or safety analysis reports as a basis for the outcomes, but the use of such references was usually poorly integrated with the evaluation. That is, the risks or hazards referred to in such assessments were generally not connected to any evaluation scenario in the occupational health evaluation. Therefore, the MEM scores were not a natural outcome of the risks or hazards cited in the referenced assessments.

Does an assignment of “A” (less than one year to occurrence) in the likelihood estimation deserve an “A”?

A fair number of likelihood scores were reported in the "A," or Very High, category, but they were almost always associated with a low severity score of 3 or 4. In any activity involving construction work and a fair number of people it would seem reasonable that minor accidents or exposures would be predicted, particularly given the conservative nature of such prognostications. The highest severity scores associated with an "A" likelihood was a 2A reported on three of the "High" risks during activities mentioned above. Two of these appear unrealistic or biased High, while the third may be possible but appears avoidable.

Table 5. Cross Site Consistency Evaluation from Stratified Random Sample -- Occupational Health, follows.

Table 5. Cross Site Consistency Evaluation from Stratified Random Sample -- Occupational Health

Site	RDS No.	Brief Description	Before Score	During Score	After Score	MEM Cell Justif=n?	Hazard Source?	Release Quant?	Exposure Pathway?	Likelihood P or T?	Basis for Severity?	Basis for Likelihood?
RF	96A0025	Design and construction of mixed waste treatment facility (preoperational)	4B Low	4A Med	4B Low	no	gen'l rad releases	no	implied only	T	no	no
RF	96A0033	Equipment and improvements for waste mgt program	4B/ Low	3A Med	4B Low	no	general	no	no	T	no	no
RF	96A0041	SNM and hazardous materia removal; facility deactivation	3C Low	3B Med	3C Low	no	general	no	no	not specified	no	no
SRS	96A0201	Operation of two high-level liq waste pretreat facilities, ITP and ESP	4A Med	4A Med	3D Low	yes	general, rad	yes	no	T	yes	yes
SRS	96A0046	Sanitary waste disposal operations	4A Med	4C Low	4C Low	yes	yes	no/na	no/na	T	yes	yes
SRS	96A0083	Evaluate various treatment and/or packaging alternatives for SNF	2C Med	2C Med	4D Low	no	general, fuel handling	no	no	F	no	no
SRS	96A0131	Maintenance of stabilization of Pu-239 solutions -- interim storage	3B Med	4B Low	blank	yes	general, rad	no	no	F(T)	yes	yes
SRS	96A0169	Design, constr &startup of an HP site support facility	4A Med	4A Med	4B Low	no	yes	no	yes	P	yes	no
SRS	96A0196	Maintenance of reactors in cold shut-down; decon and excess mat=l removal; mgt, planning &oversight	3C Low	3C Low	4D Low	no	general, rad	no	no	F	no	no
RL	96N0178	Maintenance of Hanford Emergency Response readiness	1B/High	3C Low	3C Low	no	no	no	no	P	no	no
RL	96N0028	Commercial laboratory program support	4B Low	4A Med	4A Med	no	general, rad	no	no	P	yes	no
RL	96N0239	Removal of a large amount of dispersi-ble radioactivity from 324 Bld B-Cell	1D Med	1D Med	4D Low	yes	yes	yes	yes	T	yes	yes
RL	96N0096	S&M of storage facilities for rad mat=ls at PNL - mega curie quantities	1A/High	1D Med	1D Med	yes	yes	yes	yes	T	yes	yes
RL	96N0283	Integrity assessment of 2 of 28 DSTs (double shell tanks)	4D Low	3B Med	4D Low	yes	yes	yes	yes	P	yes	yes
RL	96N0075	Design, implementation and mgt of groundwater remediation in 100NR	4C Low	4A Med	4D Low	yes	yes	na,acc-ident	na	P	yes	yes

Table 5, continued.

Site	RDS No.	Brief Description	Before Score	During Score	After Score	MEM Cell Justif=n?	Hazard Source?	Release Quant?	Exposure Pathway?	Likelihood P or T?	Basis for Severity?	Basis for Likelihood?
OR	94H0016	Remedy selection and remediation of shallow GW in WAG 1	3A Med	2A High	4C Low	no	general	no	no	not specified	no	no
PAD	94F0057	Remedial investigation of waste area group(WAG) 6, five SMUs	3A Med	2A High	4C Low	yes	yes	yes	yes	not specified	yes, but too high	yes, but too high
Y12	94C0005	Removal of mercury contaminated sediments and floodplain soils	4D Low	2B Med	4D Low	yes	yes	no	no	not specified	yes	yes
INEL	96A0009	Support of TRU waste mgt and transfer to WIPP for disposal	3B/Md	3C Low	4B Low	yes	yes	no	no	P	yes	yes
INEL	96C0067	Waste Mgt Complex operations support - compliance	2C Med	2C Med	NA/__	yes	yes	no	yes	P	yes	yes
INEL	96B0036	Purchase of SNF storage facility and continued storage operations	4C Low	4D Low	4D Low	no	no	no	no	P	yes	no
Ames	96A0008	Waste management program mgt , execution and administration	3B Med	4D Low	4D Low	no	yes	no	no	not specified	no	no
BNL	96Z0007	Contaminated facilities and envir. media assoc. with the Waste Concen-tration facility	3C Low	3B Med	4D Low	yes	yes	no	no	T	yes	yes
GJPO	96A0014	Mill tailings removal and disposal - Millsite remediation	NA/__	2B Med	4C Low	no	yes	no	yes, implied	P	no	yes
GJPO	96A0017	Peripheral property remediation	NA/__	2B Med	4D Low	no	yes, accidents	no/na	no/na	P	no	no
GJPO	96A0024	UMTRA GW No Further Action compliance activities	NA/__	3B Med	NA/__	yes	yes, accidents	no/na	no/na	not specified	yes	yes
LLNL	96A0020	Investigation of nature and extent of tritium contam in soil and GW	3C Low	2C Med	4D Low	no	yes	yes	no	not specified	no	no
SNL	96A0014	Assessment and cleanup of artillery fuse testing site	3C Low	3B Med	4C Low	no	yes, accidents	no/na	no/na	T	no	no
SNL	96A0026	Assessment and remediation of contam at break points in sanitary sewer line	3C Low	3B Low	4D Low	no	yes	no	no	T	no	no
WIPP	96A0001	Establish and maintain the WIPP facility	3C Low	2C Med	4D Low	no	yes	no	no	P	no	no

2.4.2 Groundwater Remediation Activities

The site personnel risks in the “before” and “after” scenarios were uniformly related to worker risks for unremediated and remediated groundwater, respectively, even if the RDS activity did not include remediation (e.g., monitoring alone does not provide for remediation).

However the risk ratings for the unremediated (“before”) scenario were inconsistent across sites to an extent that cannot be attributed to differences in contamination. Of 47 groundwater RDSs, for the “before” scenario, 20 were Low risk, 25 were Medium, and two were High. However, all of the OR groundwater RDSs (12) were Medium or High for the “before” scenario.

The greatest variability was for the “during” scenario; some, but not all, of this variability is to be expected because of the variability in activity. Monitoring activity risks alone ranged from Low to High. For remediation (“during”) activities, 22 of 35 RDSs rated risks as Medium or High. All of the OR remediation activity RDSs (7) were rated as Medium or High risks.

All of the post-remediation risks to workers (“after” scenarios) were rated as Low.

Table 6. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Occupational Health, and Table 7. Supplemental Table for Cross Site Consistency -- Occupational Health follow on the next pages.

Table 6. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Occupational Health

	OPS OFFICE	Facility	EM OFFICE	RDS Number	Y	P	N	Y	P	N	B	D	A	B	D	A	Activity Summary 1-5(best)	Is Hazard Given?	Before Risks Described	During Risks Described	After Risks Described	Hazard Justi-fied?	Likelihood Reasonable	P/T	Hazard Amount Given	Exposure Pathway Identified	Overall Evaluation	Agree with Ratings
1	AL	LANL	40	R96E0018			X			X																		
2	ID	INEL	30	R96C0142		X			X																			
3	ID	INEL	30	R96C0164	X					X																		
4	ID	INEL	40	R96C0032			X	X			2C	3C	4D	M	L	L	2	Y	Y	Y	Y	Y	Y	P	N	Y	4	Y
5	ID	INEL	40	R96C0035	X					X	2D	3C	4D	L	L	L	3	Y	Y	Y	Y	Y	Y	P	N	N	4	Y
6	ID	INEL	40	R96C0036		x		x			3C	3C	4D	L	L	L	2	Y	Y	Y	Y	Y	Y	P	N	Y	4	Y
7	ID	INEL	40	R96C0040			X	X			3D	3D	4D	L	L	L	3	Y	Y	Y	N	Y	Y	P	N	Y	3	Y
8	ID	INEL	40	R96C0041			X	X			3D	3D	4D	L	L	L	4	Y	N	N	N	N	Y	P	N	Y	3	Y
9	ID	INEL	40	R96C0045		X		X			2C	2C	4D	M	M	L	3	Y	Y	Y	N	Y	Y	P	Y	Y	4	Y
10	ID	INEL	40	R96D0149		X		X			1D	2D	4D	M	L	L	3	Y	N	Y	N	Y	Y	P	N	Y	4	Y
11	OR	K25	40	R94A0018			X			X	3A	3C	4C	M	L	L	4	Y	N	N	N	N	N	?	N	N	2	N
12	OR	K25	40	R94A0022		X				X	3A	2B	4C	M	M	L	4	Y	Y	Y	N	Y	N	?	N	Y	2	N
13	OR	K25	40	R96W0004		X				X	3A	1B	4C	M	H	L	4	Y	N	N	N	Y	N	?	N	Y	2	N
14	OR	K25	40	R96W0005		X				X	3A	.	4D	M	.	L												
15	OR	K25	40	R96W0006			X			X	3A	3C	4D	M	L	L												
16	OR	OR	40	R96G0020	X					X	3A	3C	4C	M	L	L	1	N	N	N	N	N	N	?	N	N	1	

Table 6, continued.

17	OR	OR	40	R96G0021	X					X	3A	3C	4C	M	L	L	1	N	N	N	N	N	N	?	N	N	1	no data
18	OR	ORNL	30	R96D0006	X					X	1B	4C	4C	H	L	L												
19	OR	ORNL	30	R96D0007		X				X	1B	4C	4C	H	L	L												
20	OR	ORNL	40	R94A0011		?				X	3A	2B	4C	M	M	L	2	N	N	N	N	N	N	?	N	N	1	N
21	OR	ORNL	40	R94H0012			X			X	3A	1B	4C	M	H	L	3	Y	Y	Y	Y	Y	N	T	N	Y	4	N
22	OR	ORNL	40	R94H0016			X			X	3A	2A	4C	M	H	L	3	N	N	N	N	N	N	?	N	N	3	N
23	OR	ORNL	40	R94H0019			X			X	3A	3A	4C	M	M	L	2	N	N	N	N	N	N	?	N	N	1	N
24	OR	ORNL	40	R94H0023		X				X	3A	3A	4C	M	M	L	3	N	N	N	N	N	N	?	N	N	2	N
25	OR	ORNL	40	R95M0063		X				X	1B	3C	4C	H	M	L	3	N	N	N	N	N	N	?	N	N	1	N
26	OR	ORNL	40	R96Y0001		?				X	3A	2B	4C	M	M	L	2	N	N	N	N	N	N	?	N	N	1	N
27	OR	ORNL	40	R96Y0010			X			X	3A	3A	4C	M	M	L	3	N	N	N	N	N	N	?	N	N	2	N
28	OR	ORNL	40	R96Y0011			X			X	1B	3C	4C	H	M	L	3	N	N	N	N	N	N	?	N	N	1	N
29	OR	Y12	30	R96B0003			X			X	2A	4B	4C	H	L	L	3											
30	OR	Y12	30	R96B0004		X				X	2A	4B	4C	H	L	L	1	Y	Y	N	N	N	N	T	N	N	2	N
31	OR	Y12	30	R96B0009			X			X	1B	4C	4C	H	L	L												N
32	OR	Y12	30	R96B0010		X				X	1B	4C	4C	H	L	L												N
33	RL	HANFS	30	R96N0108			X			X	2D	2D	3D	L	L	L	5	Y	Y	Y	N	Y	Y	P	N	Y	4	Y
34	RL	HANFS	30	R96N0120		X				X	1C	3C	3D	M	L	L	3	Y	Y	N	N	Y	Y	T	N	Y	4	N
35	RL	HANFS	30	R96N0174			X			X	3C	4C	4C	L	L	L	5	Y	Y	N	Y	Y	Y	?	N	N	4	Y
36	RL	HANFS	30	R96N0232		X				X	2C	3C	3D	M	L	L	3	Y	N	N	N	N	Y	?	N	N	1	Y
37	RL	HANFS	40	R96N0071			X	X			4D	4D	4D	L	L	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y

Table 6, continued.

38	RL	HANFS	40	R96N0072		X				X	4C	4A	4D	L	M	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y
39	RL	HANFS	40	R96N0073			X	X			4D	4D	4D	L	L	L	4	Y	Y	Y	Y	Y	Y	?	Y	N	4	Y
40	RL	HANFS	40	R96N0074			X			X	4C	4A	4D	L	M	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y
41	RL	HANFS	40	R96N0075			X			X	4C	4A	4D	L	M	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y
42	RL	HANFS	40	R96N0086		X				X	4C	4A	4D	M	M	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y
43	RL	HANFS	40	R96N0087			X			X	3B	3A	4D	M	M	L												
44	RL	HANFS	40	R96N0088		X				X	3B	3A	4D	M	M	L												
45	RL	HANFS	40	R96N0090							1B	3A	4D	H	M	L												
46	RL	HANFS	40	R96N0137		X				X	4C	4A	4D	L	M	L	4	Y	Y	Y	Y	Y	Y	?	N	Y	4	Y
47	RL	HANFS	40	R96N0251	X			X			2C	3C	3D	M	L	L	3	Y	N	N	N	N	Y	?	N	N	2	Y
48	RL	HANFS	40	R96N0252		X		X			1C	4C	4D	M	L	L	3	Y	Y	Y	Y	N	Y	?	N	Y	3	N
49	SR	SR	40	R96A0018			X			X	4B	4B	4D	L	L	L	4	Y	N	N	N	N	Y	?	N	Y	3	Y
50	SR	SR	40	R96A0064		X				X	4A	4A	3D	M	M	L	3	Y	N	N	N	Y	Y	?	N	N	3	Y
51	SR	SR	40	R96A0065			X			X	4B	4B	4D	L	L	L	3	Y	N	N	N	Y	Y	P	N	N	3	Y
52	SR	SR	40	R96A0066			X			X	4B	4B	4D	L	L	L	3	Y	N	N	N	N	Y	?	N	N	2	Y
53	SR	SR	40	R96A0067			X			X	4A	4A	4D	M	M	L	3	Y	N	N	N	N	Y	?	N	N	2	Y
54	SR	SR	40	R96A0074			X			X	3B	3B	4D	M	M	L	3	Y	N	N	N	N	Y	?	N	N	2	Y
55	SR	SR	40	R96A0075			X			X	3B	3B	4D	M	M	L												
56	SR	SR	40	R96A0076		X				X	4A	4A	4D	M	M	L	3	Y	N	N	N	N	Y	P	N	N	3	Y
57	SR	SR	40	R96A0078			X			X	4A	3B	4D	M	M	L	4	Y	Y	N	Y	Y	Y	P	N	N	3	Y
58	SR	SR	40	R96A0080		X				X	4C	4C	4D	L	L	L	3	Y	N	N	N	N	Y	P	N	N	3	Y

Table 6, continued.

59	SR	SR	40	R96A0098			X			X	4B	4B	4D	L	L	L	3	Y	N	N	N	N	Y	P	N	N	3	Y
60	SR	SR	40	R96A0100			X			X	4B	4B	4D	L	L	L	4	Y	N	N	N	N	Y	P	N	N	4	Y
61	SR	SR	40	R96A0101			X			X	4C	4C	4D	L	L	L	3	Y	N	N	N	N	Y	P	N	N	3	Y
62	SR	SR	40	R96A0102			X			X	3B	3B	4D	M	M	L	3	Y	N	N	N	N	Y	P	N	N	3	Y
63	SR	SR	40	R96A0103			X			X	4A	4A	4D	M	M	L	3	Y	N	N	N	N	Y	P	N	N	3	Y
64	SR	SR	40	R96A0104			X			X	3B	3B	4D	M	M	L	2	Y	N	N	N	N	Y	P	N	N	3	Y
65	SR	SR	40	R96A0106			X			X	4A	4A	3D	M	M	L	3	Y	N	N	N	Y	Y	?	N	N	3	Y

Table 7. Supplemental Table for Cross Site Consistency -- Occupational Health

Table 6 ID#	..	Brief Description	"Before" Scenario	R	Activity Covered by RDS	R	"After" scenario	R	Comments	Activity Categor
7	ID	Groundwater monitoring	Increased GW contamination; no detection	3D L	GW monitoring; characterization	3D L	Detect/ mitigate GW contamination	4D L	Remediation is discussed under Public Health, but not clear that it is part of this activity.	Monitor-ing
11	OR	Maintain/operate GW monitors; sample and analysis	Continued GW contamination	3A M	GW monitoring; characterization	3A L	Remediation; long term monitoring	4C L	High frequency (A: at least once per year) of "Marginal" impact Before and During is inconsistent with description.	Monitor-ing
12	OR	Maintain/operate GW monitors; sample and analysis	Continued GW contamination	3A M	GW monitoring; characterization	2B M	Remediation; long term monitoring	4C L	Risk Before (3A) and During (2B) is inconsistent with description.	Monitor-ing
13	OR	Maintain/operate GW monitors; sample and analysis	Continued GW contamination	3A M	GW monitoring; characterization	1B H	Remediation; long term monitoring	4C L	Risk Before (3A) and During (1B) is inconsistent with description.	Monitor-ing
24	OR	Monitoring of contaminant flux from burial site (landfill)	Increased GW contamination; no detection	3A M	GW monitoring; characterization	3A M	Detect/ mitigate GW exposure	4C L	Limited anal. of risk to remediation and monitoring workers; unclear on current status	Monitor-ing
27	OR	Monitoring contaminant flux from burial site (Same as #24)	Increased GW contamination; no detection	3A M	GW monitoring; characterization	3A M	Detect/ mitigate GW exposure	4C L	Limited anal. of risk to remediation and monitoring workers; unclear on current status	Monitor-ing
33	RL	Monitoring in vadose zone (between surface and aquifer) near tanks	Increased GW contamination; no detection	2D L	GW monitoring; characterization	2D L	Detect/ mitigate GW contamination	3D L		Monitor-ing
34	RL	Install or replace monitoring wells	Increased GW contamination; no detection	1C M	GW monitoring - characterization - install monitor	3C L	Detect/ mitigate GW contamination	3D L	Catastrophic impact "before" is unlikely	Monitor-ing
36	RL	Maintain/operate GW monitors; sample and analysis	Increased GW contamination; no detection	2C L	GW monitoring; characterization	3C L	Detect/ mitigate GW contamination	3D L	Incomplete RDS	Monitor-ing
37	RL	Maintain/operate GW monitors; sample and analysis	Increased GW contamination; no detection	4D L	GW monitoring; characterization	4D L	Detect/ mitigate GW contamination	4D L	..	Monitor-ing
39	RL	Maintain/operate GW monitors; sample and analysis	Continued GW contamination	4D L	GW monitoring; characterization	4D L	Remediation; long term monitoring	4D L	..	Monitor-ing
47	RL	Maintain/operate GW monitors; sample and analysis	Increased GW contamination; no detection	2C M	GW monitoring; characterization	3C L	Detect/ mitigate GW contamination	3D L	Diff. in risks from #37 unclear	Monitor-ing
5	ID	Assessment, remediation, GW monitoring of landfill area	Continued GW/ soil contamination	2D L	Install engr. barriers, monitoring	3C L	Reduce level of GW/soil contamination	4D L	Impact During (3) < Before (2); would expect reverse due to barrier installation activities.	Remedi ation

Table 7, continued.

6	ID	Landfill remediation	Continued GW/ soil contamination	3C L	Activities related remediation	3C L	Reduce level of GW/soil contam	4D L	Inadequate description of activities involved.	Remedi ation
10	ID	Transuranic disposal site assessment, remediation and monitoring	Continued soil/GW contamination	2D M	GW/soil monitoring, characterization, remediation	2D L	Reduce level of GW contamination	4D L	Not clear on activities included; Summary says "rerieve and process waste", elsewhere pump & treat is described.	Remedi ation
20	OR	Assess and mitigate seeps from landfill	Continued GW contamination	3A M	Design/ impl. remed (undefined)	2B M	Reduce level of GW contamination	4C L	No discussion of basis for projected Site Personnel risks	Remedi ation
21	OR	Remediate surface impoundments	Continued GW contamination; possible catastrophic failure.	3A M	Remove/treat liquids; stabilize/cap impoundment	1B H	Reduce level of GW contamination	4C L	"During" risk of frequent, high impact (1B) not justified.	Remedi ation
22	OR	Monitoring & remediation of GW in main plant area	Continued GW contamination	3A M	GW monitoring, characterization, remediation	2A H	Reduce level of GW contamination	4C L	Further justification needed for Before and During risk; may be high. (During risk listed as 2A, but 2B given in discussion.)	Remedi ation
23	OR	Assess and mitigate surface water, sediment contamination from landfill seeps	Continued contamination	3A M	Monitor, design/ impl. remediation (undefined)	3A M	Reduce level of contamination	4C L	No discussion of basis for projected Site Personnel risks	Remedi ation
25	OR	Waste disposal site (land fill) remediation and monitoring	Continued GW/ soil contamination	1B H	GW/soil monitoring, characterization, remediation	3C M	Reduce level of GW/soil contamination	4C L	Catastrophic impact every 10 years (1B) is not justified. (SP risk ratings in RDS sections15 and 23 are different.)	Remedi ation
26	OR	Assess and mitigate seeps from landfill (Same as #20)	Continued GW contamination	3A M	Design/ impl. remediation (undefined)	2B M	Reduce level of GW contamination	4C L	No discussion of basis for projected Site Personnel risks	Remedi ation
28	OR	Waste disposal site (land fill) remediation and monitoring (Same as #25)	Continued GW/ soil contamination	1B H	GW/soil monitoring, characterization, remediation	3C M	Reduce level of GW/soil contamination	4C L	Catastrophic impact every 10 years (1B) is not justified. (SP risk ratings in RDS sections15 and 23 are different.)	Remedi ation
50	SR	Waste disposal site (land fill) remediation and monitoring	Continued GW/ soil contamination	4A M	GW/soil monitoring, characterization, remediation	4A M	Reduce level of GW/soil contamination	3D L	RDS contains wide range of activities; not clear on basis for risks projected; unclear on current status	Remedi ation
51	SR	Waste disposal site (seepage basin) remediation and monitoring	Continued GW contamination	4B L	GW monitoring, characterization, remediation	4B L	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected; unclear on current status	Remedi ation
52	SR	Waste disposal site (seepage basin) remediation and monitoring	Continued GW contamination	4B L	GW monitoring, characterization, remediation	4B L	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected; unclear on current status	Remedi ation
53	SR	Waste disposal site (seepage basins) remediation and monitoring	Continued GW contamination	4A M	GW monitoring, characterization, remediation	4A M	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected (why higher than # 51,52?)	Remedi ation
54	SR	Waste disposal site (seepage basins) remediation and monitoring	Continued GW contamination	3B M	GW monitoring, characterization, remediation	3B M	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected (why higher than # 51,52,53?)	Remedi ation
55	SR	Waste disposal site (seepage basin) remediation and monitoring	Continued GW contamination	3B M	GW monitoring, characterization, remediation	3B M	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected (why higher than # 51,52,53?)	Remedi ation

Table 7, continued.

56	SR	Waste disposal site (land fill) remediation and monitoring	Continued GW/ soil contamination	4A M	GW/soil monitoring, characterization, remediation	4A M	Reduce level of GW/soil contamination	4D L	Before and during risk rated as very frequent, low impact (4A); were others considered? (less freq., higher impact)	Remedi ation
57	SR	GW in tank farm vicinity; remediation and monitoring	Continued GW contamination	4A M	GW monitoring, characterization, remediation	3B M	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear which of those causes risks projected "During"	Remedi ation
58	SR	Assessment and remediation of GW plume	Continued GW contamination	4C L	GW monitoring, characterization, remediation	4C L	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear which of those causes risks projected	Remedi ation
59	SR	Assessment and remediation of GW in vicinity of seepage basin	Continued GW contamination	4B L	GW monitoring, characterization, remediation	4B L	Reduce level of GW contamination	4D L	Risks projections based on experience from previous activities at similar sites	Remedi ation
60	SR	Assessment and remediation of GW in vicinity of seepage basin	Continued GW contamination	4B L	GW monitoring, characterization, remediation	4B L	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear which of those causes risks projected	Remedi ation
61	SR	Assessment and remediation of GW in vicinity of seepage basin	Continued GW contamination	4C M	GW monitoring, characterization, remediation	4C L	Reduce level of GW contamination	4D L	Not clear why likelihood is lower "During" than for #51-55,60.	Remedi ation
62	SR	Assessment and remediation of GW in vicinity of reactor sites	Continued GW contamination	3B M	GW monitoring, characterization, remediation	3B M	Reduce level of GW contamination	4D L	Text says increased risk "during"; this is not reflected in ratings.	Remedi ation
63	SR	Assessment and remediation of GW in area of reactor seepage basin	Continued GW contamination	4A M	GW monitoring, characterization, remediation	4A M	Reduce level of GW contamination	4D L	Not clear why likelihood is high (A) "During".	Remedi ation
64	SR	Assessment and remediation of GW in area of sanitary landfill	Continued GW contamination	3B M	GW monitoring, characterization, remediation	3B M	Reduce level of GW contamination	4D L	Summary discusses history; not clear on which activities are included in the RDS evaluation.	Remedi ation
65	SR	Waste disposal site (seepage basin) remediation and monitoring	Continued GW contamination	4B L	GW monitoring, characterization, remediation	4B L	Reduce level of GW contamination	4D L	RDS contains wide range of activities; not clear on basis for risks projected; unclear on current status	Remedi ation
4	ID	Installation, operation of GW remediation	Continued GW contamination	2C M	Pump & treat instal-lation & operation	3C L	Reduce level of GW contamination	4D L	Impact During (3) < Before (2); would expect reverse due to pump & treat activities.	Remed/ Pmp &T
8	ID	Planning, installation, operation of GW remediation	Continued GW contamination	3D L	Pump & treat installation & operation	3D L	Reduce level of GW contamination	4D L	Before and During risk given same rating; increased worker risk of pump & treat are expected.	Remed/ Pump & Treat
9	ID	Planning, installation of landfill remediation.	Continued GW contamination	2C M	Pump & treat installation & operation	2C M	Reduce level of GW contamination	4D L	Before and During risk given same rating; increased worker risk of pump & treat are expected.	Remed/ Pump & Treat
38	RL	Planning, installation, operation of GW remediation	Continued GW contamination	4C L	Pump & treat installation & operation	4A M	Reduce level of GW contamination	4D L	Chromium removal; During risk "based on Safety statistics"	Remed/ Pump & Treat
40	RL	Planning, installation, operation of GW remediation	Continued GW contamination	4C L	Pump & treat installation & operation	4A M	Reduce level of GW contamination	4D L	Chromium removal; During risk "based on Safety statistics" [Same as #38]	Remed/ Pump & Treat

Table 7, continued.

41	RL	Planning, installation, operation of GW remediation	Continued GW contamination	4C L	Pump & treat installation & operation	4A M	Reduce level of GW contamination	4D L	Rad removal; During risk "based on Safety statistics" [Similar to #38]	Remed/ Pump & Treat
42	RL	Planning, installation, operation of GW remediation	Continued GW contamination	4C L	Pump & treat installation & operation	4A M	Reduce level of GW contamination	4D L	During risk "based on Safety statistics" [Similar to #38]	Remed/ Pump & Treat
46	RL	Planning, installation, operation of GW remediation	Continued GW contamination	4C L	Pump & treat installation & operation	4A M	Reduce level of GW contamination	4D L	During risk "based on Safety statistics" [Similar to #38]	Remed/ Pump & Treat
49	SR	Operation of GW remediation & monitoring	Continued GW contamination	4B L	Operation of pump & treat, vacuum extr, monitoring	4B L	Reduce level of GW contamination	4D L	Limited anal. of risk to remediation and monitoring workers; unclear on current status	Remed Pump & Treat
29	OR	Landfill operations	On site storage of industrial/ sanitary waste	2A H	Operate landfill & assoc. sys., post-closure monitoring	4B L	On site disposal of industrial/ sanitary waste	4C L	During and after activities same, thus risk should be same. Frequent, high impact (2A) for Before risk not justified.	
30	OR	New landfill construction/operation	Off site transport of industrial/ sanitary waste	2A H	Constr./Operate landfill & assoc. sys.	4B L	On site disposal of industrial/ sanitary waste	4C L	Inadequate Summary Description. Frequent, high impact (2A) for Before risk not justified.	
35	RL	Maintain tratment facility in "ready" mode	Alternate facility; less eff. treatment	3C L	Treatment facility operation	4C L	More effective GW treatment	4C L	..	

2.4.3 Recommendations for Site Personnel Safety and Health

1. **In general, based on the RDSs sampled, the Site Personnel components of the RDSs in a large percentage of cases fall short of the objective of having content and form that is most useful to those involved in decision making. To a large extent the RDS information has not been expressed clearly and concisely with supporting rationale so that it can easily be used by a variety stakeholders as input to decisions.**

2. **RDS Summaries should provide more contextual information, e.g., what has been, is being, or will be done in this and other related work. In many cases it is presumed that the reader is already somewhat familiar with the proposed activity.**

3. **Worker risk should be one of the more readily quantifiable components of the RDSs. The at-risk worker population is well defined, and there is a growing set of statistics of impacts on DOE environmental workers. Also, many of the activities are similar to other industrial non-DOE tasks. This information was seldom used in the RDSs reviewed.**

4. **An evaluation of worker risk for different activities that is used in a qualitative comparison or risk, [i.e., relative risk] should consider the number of workers affected; the RDS guidance did not suggest how to do this and it was not done in the RDSs reviewed.**

5. **The approach for estimating likelihood levels -- expected time to occurrence (T) or probability (P) -- was frequently not given. Why? Site managers appear to need guidance on how to use available quantitative information to obtain likelihood estimates.**

6. **In spite of apparent shortcomings in analysis, the majority of the ratings for risk (High-Medium-Low) were considered reasonable. However, the level of "reasonableness" was not consistent across sites. Also, given the lack of any detail in how worker risk was determined, the term "reasonable" is only a very crude indicator of accuracy.**

2.5 Environmental Impacts

2.5.1 Stratified Random Sample

Sixty RDSs from the stratified random sample were reviewed to determine cross-site consistency issues for the environmental impacts category. Reviewers were asked to address the following questions:

- Are the risks of doing the activity (the “during” risks) addressed in a consistent manner across sites?
- Do “As” (less than one year to occurrence) in the likelihood estimation deserve “As”?
- Is this section meaningfully addressed? Do impact options make sense for scenario?
- Is there life-cycle information?
- Was a time to impact listed? If so, was it from a Safety Analysis Report?
- Was a level of uncertainty given in the narrative response? (i.e. any hints regarding the basis for assessments: professional judgment, complete assessment, etc.)

The *MEM Matrix Instructions* state that category (field 24) is to include any potential adverse impact on natural resources, defined as air, water, land and wildlife. Impacts should be defined as catastrophic (value of 1), significant (value of 2), or minor (value of 3). The description under this field should include a complete justification of the MEM cell selection, as well as a description of the hazards (chemicals, physical events), quantities of release, exposure, pathways, and ecological receptors.

The above descriptions, if addressed in the RDS, would provide a very meaningful evaluation of the potential ecological or environmental consequences of any given activity on DOE sites. While this methodology could be improved upon with finer descriptions of the receptors and the types of damage, as well as the recovery potential, it is sufficient to provide a clear understanding of the hazard, pathways, receptors, and assessment of likelihood of occurrence.

Overall, the Environmental Protection fields of the RDS sheets are lacking in some of the basic details which would allow either a lay-person or a DOE manager to determine the key aspects of the ecological or environmental risk. This makes it difficult to have a great deal of confidence in the values on the Management Evaluation Matrix. With this caveat, however, there is a general consistency in the evaluation across sites. In an in-depth review of 60 RDS sheets from 18 sites, any disagreements between our evaluation and those listed in the MEM were one of degree and were not major. Where there were disagreements, they arose either because no rating was given, the likelihood of occurrence was one level too low, or there was insufficient information given to evaluate their ratings.

The greatest problem in the Environmental Protection field of the RDS sheets is a lack of information about the hazards (both physical and chemical), pathways, and receptors. Overall, these three aspects were covered in only about 25% of the RDS's. In about 30 % of the cases, the hazards were not clearly defined. In about 70 % of the cases, the receptors were not defined. In many cases the RDS simply stated there would or would not be a risk to the "environment", without even stating any reference to air, water, soil or biota. It was more common to refer to ground water than to any other possible receptor.

Only three or four RDS even listed any particular plants or animals as being at risk. This consistent lack of information regarding the pathways or receptors of concern makes it difficult to evaluate the true ecological or environmental risk from on site activities. Simply saying that the "risk to the environment" will increase or decrease does not provide information that can be used in a risk evaluation. Similarly, referring to "contaminants" without listing them is less useful than actually listing the principle contaminants. For some sites, the same phrases appeared in the before, during and after evaluations for several of the RDS's - suggesting that they used a stock answer rather than one deriving from a particular risk.

Several aspects that are important in assessing environmental risk were uniformly not included in the RDSs with respect to Environmental Protection, for example, the total time required to complete the activity of the RDS, the life cycle of the activity or of the receptors of interest, the time it would take for there to be an effect, uncertainties in their evaluations, and the species of concern. Total time for the proposed activity was given in only about 5 % of the cases (although it could be inferred in many more), yet this is critical for environmental risks where seasonality affects processes.

Many of the DOE sites have important, threatened, or endangered species, or species of concern on the site. These were largely ignored. Only one site mentioned the endangered Gopher Tortoise, and no others were

mentioned. This is one aspect that clearly needs more consideration, both in the instructions and in the preparation of future RDS's.

There was overall consistency in the risks listed in the before, during, and after scenarios, making it possible to make management decisions across sites from the present data set. The difficulty is that nearly all of these require more information to allow for a truly meaningful evaluation of the relative risks across tasks or across sites. In future RDS instructions it would be useful to state clearly that the hazards, pathways and receptors MUST be identified.

The timing element was conspicuously missing from the RDS's: in the summaries and in the individual sections. There was almost no timing information present in any of the RDS's. Times that would be informative in evaluating risks to the environment are: length of time for the proposed activity, time (season) of its occurrence, time for expected impacts, and life cycle information on the receptors of interest.

Uncertainty was not treated well in the Environmental Protection field. Almost none of the RDS's examined listed any uncertainties in their evaluations, in the proposed activity, or in the expected effects. The methodology for arriving at the likelihood ratings was given in about 75 % of the RDS's, but was generally lacking from those from SRS. Oak Ridge, and some of the "other" sites listed when their environmental information was based on an impact statement or a previous study. This was very useful, and should be encouraged in other RDS's in the future.

One aspect bearing comment is the scope of the RDS sheets. A number of DOE facilities grouped such a wide variety of activities under one RDS sheet that it was difficult to evaluate or rank the true risks. This also ensured that the hazards and effects were not clearly identified for these RDSs.

Table 8. Cross Site Consistency Evaluation from Stratified Random Sample -- Ecological Health, follows:

Table 8. Cross Site Consistency Evaluation from Stratified Random Sample -- Ecological Health

LOC	NUMBER	RANK	RANK	SUMMARY SECTION	HAZARD GIVEN in Summary	B-RISKS DESCRIBE	D-RISKS DESCRIBE	A-RISKS DESCRIBE	HAZARD ID in ENV.	LIKLIHOOD REASONABLE	TIME FOR ACTIV.	LIFE CY	TIME FOR EFFECT	SENSITIVE SP/HAB/	UNCERTA INTIES	OVERALL RATING	? Agre with RATINGS
RF	AOO46	3C 3B 3D	L M L	3-no time	partly	? release	?level resease	? level/far	partly	yes	no	no	no	no	no	3.5	yes
RF	A0043	2C 2C 3D	M M L	4	no	?release	?	yes	no	yes	no	no	no	no	no	4	yes
RF	A0030	3B 3B 3D	M M L	2	no	ok	?minimal?	ok	no	partly	no	no	no	no	no	3	yes
RF	A0039	2A 3C	M L	1	no	ok	none given	no	yes	no	no	no	no	no	yes	2	no
RF	A0051	3C 3D	L L	4	no	ok-resleas?	?releases	ok	yes	yes	no	no	no	no	no	4.5	yes
RF	AOO35	2D NA 3D	L L	4	partly	?low risk?	???	no	no	partly	no	no	no	no	no	3	no (low
SRS	A0026	1B 1B 2C	H H M	1	no	no	no-unreason.	no	no	yes	no	no	no	no	no	2	no (low
SRS	A0044	1B 3C 3C	H L L	3	no	partly	partly	partly	no	no (low)	no	no	no	no	no	3	no (low
SRS	A0102	1B 1B 2D	H H L	1	mostly	no	no	partly	no	no	no	no	no	partly	no	2	no (low

Table 8, continued.

SRS	A0080	1B 1B 2D	H H L	3	partly	partly	partly	yes	partly	yes	no	no	no	partly	no	3	yes
SRS	A0132	1C 3B	M M	5	yes	partly	partly	why not?	partly	no(low)	no	no	no	no	no	4	no
SRS	A0193	1B 1C 3C	H M L	2	no	no	no	no	no	no	no	no	no	no	no	0	Can't tell
SRS	C0003	2A 3C	H L	1	no	yes	??	yes	partly	yes	no	no	no	no	no	3	yes
SRS	BOOO5	2C 3D 3D	M L L	1	no	no	no	no	no	ok	no	no	no	partly	no	2	can't tell
SRS	A0143	1C 3B	M M	5	yes	partly	partly	why not?	partly	partly	no	no	no	no	no	4	during low
SRS	A0049	1C 3C 3C	M L L	4	partly	partly	partly	partly	mostly	yes (?low)	no	no	no	partly	no	4	no (low
SRS	A0090	2A 2A 3C	H H L	3	partly	no	no	no	partly	no	no	no	no	no	no	2	little data
SRS	A0165	1C 1C 1C	M M M	3	no	partly	??	partly	partly	yes	no	no	no	no	no	3	initial low
HAN	N0187	2A	H	4	no	??	??	no	no	no	no	no	no	no	no	3	meed data
HAN	N0027	1A 3C 3C	H L L	4	no	partly	partly	partly	slightly	yes	partly	no	no	no	partly	4	yes
HAN	N0115	1D 1D 3D	M M L	5	yes	partly	??	partly	no	no	no	no	no	no	no	3	no (low

Table 8, continued.

HAN	N0169	1A 3B 3B	H M M	4.5	no	yes	yes	yes	no	yes	no	no	no	no	yes	4	yes
HAN	N0073	3C 3C 3D	L L L	4	partly	yes	yes	yes	partly	yes	no	no	no	partly	partly	5	yes
HAN	N0082	2A 2A 3D	H H L	4	mostly	yes	yes	yes	partly	yes	no	no	no	yes	no	5	yes
HAN	5C0007	1B 1D 3D	H M L	3.5	partly	mostly	mostly	mostly	mostly	low	no	no	no	partly	no	4	yes
HAN	N0056	1A	H	5	yes	yes	yes	yes	yes	yes	no	no	no	mostly	no	5	yes
HAN	5T0001	3A 3C 3D	M L L	5	mostly	slightly	no	no	slightly	yes	no	no	no	no	no	3.5	yes
HAN	N0186	3D 3D 3D	L L L	3	no	no	no	no	no	no	no	no	no	no	no	2	Can't tell
HAN	5B0024	2A 2A	H H	4	partly	partly	no	no	slightly	no	no	no	no	no	no	3	mostly
HAN	N0098	3B	M	4	mostly	partly	too low	partly	partly	no	no	no	no	slightly	no	3	none for da
OR	O0009	2B 3D 3D	M L L	2	no	slightly	slightly	slightly	no	unclear	no	no	no	no	no	2	Can't tell
OR	W0003	2B 3C 3C	M L L	3	no	partly	partly	partly	no	no	no	no	no	no	no	2	Cna't tell

Table 8, continued.

OR	4H0013	1B 2B 3C	H M L	2.5	no	yes	yes	tes	partly	nyes	no	no	partly	partly	no	4	yes
OR	4A0011	1A 2B 3C	H M L	4	yes	no	no	no	yes	no	no	no	no	no	no	2	Can't tell
OR	4G0006	2B 3D 3C	M L L	3	no	yes	yes	yes	partly	yes	no	no	no	implied	no	3.5	Need more data
OR	4G0017	2A 2C 3C	H M L	1	no	yes	yes	yes	partly	yes	no	no	no	implied	no	4.5	Need more
INEL	D0159	2D 2C 2C	L M M	2.5	no	partly	no	partly	yes	yes	no	no	no	slightly	no	4	yes
INE	C0034	1A 2A 2D	H H L	4	mostly	partly	partly	partly	slightly	yes	no	no	no	slightly	no	4	yes
INE	C0040	2A 3A 3D	H M L	4	no	partly	no	slightly	no	yes	no	no	no	slightly	no	3	yes
INE	D0137	3B 3D 3D	M L L	4	no	partly	no	no	slightly	low	no	no	no	no	no	2	Can't tell
INE	B0024	2B 3D 3D	M L L	3.4	partly	mostly	no	no	partly	yes	no	no	no	partly	no	3.5	yes
INE	A0006	2D 2D 3D	L L L	5	not nec.	yes	yes	yes	NA	yes	partly	na	no	no	partly	4	yes
ANLE	A0002	1A 3C 3D	H L L	3.5	no	partly	partly	partly	parly	yes	no	no	no	no	no	3.5	yes
BNL	Z0005	3A 3A 3D	M M L	5	mostly	partly	partly	partly	slightly	yes	no	no	no	no	no	3.5	yes
EML	A0001	3D 3C 3D	L L L	4.5	partly	no	no	no	no	yes	no	no	no	no	no	2	Can't tell

Table 8, continued.

KCP	A0022	2B 3D 3D	M L L	3.5	no	no	no	no	no	yes	no	no	no	no	no	1.5	Can't tell
LANL	E0045	3B 3B 3B	M M M	3.5	no	partly	mostly	mostly	partly	yes	no	no	no	partly	no	3.5	yes
LLNL	B0011	2C 2C 3C	M M L	3.5	no	yes	yes	yes	partly	yes	no	no	partly	slightly	no	4	yes
LLNL	A0012	1B 3C 3C	H L L	5	yes	partly	partly	partly	partly	yes	partly	no	no	slightly	no	4	yes
NTS	5DOO15	NA 3D 3D	L L	2.5	no	no	partly	partly	no	yes	no	no	no	yes	no	3.5	no (too low)
NTS	A0004	3D 2C 2C	L M M	4	no	no	no	no	no	Can't tell	no	no	no	no	no	2	??
SNL	P0032	3B 3D 3D	M L L	3	no	yes	yes	yes	partly	yes	no	no	no	yes	no	4	yes
SNL	A0013	2C 3C 3D	M L L	1.5	yes	slightly	no	slightly	yes	yes	no	no	no	no	no	2	Can't tell
NVO	5D0003	3B 3B 3B	M M M	5 **	yes	yes	mostly	mostly	partly	yes	no	no	no	yes	no	4.5	yes
FNAL	A0005	2A 3C 3C	H L L	5	yes	slightly	no	no	partly	yes	no	no	no	no	no	3	mostly
BNL	A0009	2B 3C 3C	M L L	4	no	yes	partly	partly	no	yes	no	no	no	partly	no	3.5	yes
GJPO	A0011	2C 2C NA	M M	3	no	partly	partly	partly	yes	mostly	no	no	no	no	no	3	mostly

Table 8, continued.

LANL	E0055	2C 2C 2C	M M M	4	yes	no	no	no	no	yes	no	no	no	no	no	2	yes
MOUND	T0006	1A 1A 1A	H H H	3.5	partly	partly	partly	partly	partly	yes	no	no	no	no	no	3	yes
PANTX	A0024	3B 3D 3D	M L L	3.5	no	slightly	slightly	slightly	mostly	yes	no	no	no	no	no	3	yes

2.5.2 Groundwater Remediation Activities

An evaluation of 65 RDSs from four sites indicates a similar lack of detail concerning environmental hazards and risks. No site consistently listed ecological receptors of concern, and less than half listed the hazards of concern. With respect to hazards, Hanford identified more than the others, and SRS identified fewer than the other sites. Similarly, Hanford did the best job of actually identifying the pathways of exposure and the species or habitats at risk.

An evaluation of their overall description under Environmental indicates that 50 % of INEL's were reasonable, 44 % of Hanford's were reasonable, 36 % of Oak Ridge's were reasonable, and only 23 % of Savannah River's were reasonable. In evaluating whether we agreed with the MEM Environmental rankings given on the RDSs, agreement was 23 % at Savannah River, 50 % at INEL, 63% at Oak Ridge, and 62% at Hanford. Given this degree of inadequacy and lack of information, it is impossible to evaluate the RDSs with respect to the Environmental category. There is both a lack of information, and a lack of agreement with the MEM, even if we used the available information.

Another way to examine for consistency among the four sites is to determine whether the four sites used similar rankings for their evaluations of similar activities/processes. To accomplish this type of review, the group chose to evaluate one category of remediation activities, groundwater. Groundwater activities were separated into three types of activities: monitoring, pump and treat (only) and remediation including some pump and treat activities. In general, the RDSs that related to monitoring of ground water were not ranked equivalently using MEM scores. INEL ranked theirs as Medium (N=l), Oak Ridge ranked theirs as Low (N=3) and High (N=2), and Hanford ranked theirs as Low (N=4) and Medium (N=2). There were none for Savannah River.

For Pump and Treat, Savannah River (N=1) and Hanford (N=5) ranked the environmental risks as High; while INEL ranked them as Low (N=l), Medium (N=1) and High (N=1). There were none from Oak Ridge. The RDSs for remediation, a broader category that included Pump and Treat, was ranked relatively the same at Savanna River (4 Highs, 2 Mediums) and Hanford (5 Highs); but Oak Ridge (3 Highs, 4 Mediums) and INEL (4 Lows, 1 Medium) ranked them lower. These differences were not solely due to differences in contaminants.

Table 9. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Ecological Health, follows.

Table 9. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Ecological Health

	OPS OFFICE	Facility	EM OFFICE	RDS Number	Y	P	N	Y	P	N	B	D	A	B	D	A	Activity Summary 1-5(best)	Is Hazard Given?	Before Risks Described	During Risks Described	After Risks Described	Haz Amt, Exposure Pathway	Likelihood Reasonable	P/T	Time for Activity	SP	HAB	Abiotic	Overall Evaluation	Agree with Rating	
1	AL	LANL	40	R96E0018			X			X	2A	3C	3C	H	L	L	4.5	P	Y	N	P	P	Y	.	N	Y	Y	Y	4.5	Y	
2	ID	INEL	30	R96C0142		X			X		3A	NA	NA	L	.	.	4	N	P	P	P	Y	Y	.	N	N	Y	Y	4	Y	
3	ID	INEL	30	R96C0164	X					X	NA	NA	NA	.	.	.	4	Y	.	.	.	.	Y	.	N	N	N	N	4	Y	
4	ID	INEL	40	R96C0032			X	X			1A	2A	3D	H	H	L	4.5	Y	P	N	N	P	Y	P	N	N	N	N	2	?	
5	ID	INEL	40	R96C0035	X					X	3D	3D	3D	L	L	L	4	M	P	P	N	N	?	P	N	N	N	N	2	N	
6	ID	INEL	40	R96C0036		x		x			3D	3D	3D	L	L	L	3	Y	P	N	N	P	N	P	N	P	Y	Y	3.5	?	
7	ID	INEL	40	R96C0040			X	X			2A	3A	3D	H	M	L	4	N	P	Y	P	Y	Y	P	N	N	P	P	3.5	Y	
8	ID	INEL	40	R96C0041			X	X			2A	3A	3D	H	M	L	4	P	P	P	P	N	?	P	N	N	N	P	3	Y	
9	ID	INEL	40	R96C0045		X		X			1B	3D	3D	H	L	L	3	N	N	N	N	SLIGHT	N	P	N	N	N	P	2	N	
10	ID	INEL	40	R96D0149		X		X			1D	3D	3D	M	L	L	3	N	N	N	N	N	?	P	N	N	N	N	2	?	
11	OR	K25	40	R94A0018			X			X	2A	3C	3C	H	L	L	2.5	N	N	N	N	P	Y	.	N	P	P	P	4	Y	M
12	OR	K25	40	R94A0022		X				X	2A	2A	3C	H	H	L	4.5	Y	P	P	N	N	Y	.	N	N	N	N	3.5	Y	M
13	OR	K25	40	R96W0004		X				X	2A	1A	3C	H	H	L	2	N	N	N	P	P	?	.	N	N	N	N	2	Y	M
14	OR	K25	40	R96W0005		X				X	2B	.	3C	M	.	L	2.5	N	Y	N	P	Y	P	.	Y	N	Y	Y	4	Y	M, T, W
15	OR	K25	40	R96W0006			X			X	2B	3D	3C	M	L	L	2.5	N	Y	P	Y	Y	Y	.	Y	N	Y	Y	4	Y	M, T, W
16	OR	OR	40	R96G0020	X					X	2A	3C	3D	H	L	L	1	N	.	.	.	.	N	.	N	N	N	N	1	N	M, A
17	OR	OR	40	R96G0021	X					X	2A	3C	3D	H	L	L	1	N	.	.	.	.	N	.	N	N	N	N	1	N	

Table 9, continued.

18	OR	ORNL	30	R96D0006	X					X	2B	3D	3D	M	L	L	3	N	N	P	N	N	?	T	N	N	N	N	2	Y
19	OR	ORNL	30	R96D0007		X				X	2B	3D	3D	M	L	L	3.5	N	N	N	N	N	?	T	N	N	N	N	2	?
20	OR	ORNL	40	R94A0011		?				X	1A	2B	3C	H	M	L	3	N	P	MOSTLY	Y	N	Y	.	N	P	P	N	4	Y
21	OR	ORNL	40	R94H0012			X			X	2A	2A	3D	H	H	L	5	Y	Y	Y	Y	Y	Y	.	N	Y	Y	Y	5	Y
22	OR	ORNL	40	R94H0016			X			X	2A	2A	3C	H	H	L	4	N	Y	Y	Y	Y	Y	.	N	Y	Y	Y	5	Y
23	OR	ORNL	40	R94H0019			X			X	1A	1A	3C	H	H	L	3.5	N	N	N	N	N	?	.	N	N	N	N	2	?
24	OR	ORNL	40	R94H0023		X				X	3C	3C	3D	L	L	L	4	P	P	Y	MOSTLY	Y	Y	.	N	N	N	N	3	Y
25	OR	ORNL	40	R95M0063		X				X	2A	2B	3C	H	M	L	4	N	MOSTLY	Y	Y	Y	Y	.	N	P	Y	Y	5	Y
26	OR	ORNL	40	R96Y0001		?				X	1A	2B	3C	H	M	L	4	Y	N	N	N	N	?	.	N	N	N	N	1	?
27	OR	ORNL	40	R96Y0010			X			X	3C	3C	3D	L	L	L	4	N	Y	Y	Y	Y	Y	.	N	N	N	N	4	Y
28	OR	ORNL	40	R96Y0011			X			X	2A	2B	3C	H	M	L	3	Y	N	N	N	N	Y	.	N	N	N	N	2.5	Y
29	OR	Y12	30	R96B0003			X			X	2A	.	3C	H	.	L	4	N	P	P	P	P	Y	T	N	N	N	N	3.5	Y
30	OR	Y12	30	R96B0004		X				X	2A	.	3C	H	.	L	1	N	N	N	N	N	?	T	N	N	N	N	2	?
31	OR	Y12	30	R96B0009			X			X	2B	3D	3D	M	L	L	4	N	N	N	N	N	?	T	N	N	N	N	2	?
32	OR	Y12	30	R96B0010		X				X	2B	3D	3D	M	L	L	4	N	P	N	N	N	?	T	N	N	N	N	2	N?
33	RL	HANFS	30	R96N0108			X			X	2D	2D	3D	L	L	L	5	Y	N	N	N	N	?	P	N	N	N	N	2	?
34	RL	HANFS	30	R96N0120		X				X	1C	3C	3C	M	L	L	4	N	N	N	P	SLIGHTLY	?	T	N	N	N	N	3	N
35	RL	HANFS	30	R96N0174			X			X	3D	.	.	L	.	.	5	Y	P	N	N	SLIGHTLY	?	P/T	N	N	N	N	2	?
36	RL	HANFS	30	R96N0232		X				X	1C	1C	1C	M	M	M	3	N	N	N	N	N	?	.	N	N	N	N	1	?
37	RL	HANFS	40	R96N0071			X	X			3C	3C	3D	L	L	L	4	N	P	N	N	P	N	.	N	P	N	N	3.5	N
38	RL	HANFS	40	R96N0072		X				X	2A	2A	3D	H	H	L	5	Y	Y	Y	Y	Y	Y	.	N	Y	Y	Y	5	Y

Table 9, continued.

39	RL	HANFS	40	R96N0073			X	X			3C	3C	3D	L	L	L	4.5	N	P	P	N	P	N	.	N	P	P	P	3.5	Y
40	RL	HANFS	40	R96N0074			X			X	2A	2A	3D	H	H	L	5	Y	Y	Y	M	Y	Y	.	N	Y	Y	Y	5	Y
41	RL	HANFS	40	R96N0075			X			X	2A	2A	3D	H	H	L	4	M	P	P	P	P	Y	.	N	P	P	P	4	Y
42	RL	HANFS	40	R96N0086		X				X	2C	2A	3D	M	H	L	H	Y	S	N	N	N	Y		N	N	N	P	3	?
43	RL	HANFS	40	R96N0087			X			X	2A	2A	1D	H	H	M	3.5	Y	Y	Y	Y	Y	Y		N	Y	Y	Y	5	Y
44	RL	HANFS	40	R96N0088		X				X	2A	2A	3D	H	H	L	4.5	M	Y	Y	Y	Y	Y		N	Y	Y	Y	5	Y
45	RL	HANFS	40	R96N0090							1A	1A	1D	H	H	M	4	N	P	P	P	P	Y		N	Y	N	P	5	Y
46	RL	HANFS	40	R96N0137		X				X	2C	2A	3D	M	H	L	5	N	P	P	N	N	Y		N	N	N	P	3.8	Y
47	RL	HANFS	40	R96N0251	X			X			1C	1C	1C	M	M	M	4.5	N	P	P	P	P	N		N	N	N	P	4	N
48	RL	HANFS	40	R96N0252		X		X			1C	3C	3D	M	L	L	4	N	P	N	N	P	Y		N	N	N	N	2.5	Y
49	SR	SR	40	R96A0018			X			X	1A	1A	2D	H	H	L	4	Y	N	P	N	P	Y	F	N	N	N	P	3.5	N
50	SR	SR	40	R96A0064		X				X	1B	1B	1D	H	H	M	5	Y	P	N	N	N	Y	F	N	N	N	Y	3.8	Y
51	SR	SR	40	R96A0065			X			X	1A	1A	1C	H	H	M	5	Y	P	N	N	P	Y	P	N	P	P	P	4.5	Y
52	SR	SR	40	R96A0066							1A	1A	1A	H	H	H	4.5	Y	Y	Y	Y	Y	Y	P	N	N	Y	Y	4.8	N
53	SR	SR	40	R96A0067							1A	1A	1D	H	H	L	5	Y	P	N	N	P	N	F	N	N	N	Y	3	N
54	SR	SR	40	R96A0074			X			X	1A	1A	2C	H	H	M	4.5	Y	P	P	P	N	Y	P	N	N	N	N	3.8	?
55	SR	SR	40	R96A0075							1A	1A	2D	H	H	L	5	Y	P	P	N	N	N	F	N	N	N	P	4	N
56	SR	SR	40	R96A0076		X				X	1A	1A	1D	H	H	M	3.5	P	P	P	N	N	?	F	N	N	N	N	3	?
57	SR	SR	40	R96A0078							1B	1D	1D	H	M	M	2.5	P	P	N	N	N	N	P	N	N	N	P	3.5	N
58	SR	SR	40	R96A0080		X				X	1B	1B	2D	H	H	L	3	P	P	P	Y	P	Y	P	N	P	N	N	3	Y
59	SR	SR	40	R96A0098							1B	1B	2D	H	H	L	3.5	P	P	N	N	N	N	F	N	N	N	Y	3	?
60	SR	SR	40	R96A0100		?	X			X	2B	2B	2D	M	M	L	5	Y	P	N	N	N	N	F	N	N	N	P	3.5	?

Table 9, continued.

61	SR	SR	40	R96A0101							2B	2B	2D	M	M	L	4.5	Y	Y	P	N	N	P	F	N	N	N	Y	4	Y
62	SR	SR	40	R96A0102			X			X	1B	1B	2D	H	H	L	3.8	Y	P	N	N	N	N	P	N	N	N	P	3.5	?
63	SR	SR	40	R96A0103							1B	1B	2B	H	H	M	4.5	Y	P	P	P	N	N	F	N	N	N	P	3.8	N
64	SR	SR	40	R96A0104			X			X	1B	1B	2D	H	H	L	4	Y	P	N	N	N	N	F	N	N	N	P	3	?
65	SR	SR	40	R96A0106							2B	2B	1D	M	M	M	3.5	Y	S	N	N	N	N	F	N	N	N	N	3	N

2.5.3 Recommendations

1. **There is a need to develop more meaningful measure whereby RDSs can characterize environmental impacts at DOE sites. This may necessitate a series of iterative improvements commencing with revisions for the next year. This could be accomplished by a series of technical workshops to obtain scientific data, professional judgments, and stakeholder views.**

2. **These two different sets of evaluations of the RDS across four sites for consistency indicates that there is little consistency, either in the information provided or in their evaluations of the environmental risks. The overall lack of information about the hazards, pathways and receptors, and the lack of consistency across sites in their MEM rankings, clearly called for in guidance, discounts the utility of an environmental impact as a matrix element in the Internal Review of Budget process This is disturbing given the importance of environmental protection to the risk process at the DOE sites.**

2.6 Social/Cultural/Economic Impacts

2.6.1 Stratified Random Sample

Sixty (60) RDSs were evaluated with particular focus on Social/Cultural/Economic (SCE) Risk Impact Rating. Reviewers were asked to address the following questions:

- Are the overall "before" scenarios comparable across sites for comparable activities?
- Are the impact categories of similar activities rated the same at the different sites?
- Are the "likelihood " designations being interpreted and used consistently across sites?
- Were each of the three topics addressed separately?
- Are the issues addressed in a consistent manner across sites?
- Does the RDS give enough information to understand how the impacts were chosen?
- Did impacts appear to be specific for this activity or generic for the site?
- Did these assignments appear to be reasonable and credible given the information listed in the RDSs?

The evaluation of ratings on SCE risk impact was greatly hampered by lack of sufficient information provided by the RDS summary or scenario fields. Furthermore, in about 50% RDSs (29 out of 60) no or incomplete ratings of the SCE matrix element were given. For those in which entries were made there is not enough information given in the narrative in most RDSs to enable an unfamiliar reader or DOE manager to evaluate the true extent of SCE impact. Nevertheless, the inclusion of SCE impact in the MEM matrix, if sufficiently detailed, would provide extremely valuable information on public support or nonsupport of the activity.

In general, there is inconsistency in scope of activities included in a single RDS. Some RDSs describe a myriad of activities while others describe a single activity. Out of 60 RDSs reviewed 48 did not separate or distinctly discuss any of the three topics individually, i.e., social, cultural, economic. Five RDSs were marked as zeros because the impact area was left blank. The remaining seven RDSs mentioned at least one

of the topic areas by name. Thus, it was difficult to compare ratings because it was not clear whether the ratings represented the most serious impact. For twenty RDSs there was not enough information given to understand how the impacts were chosen, for twenty four RDSs there was sufficient information and for 6, no impact information was given (i.e., impact area was left blank). For ten RDSs some type of other remark was made by the reviewers. For example, discussion is not clear enough to make a decision, discussion didn't make sense, or not thought through very well.

Although there was an attempt to describe impacts specific for the activity in the RDS, in many cases, the text supporting a rating was repeated verbatim for "Before," "During," and "After" activities, and was repeated in other RDSs describing a different activity.

Extremely few (2 out of 60 RDSs) specifically mentioned economic impact. This is not a recommendation to remove economic factors from the matrix. To the contrary, evaluations of economic impact, if present, should be included and encouraged.

In addressing this Impact area, most sites did it in a collective manner and generally quoted text directly from the guidance. In that, if the activity didn't proceed, the public, or special interest group would demonstrate some level of dissatisfaction. Thus, although there were inadequacies for this section, there did appear to be consistency across sites.

In response to the question of reasonable and credible impact value assignments, the reviewers identified the following:

- 17 were found to be reasonable and credible
- 21 were found not to be reasonable and credible
- 5 left the impact area blank
- 6 left the narrative blank
- 17 solicited other remarks. For example: Discussion of Impact minimal, not very well thought out, assigned score not credible etc.

2.6.2 Groundwater Remediation Activities

Sixty-five (65) RDSs associated with groundwater (GW) activities were evaluated from the following sites: Hanford (16), INEL (9), Oak Ridge (22), and Savannah River Site (17). In the social/cultural/economic (SCE) category, matrix ratings (field 15) in 10 RDSs were left partially or completely blank. There are even more blank entries in the narrative (field 28) with 18 RDSs showing no entries. In many instances the ratings did not agree with the narrative. For example, a High impact rating was described in the narrative as "minimal socioeconomic impact." One RDS has a rating of "Low" on an activity described as characterization, packaging and shipment of chemical/radiological waste, an activity that would generate some degree of public concern. One may conclude from this that this category may be less clearly defined compared to the other categories.

2.6.2.A Findings for Groundwater

In general, evaluation of the ratings on Social Cultural and Economic impact was hampered by insufficient or lack of any information provided in the RDS summary or scenario fields (fields 14 and 21). In certain

instances, it was difficult to determine precisely what activity was evaluated by the RDS. Moreover, there is inconsistency even within individual sites on the definition of scenario.

Generally, SCE risk ratings were given a value of High with 51 out of 59 RDSs showing an entry in the "Before" category, and in the case of SRS, all GW-related activities were rated High for SCE impacts:

INEL	7 out of 8 are High
Oak Ridge	16 out of 20 are High
Hanford	11 out of 16 are High
Savannah River	17 out of 17 are High

2.6.2.B Findings for RDSs Associated with Pump and Treat-Activities

Nine RDSs directly relating to pump and treat activities were evaluated. All but one (from OR) consistently rated the SCE impact as "High" (with a matrix value of "1A"). Those RDSs with High SCE impacts included a variety of activities ranging from pump/treat/reinjection, to thermal oxidation, to preparation of pump and treat Remedial Investigation/Feasibility Study reports. Furthermore, the ratings did not discriminate the type of contaminant being treated -- with contaminants varying from $CC1_4$ waste to mixed chemical/radiological waste having the same rating. The justification for the High ratings included the impact on salmon and freshwater fish from the Columbia River, "loss of public credibility" and "inability to use contaminated area."

2.6.2.C Findings for RDSs Associated with Monitoring Activities

Activities on monitoring associated with GW contamination/remediation were generally rated as High impact on SCE risk. Of the 34 RDSs covering this activity, 3 were not included in the evaluation because of lack of information in the summary or because it related to a management activity (information gathering). Monitoring activities related to GW again generally rated High (26 out of 31). This is similar to the level of SCE impacts identified by GW pump and treat associated activities. Five of 6 ratings on the Hanford RDSs were Medium, showing a significant deviation of the Hanford RDSs from the general trend for the same type of activities, and an *under*-estimation of impacts of these activities compared to the other sites evaluated. The narrative describing the justification for the ratings in the SCE category ranged from "potential for contaminating Richland drinking water" (rated Medium!) to "loss of credibility," etc.

Narratives on 5 of the RDSs where the SCE impact was rated High did not contain any entry. Furthermore, several "High" ratings were described as "minimal socioeconomic impact" or "no SCE impact anticipated because area is unlikely to be returned to public for residential or agricultural use."

Based on the observations above, about 10% of the RDSs were reasonable. They tend to both overestimate and underestimate of the SCE impacts were evident, depending on the site. Site specific differences in these over and under-estimations are detailed in preceding sections.

Table 10. Cross-Site Consistency Evaluation of Groundwater Remediation Activities -- Social/Cultural/Economic

Table 10. Cross-Site Consistency Evaluation of Groundwater Remediation Activities --Social/Cultural/Economic

	OPS OFFICE	Facility	EM OFFICE	RDS Number	Y	P	N	Y	P	N	B	D	A	B	D	A	Activity Summary 1-5(best)	Is Hazard Given?	Before Impact Described	During Impact Described	After Impact Described	Benefits Identified	Likelihood Reasonable	P/T	Basis/ Documen t- ation	Overall Evaluation	Agree with Ratings
1	AL	LANL	40	R96E0018																							
2	ID	INEL	30	R96C0142		X			X		2D	2D	NA	L	L	.	2					N	??			1	Y
3	ID	INEL	30	R96C0164	X					X	NA	NA	NA	.	.	.	1		NA							0	N
4	ID	INEL	40	R96C0032			X	X			1A	NA	NA	H	.	.	3	Y	Y	Y	Y	Y	Y	P	P/T	4	Y
5	ID	INEL	40	R96C0035	X					X	2A	NA	NA	H	.	.	3	Y	Y	Y	Y	Y	N	P		1	N
6	ID	INEL	40	R96C0036		x		x			2A	NA	NA	H	.	.	2	Y	Y	Y	Y	Y		P		1	N
7	ID	INEL	40	R96C0040			X	X			1A	NA	NA	H	.	.	3	N	Y	Y	Y				M	1	N
8	ID	INEL	40	R96C0041			X	X			1A	NA	NA	H	.	.	4	Y	Y	Y	Y				P/T	1	N
9	ID	INEL	40	R96C0045		X		X			1A	NA	NA	H	.	.	4	Y	Y	Y	Y				P/T	1	N
10	ID	INEL	40	R96D0149		X		X			2A	3D	2D	H	.	.	4	Y	Y	Y	Y				P/T	1	N
11	OR	K25	40	R94A0018			X			X	2C	2C	2D	M	M	L	1	N							M	0	Y
12	OR	K25	40	R94A0022		X				X	2D	2D	2D	L	L	L	2	N							M	0	Y
13	OR	K25	40	R96W0004		X				X	1A	2D	2D	H	L	L	1	N							M	0	N
14	OR	K25	40	R96W0005		X				X	2A	.	2D	H	.	L	1									0	N
15	OR	K25	40	R96W0006			X			X	2D	2D	2D	L	L	L	2	N								0	Y
16	OR	OR	40	R96G0020	X					X	2A	2C	2D	H	M	L	1	N								0	N
17	OR	OR	40	R96G0021	X					X	2A	2C	2D	H	M	L	1	N								0	N
18	OR	ORNL	30	R96D0006	X					X	1A	2B	2D	H	M	L	3	N	Y	Y	Y		Y	T	Y	3	N

Table 10, continued.

19	OR	ORNL	30	R96D0007		X				X	1A	2B	2D	H	M	L	3	N	Y	Y	Y		Y	T	Y	3	N
20	OR	ORNL	40	R94A0011		?				X	2A	2C	2D	H	M	L	2	Y								0	N
21	OR	ORNL	40	R94H0012			X			X	2B	2B	2D	M	M	L	3	Y							P/T	0	Y
22	OR	ORNL	40	R94H0016			X			X	2A	2C	2D	H	M	L	1	N							M	0	N
23	OR	ORNL	40	R94H0019			X			X	2A	2D	2D	H	L	L	1	N							M	0	N
24	OR	ORNL	40	R94H0023		X				X	2C	2C	2D	M	M	L	2								M	0	N
25	OR	ORNL	40	R95M0063		X				X	2A	2A	2D	H	H	L	3								M	0	N
26	OR	ORNL	40	R96Y0001		?				X	2A	2C	2D	H	M	L										0	
27	OR	ORNL	40	R96Y0010			X			X	2C	2C	2D	M	M	L	2	Y							M	0	Y
28	OR	ORNL	40	R96Y0011			X			X	2A	2A	2D	H	H	L	1	N							M	0	N
29	OR	Y12	30	R96B0003			X			X	1A	1D	1D	H	M	M	3	N					Y	T		2	N
30	OR	Y12	30	R96B0004		X				X	1A	1D	1D	H	M	M	1	N					N	T		2	N
31	OR	Y12	30	R96B0009			X			X	1A	2B	2D	H	M	L	2	N						T		2	N
32	OR	Y12	30	R96B0010		X				X	1A	2B	2D	H	M	L	3	N						T		2	N
33	RL	HANFS	30	R96N0108			X			X	2C	2C	2C	M	M	M	4								M	3	Y
34	RL	HANFS	30	R96N0120		X				X	2C	2D	2D	M	L	L								T	M		Y
35	RL	HANFS	30	R96N0174			X			X	2A	.	.	H	.	.	4									3	Y
36	RL	HANFS	30	R96N0232		X				X	1C	2C	2D	M	M	L									M	0	
37	RL	HANFS	40	R96N0071			X	X			1A	1A	2C	H	H	M									M	2	N
38	RL	HANFS	40	R96N0072		X				X	1A	1A	2C	H	H	M										3	N
39	RL	HANFS	40	R96N0073			X	X			1A	1A	2C	H	H	M									M	2	N
40	RL	HANFS	40	R96N0074			X			X	1A	1A	2C	H	H	M	4								P/T	3	Y

Table 10, continued.

41	RL	HANFS	40	R96N0075			X			X	1A	1A	2C	H	H	M									P/T	3	N
42	RL	HANFS	40	R96N0086		X				X	1A	1A	2C	H	H	M									P/T		
43	RL	HANFS	40	R96N0087			X			X	1A	1A	2C	H	H	M										2	N
44	RL	HANFS	40	R96N0088		X				X	1A	1A	2C	H	H	M										2	N
45	RL	HANFS	40	R96N0090							1A	1A	.	H	H	.										1	N
46	RL	HANFS	40	R96N0137		X				X	1A	1A	2C	H	H	M									P/T	3	N
47	RL	HANFS	40	R96N0251	X			X			1C	2C	2D	M	M	L									M	3	Y
48	RL	HANFS	40	R96N0252		X		X			2C	2D	2D	M	L	L										0	N
49	SR	SR	40	R96A0018			X			X	1A	1A	2C	H	H	M								P	P/T	2	N
50	SR	SR	40	R96A0064		X				X	2A	2A	2D	H	H	L								F	P/T	1	N
51	SR	SR	40	R96A0065			X			X	1A	1A	1D	H	H	M								P	P/T	1	N
52	SR	SR	40	R96A0066							1A	1A	2C	H	H	M								P		3	N
53	SR	SR	40	R96A0067							2A	2A	2D	H	H	L								P		3	N
54	SR	SR	40	R96A0074			X			X	2A	2A	2D	H	H	L								P		2	N
55	SR	SR	40	R96A0075							2A	2A	2D	H	H	L								F		2	N
56	SR	SR	40	R96A0076		X				X	2A	2A	2D	H	H	L								F		2	N
57	SR	SR	40	R96A0078							1A	1A	2C	H	H	M								F		2	N
58	SR	SR	40	R96A0080		X				X	2A	2A	2C	H	H	M								F		2	N
59	SR	SR	40	R96A0098							2A	2A	2D	H	H	L								F		2	N
60	SR	SR	40	R96E0006		?	X			X	2A	2A	2C	H	H	M								F		1	N
61	SR	SR	40	R96E0007							2A	2A	2D	H	H	L								F		2	N
62	SR	SR	40	R96E0017			X			X	2A	2A	2D	H	H	L								P		1	N

Table 10, continued.

63	SR	SR	40	R96E0009						2A	2A	2D	H	H	L								F		3	N
64	SR	SR	40	R96E0021			X			X	2A	2A	2D	H	H	L								P		2	N
65	SR	SR	40	R96A0032							2A	2A	2C	H	H	M								F		2	N

2.6.3 Recommendations

1. **The social and cultural segments of this element need to be revised to place emphasis on understanding the nature of public concern, threatened cultural values, etc. Current guidance places emphasis on the degree of public outcry. The Panel found this emphasis neither informative or helpful. The degree of public concern as documented in public meeting-minutes, letters, position papers and independent studies may be a more useful tool for gauging severity of impact rather than attempting to predict "organized public outcry."**

2. **Information on concerns expressed by Site Specific Advisory Boards and stakeholders should be included in the support narrative. The fact that an on-going or planned activity that has been discussed at public meetings should be mentioned.**

3. **Since most RDS activities are compliant-related, mission-related or high-profile, mention should be made of whether the public (stakeholder) supports, does not support or is indifferent to the activity. Any pending lawsuits related to the activity should be described.**

4. **Differences of opinion between stakeholders groups should be noted. The Panel noted that Records of Decision often contain such information.**

5. **This matrix element basically ignored the economic segment of this topic. Only two RDSs mentioned the fact the proposed activity could affect economic aspects. Since this is an important category in its own right its should be considered as a stand alone category in future revisions. Further, a good deal of thought needs to be accorded to guidance so that more robust information is collected.**

2.7 Unit of Analysis

Thirty Risk Data Sheets from the stratified random sample were specifically evaluated to determine if an appropriate unit of analysis was chosen for the RDSs. In addition all reviewers were asked to review their data sheets with an eye to appropriate unit of analysis.

Questions asked specifically regarding unit of analysis:

- Are similar program activities being grouped together and evaluated by a single RDS in a similar manner across sites?
- Are activities involved with institutional controls (minimum-safe RDSs) evaluated consistently across sites?
- Are activities of comparable risk being grouped together and evaluated by a single RDS? Does the activity take "credit" for an appropriate amount of impact? i.e., does an impact only evaluate changes associated with doing or not doing that activity or is there an assignment of all potential risks associated with that entire restoration activity over many years of activity?

By chance this sample appeared to have a large number of RDSs that dealt with management, seismic monitoring and fire protection type activities. A list of the RDSs reviewed specifically for unit of analysis is given in Appendix A2. Of the 30 RDSs reviewed specifically for this task, only 4 appeared to either give insufficient details to evaluate the activities for similar or dissimilar inherent risks. To address the questions about appropriate unit of analysis similar program activities were evaluated. Of the 30 RDSs selected from the stratified random sample that were reviewed for this activity, there did not appear to be significant difference in how unit of analysis was handled.

RDSs that included activities that were critical to maintaining minimum safety (min-safe) conditions at the site were specifically evaluated for their handling of MEM impacts. No apparent problems with unit of analysis was noted in this sub category.

A quick look at the range of unit of analysis across the complex can be seen by looking at the wide range of total annual costs estimated for each Risk Data Sheet -- the annual costs range from modest sums to tens of millions of dollars (see Table C5, in Appendix C). This intuitively suggests that the concept of unit of analysis needs thoughtful and scholarly consideration for the next iteration of the Management Evaluation Process.

Although not a specific item in the "report card" analysis, the Panel is aware that unit of analysis was an implicit criterion for assessing adequacy of RDS fields 14 & 21. Deficiencies associated with this topic was one basis for an inadequacy finding; some reviewers made notations of this sort in the appropriate comments section of the report card.

2.7.1 Recommendation

The unit of analysis concept needs further thoughtful and scholarly consideration to improve the Management Evaluation Process for both in next year's iteration and by the Comprehensive Peer Review Committee.

2.8 Land Use

Thirty RDSs were also reviewed from the stratified random sample specifically to examine how Land Use was discussed in the development of the RDSs. Reviewers were asked to address the following questions:

- Are the assumptions regarding future use clearly and consistently stated and are the assumptions reasonable?
- Where is this issue addressed by each site?
- Are land use assumptions used in a consistent manner to influence the discussion/ evaluation of risk and other impacts?

In the 30 RDSs specifically assigned, so little discussion of land use was found, that the review was broadened to include and additional 60 RDSs (originally assigned to the Social, Cultural and Economic Impact group). Eighty of the ninety RDSs reviewed were totally silent on land use. In fact, the two words land and use, mentioned together only occurred in one RDS. Ten RDSs mentioned that the activity being described was related to some action to do with land, such as to return it to a previous owner, or intended to

remediate, or dispose of resident waste containers so a future action could take place, but there was no observed discussion of Assumptions in any of the reviewed RDSs.

Occasionally indirect consideration of land use options was evident from the scenarios evaluated in public health and safety, site personnel or environmental impact categories. For example, on public health risk scenario described in multiple RDSs was the use of potentially contaminated water in a residential land use scenario. Although such a residential scenario was described, no statements regarding specific site-wide land use assumptions were made.

2.8.1 Conclusion:

This set of 300 RDS sampled by the Panel was either biased in excluding all RDSs where Land Use discussions were well developed or the Land Use issue was not considered important and/or influencing enough to be seriously discussed. The Standard Assumptions in the guidance may also have been interpreted to assume the "status quo."

2.9 Management Activities

As another check on Cross-site Consistency the RDSs titled Program Direction or Management was examined. A subset of the 1408 submitted data sheets was identified by completing a key-word search on "Program Direction" and "Management" Nearly 100 RDSs sorted into this category. From these 100 the major RDSs that funded management at each Operations Office were examined. In this examination Public Safety, Site Worker, Environment and Social, Cultural, Economic Impact were reviewed. A list of these Risk Data Sheets can be found in Appendix A2.

2.9.1 Observations

It was observed that five Operations Offices scored Public Safety, Site Worker, Environment and Social, Cultural, Economic Impact areas for Program Management, and five did not score these impact areas. These management RDSs usually scored High for mission impact and compliance.

2.9.2 Recommendations

As these RDSs deal with core support, which arguably can impact in some way on every activity, it is difficult to be specific on how risk impact areas can be assigned. Because of the inability of make clear assessments concerning how to apply a level of risk, it would probably be better to instruct the Operation Offices to leave the impact areas mentioned above, blank or mark N/A, while properly assessing the Management area of Mission Impact, Mortgage Reduction and Compliance.

Guidance is clearly needed to clear up the confusion made evident through this analysis. If the confusion remains in the next iteration of the Management Evaluation process, the effort of scoring an RDS in these Impact areas for General Program Management and Direction, will have little value.

3. Independent Verification of RDS Information

3.1 Overview

The principal objective of the Independent Verification was to review the technical documents supporting the RDSs and determine if the RDSs accurately characterized the risk as stated in the support documents. This section of the report begins with information pertaining to the mechanics of the evaluation process itself, i.e., delineation of tasks and how the review was conducted. Following is a statement summarizing the reviewers general observations. Subsequent sections discuss each of the selected areas evaluated and specific observations/recommendations for each of the respective areas of focus.

The Panel analyzed RDSs from selected sites across the DOE complex by reviewing documents referenced in the RDSs or by studying additional documents available to the reviewers. Knowledge that individual reviewers had of each of the four selected sites also factored into the analysis. A main objective was to ascertain whether the RDSs accurately reflected the conclusions of supporting documents and whether the supporting documents themselves were credible.

Three areas of study were selected to undergo the Independent Verification -- they were plumes, landfills and tanks. These areas also represent three of the five DOE Focus Groups that are present at many of the DOE sites. Four specific sites were chosen and the RDSs noted in Table 11, below, were selected for review.

Table 11.

Selected Areas of Focus	Sites	Risk Data Sheets (RDSs)
Plumes	Hanford; INEL	HANFS -- R96N0075; R96N0088 INEL -- R96C0032; R96C0041
Landfills	INEL (Pit 9); Oak Ridge (SWSA 6)	INEL -- R96C00045; R96D0149 ORNL -- R94H0023; R96Y0010
Tanks	Hanford; SRS	HANFS -- R95W0004; R96N0124 SRS -- R96A0008; R96A0009; R96A0024

Several questions focused the reviewers on the topics of key interest:

- Is there documentation or is rationale provided for the risk characterized in the RDS?
- How good is the documentation? Does the methodology incorporate acceptable scientific standards and practices?
- Does the analysis support the risk ranking (MEM score)?
- How conservative are the assumptions? Is the evaluation scenario reasonable, and is it evaluated consistently when developing the MEM risk rankings?

Key persons, or points of contact (POC) were identified at each of the sites before the evaluation process began. These individuals were asked to assemble the requested documents before the Panel convened and have them sent to the meeting location.

For each topic at each of the sites there was a primary and secondary reviewer. The reviewers worked in pairs; for example, the primary reviewer of landfills at INEL (Pit 9) served as the secondary reviewer of landfills (SWSA 6) at Oak Ridge, and vice versa. RDSs were selected by various methods and for different reasons. In some cases RDSs were selected after conducting a search of the RDS database; e.g., a search was conducted for landfills at INEL - six RDSs were

found, and two of them pertained to Pit 9, probably the most widely recognized landfill site at INEL. Therefore, those were the two RDSs evaluated for "landfills" at INEL. In another case, the RDSs selected for review at Hanford and INEL pertaining to plumes were chosen because there were comparable in that both were representative of vadose zone plume activity and ground water plume activity.

3.2 Summary

The consensus of the panel members was that the Independent Verification was a worthwhile exercise, however the review was impeded somewhat due to the difficulties in acquiring various relevant reports and other supporting documentation within the period of time allotted for this task. In most cases this was a problem due to the failure of the RDSs to cite relevant references. Although the panel members eventually were able to find many of the documents and found that they generally supported the risks as they were characterized in the RDS, they all agreed that had these references been included in the RDSs, the RDSs would have been more complete and credible tools to evaluate.

Initially, the reviewers had hoped to track four contaminants of concern, i.e., tritium, strontium-90, carbon tetrachloride and TCE, across the sites. However, it turned out that most of the cases where these contaminants were the toxicants of concern, they were not even listed in the RDS. Therefore, it was difficult for the reviewers at the outset of the evaluation process to select the relevant RDSs due to lack of information. What the panel members found when they started reviewing the supporting documents, however, was a plethora of information pertaining to the toxicants present at the sites, along with detailed analyses and modeling studies. This is information that should have been included in the RDS.

Overall, many of the general observations and recommendations concerning the RDS review process resulting from the Independent Verification exercise mirrored those of the cross-site consistency team's assessment.

3.3 General Observations/Recommendations from The Independent Verification of RDS Information.

1. Risk rankings for many activities were based on the merits of the overall program of which the specific activity is only one part. The same scenarios and risk rankings were then cloned across many RDSs. This creates redundant documentation and presents an apparent all-or-nothing choice for the potential funding decision maker with no way to assess the importance of the related activities to the achievement of the top level program. Perhaps this situation could be improved with a two-tiered ranking system. At the first level the risks of the overall program would be examined in detail across all impact categories and referenced in "daughter" RDSs. Then, the individual activities would be evaluated in relationship to the importance of that activity to the overall program using only the impact categories relevant to that activity. This would eliminate the need to evaluate, for example, public health risk for a management task.

2 To improve the fidelity and consistency of the risk rankings, at least with regard to the public health and worker health impact categories, the management evaluation matrix (MEM) should be expanded to include five bins generally described as follows:

   I. Potential loss of life. (AEDE[10] 100 rem, EPRG[11]> level 3)

[10] Annual Effective Dose Equivalent (AEDE) - The summation of the products of dose equivalents received by specific tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be summed to estimate the health-effects risk of an exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The annual effective dose equivalent is the EDE received in a year. The AEDE is expressed in units of rem (or sievert).

II. Serious injury or increased chance of latent cancer or other long-term health effect. (AEDE=25 to 100 rem, EPRG> level 2 but < level 3)
III. Exposure above regulatory limits but not sufficient to cause significant health effects. (AEDE=0.1 rem {public} or 5 rem {workers} to 25 rem, EPRG< level 2)
IV. Exposure within regulatory limits. (AEDE<0.1 rem {public} or 5 rem {workers}, EPRG< level 1)
V. No or negligible impacts; or, equal to or not distinguishable from background.

In addition, a more sophisticated approach could be used that would also include ranking of the extent of the impact and the confidence level in the occurrence of the impact.

3. It appears that worker risks are being defined primarily as risks from accidents. Cumulative occupational exposures across the total work force, even with no individual doses above regulatory limits, may be significant and should be considered.

4. Ground water and vadose zone risk appear to be somewhat difficult to rank within the current risk ranking ability of the management evaluation matrix. Specifically, the immediate health and ecological risks are often low or nonexistent and long term risks are difficult or impossible to estimate. Thus, they do not generally seem to justify the cleanup or to capture the basic reason for doing such cleanups. The most significant risk seems to be "degradation of a natural resource," which may be wanted in the future. There is also often a risk associated with not performing remedial action early. That is, the resource may be much more difficult and expensive to remediate at a later time. There is a need to consider how best to treat the risks related to contaminated ground water and the vadose zone and the need for remediation and to provide guidance on this to the field offices.

5. A "team" process for preparing RDSs is recommended. For example, although there have been many risk analyses completed for the Hanford site, the RDSs do not reflect much or any input from staff who have expertise in specific areas. This situation may have developed due to time constraints, etc., however, we strongly recommend the concept of a team approach for preparation of the RDSs so that the RDSs may better reflect the kinds of risk analyses that have been completed for a site.

6. The RDS form should explicitly include a question regarding the current status of the site or activity with respect to Records of Decision (RODs). These are important documents and this kind of information needs to be provided to decision makers.

---

[11] Emergency Response Planning Guideline (ERPG)-1. The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild, transient adverse health effects or perceiving a clearly defined objectionable odor;

ERPG-2. The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action;

ERPG-3. The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

7. Cite references and list agents of concern in the summary description (field 14); and, clearly state references, agents, exposures, and estimates of the number of persons exposed, in the narratives (fields 21 - 24).

8. Additional guidance is necessary for those situations where the regulations of two agencies which have jurisdiction differ widely. For example, in one RDS the occupational worker receives 2 rem over 30 years or 70 millirems per year which would not cause concern within DOE, and might even qualify for non-badging status, yet would lead to a lifetime risk of 1E-3 which is higher than EPA's allowable risk band of 1E-4 to 1E-6.

3.4 Specific Observations and Recommendations

See Section 3.5 for detailed analysis

3.4.1 Hanford Plumes

1. In general, the summary descriptions of the two Hanford RDSs are readable and reasonably describe the project activities.

2. The RDS management evaluation matrix (MEM -- field 15), however, has High, Medium and Low rankings based on acknowledged subjective, qualitative risk information, using the terms "technical judgment, "professional judgment," "engineering judgment," "negligible impact," and, "minor impact." The High, Medium, and Low rankings in the two RDSs are reasonable but arbitrary due to the inherent flexibility of the MEM Impact Category choices.

3. There are no references to specific risk studies in the RDSs, however there are general references to the Tri-Party Agreement (TPA), Remedial Actions (RAs), and Records of Decision (RODs). The RAs and RODs are not specified.

4. Although not specifically stated, the activities noted in the two Hanford RDSs reflect the plume-specific approach given in DOE/RL 89-12, Rev 2, Hanford Site Ground Water Protection Management Plan. The Plan states (pp. 5-20) "contaminant species that are widespread and/or pose serious environmental concerns are addressed by a cleanup approach of containment and mass reduction". These two RDS activities are prioritized in the Hanford Site Ground Water Protection Management Plan, (pp. 5-21).

5. The RDSs point out the uncertainty of final land use differences between stakeholders and three affected Native American Tribes.

6. The two RDSs point out the difficulty in using risk in ground water and vadose zone remedial action activities. Modeling studies used to determine risk, dose, ecological damage and loss of future ground water resources are not (and may never be) a reliable tool for ranking risk. Managers using the MEM for priority ranking of Environmental and Public Health categories will have difficulty with the subjectivity of the terms "widespread, long term, significant damage, and irreversible effects."

3.4.2 INEL Plumes

1. INEL-R96C0032 -- ER 110 OU 1-07B TAN Groundwater

   The descriptive materials in fields 14, 21, and 22-24 captured the key features fairly well and supported the RDS risk rankings reasonably well. However, there was material in the supporting documentation that should been included in the RDS. For example, the risk analyses in the Final ROD included two land use scenarios, one which addressed the "Standard Assumptions" for this site (populations and their distribution, on and off site, assumed fixed at current levels, and land continues to be a DOE site). The ROD also included two residential land use scenarios for the future, however there was no reference to these analyses in field 20 - Standard Assumptions.

2. INEL-R96C0041 -- ER119 OU 7-08 Organic Compounds Vadose Zone

   Field 14 was fairly good except for the description of the contaminants of concern. The ROD says that this OU includes only the organic compounds that migrated from the waste disposal pits into the vadose zone, i.e., vapor-phase CCl_4 plus some other organics. It explicitly excludes the wastes disposed of in the pits. The RDS, however, states that the contaminants of concern are the organic liquids including lathe coolant, used oils and degreasing agents.

3.4.3 INEL Landfill (Pit 9)

1. Technical details were referenced but were not available to the reviewers. In general, the ratings matched the write-ups but there were some anomalies, including test results from another totally different area (TAN). There was no discussion of the impacts on the biota in field 24 - environmental .
2. Although the summary descriptions in both RDSs are similar, the risk ratings differ which may represent real differences or just different interpretation of risk from one location to another.
3. Although some of the risk ratings are justified by reference, not all of them are, and they should be. Examples of supplemental materials might be the summary of site risks found in the ROD, or the safety analysis report for environmental restoration activities at INEL. Biota (ecological) impacts must be taken into account. Justification for different ratings when describing what appears to be identical scenarios must be provided.

3.4.4 Oak Ridge Landfill (SWSA 6)

1. The RDSs were comparatively well done in that numbers were given and isotopes identified. The available documentation appears to substantiate the ratings given. The problems with the RDS are:

a. There were no references provided, therefore one must guess where the numbers stated came from. This also makes it difficult to independently determine what the score should be.

b. There is confusion between the impact from monitoring and the releases from the WAG 6, hence the evaluation goes back and forth between the two.

c. While the appropriate scoring numbers are used in field 15, the scenarios provided in the fields 22-24 depict the risk scores from last year (for FY 97), rather than the appropriate scoring or this year (for FY 98). If one did not have the key to last year's scoring then it would not have been possible to interpret the results.

d. In retrospect, SWSA 6 was not an appropriate site to evaluate because the only funded activity is monitoring. This also raises the problem of what risks we may be missing because of activities that are ongoing and therefore are not funded for remediation.

2. All RDSs should provide numerical results when available, and cite references. For ease in checking the results, summary tables should be given as appendices if one chooses to use them. Biota impacts need to be taken into consideration. In order not to miss some potential impacts for monitoring and housekeeping/landlord-type operations (especially when there are impacts due to operations and releases from these facilities), two sets of risk scores should be prepared to reflect these differences.

3.4.5 Hanford Tanks

1. There was considerable variability in the scoring of the various fields given the scenarios used. In some cases there was inadequate or absent documentation in support of the rankings. The reviewer's modified rankings (see below) were based on a best estimate using the scenario given, however, this is not to suggest that the original analysis used by the preparer of the RDS was incorrect -- only that a different interpretation of the information is possible and further analysis based on what was found in supporting documentation can lead to revised risk rankings. The support for the proposed modifications of the reviewer's modifications is provided in the discussions above.

HANFS -- R95W0004

Field	**RDS Ranking**			**Reviewer Ranking**		
	"before"	"during"	"after"	"before"	"during"	"after"
PS	H	L	L	M	L	L
SP	H	M	L	M	L	L
EN	H	M	L	M	L	L

HANFS - R95N0124

Field	**RDS Ranking**			**Reviewer Ranking**		
	"before"	"during"	"after"	"before"	"during"	"after"
PS	H	M	M	M	M	M
SP	H	M	M	H	M	M
EN	H		H	M	L	L

3.4.6 SRS Tanks

1. Only minimal information is provided for risk ranking in this RDS. Given the size and cost of the High Level Waste activities at SRS, considerable data must exist that could be applied to RDS development. It was especially disturbing that risks to workers and the public during waste treatment operations were not addressed. This condition is even more acute for the four secondary risk categories not reviewed here.

2 In three instances, it appeared that the frequency from one scenario and the consequences from another were combined to arrive at the listed risk ranking. Using frequency and consequence from the same scenario results in a lower risk ranking. In two instances, a lower risk ranking is recommended.

3. No site priority ranking is given for this RDS. In general, it appears that this activity is believed to be of such a high priority that comprehensive risk information is not needed for this RDS.

3.5 Detailed Analyses completed for Independent Verification of RDS Information

3.5.1 Plumes at Hanford and INEL

3.5.1.A. Hanford:

Two Risk Data Sheets (RDSs) from Hanford were selected for evaluation:
HANFS -R96N0075 -- 100 NR GW Remedial Design/Remedial Action; and
HANFS - R96N0088 -- 200 ZP Soil Remedial Design/Remedial Action.

These RDSs can be compared with two similar RDSs at INEL. They were chosen as representative of a comparable RDS vadose zone plume activity and a ground water plume activity.

HANFS-R96N0075 -- 100 NR GW Remedial Design/Remedial Action:

Field 13 - A-106 Activity:

The answer "Yes" was provided here, which is correct. However, many Hanford RDSs had this item answered as "No". Calls of inquiry were made to DOE-HQ (since the RDS Guidance Manual was lacking in information concerning the purpose of this field), and to Hanford, specifically to the Ground Water section to determine if they understood this activity. The answer was positive. They do understand the category which pertains to pollution abatement (A-106) activity. Information from DOE-HQ indicates that A-106 refers to activities that are driven by Federal environmental laws and their respective regulations listed in OMB Circular A-106 (or state laws and regulations and DOE Orders that implement the Federal requirements) and are required to maintain the current level of compliance, or bring the facility into compliance with these Federal laws and regulations, must be reported as A-106 activities. Therefore, this means that within the Environmental Safety and Health (ES&H) Management Plan, the following activities should be designated as A-106:

- Essential environmental activities (previously referred to as Core) that are required to maintain compliance with Federal environmental requirements.
- Environmental activities that are performed to bring a facility into compliance with Federal environmental requirements (previously referred to as Compliance).
- Core, compliance, and improvement waste minimization/pollution prevention activities, except for waste minimization/pollution prevention opportunity assessments or Research, Development, and Demonstration (RD&D) activities.

Apparently, the preparers of tank-related RDSs at Hanford did not understand this question or chose not to answer it, and consequently ended up with a "No" answer by default.

Field 14, Summary Description

The summary description adequately describes the project. It states that, "Levels of low-level radiological and chemical contamination entering the Columbia River are providing an increased risk to human and ecological receptors." The support for this statement is not referenced directly but states "these actions will be taken in accordance with a ROD (FY 98)". The fidelity of the RDS would be enhanced if relevant portions of the ROD were summarized and the ROD actually cited.

Field 21, Evaluation Scenario -

This part of the RDS states that the exposures during the remedial activities will be the same as before. Since the activities will be quite different in the "before" and "during" scenarios, this doesn't seem reasonable.

Field 22, Public Health & Safety

The "before" and "during" conditions associated with the risk evaluation state that skin contamination from dermal contact "would result in greater than a moderate to low level exposure by FY 2018...". Although the reviewers did not have access to documents describing the risk

analyses, their best estimates suggest that ingestion of this same water would be a much more significant exposure pathway than the dermal contact pathway. However, ingestion is not mentioned in the RDS.

HANFS-R96N0088 -- 200 ZP Soil Remedial Design/Remedial Action:

Field 14 - Summary Description

This summary description adequately describes the project but contains one confusing statement: "The soil contamination....that permeates the Vadose Zone will result in barriers that cover 1.5 million square meters." This may or may not be the required or appropriate action, but it certainly is not "the result" of contamination. Records of decisions (RODs) and remedial actions were discussed but not referenced.

Field 19 -- Site Priority

Site priority is indicted as 92.0, but funded through FY 96 only. There was a question of why the "High" ranking on the Integrated Priority List (IPL) was not carried to FY 98 budget activity. The issue was resolved when Hanford was contacted. This RDS has been transferred to a groundwater RDS R960137, but not noted in the RDS. RDS R960137 is No. 103 on the IPL for FY 98.

Field 24 - Environmental Impact

Environmental Impact could have had a stronger narrative associated with if for the value of this activity. The activity discussed here, i.e., pumping carbon tetrachloride in the vapor phase from the vadose zone would keep carbon tetrachloride from getting to ground water where it becomes much more expensive to remediate. Without early remediation, widespread, long term and perhaps irreversible damage can occur as carbon tetrachloride moves from the unsaturated zone (vapor stage) to ground water gradually forming a DNAPL stage. The DNAPL form of carbon tetrachloride is a much more difficult and expensive form of carbon tetrachloride to remediate.

Environmental Impact had no reference for "threatened, and/or endangered species such as the loggerhead shrike or bald eagle" (This statement was found referenced in DOE/RL-91-58, Rev 0, page 3-35, The Z Plant Aggregate Area Management Study Report).

3.5.1.B. Idaho National Engineering Laboratory (INEL):

Two RDSs were selected for evaluation associated with plumes at INEL:

INEL-R96C0032 -- ER110 OU 1-07B TAN Groundwater and
INEL-R96C0041 -- ER119 OU 7-08 Organic Compounds Vadose Zone.

INEL-R96C0032 -- ER 110 OU 1-07B Test Area North (TAN) Groundwater.

Is there documentation or a rationale provided for the risk characterized in the RDS?

There is quite good documentation of the risk analyses for the public, for workers and for environmental risks in the two Records of Decision (RODs) documents and the Auditable Safety Analysis for Test Area North (TAN) TSF-05 Injection Well and Surrounding Groundwater ... (Operable Unit 1-07A). These reports are clearly written, state the assumptions made and qualitatively discuss the uncertainties associated with these analyses (or reasons for not doing particular analyses).Inexplicably, the RDS does not reference these documents.

How good is the documentation itself? Does the methodology incorporate acceptable scientific standards and practices?

The methodology used for risk assessments for the public and workers generally meets currently acceptable scientific standards and practices. In fact, the risks analyses not only address the risks from ingestion of contaminated water, but also the inhalation risks from volatilization of TCE during showering, a relatively recent practice in risk analysis. However, the risk analyses for the residential exposure scenarios do not include dermal exposures from bathing. These are relevant for the organics in the ground water. The risk analyses in the Final ROD evaluates scenarios for both current land use (industrial) and for possible future residential land use. In the latter scenarios, consumption of crops (irrigated with ground water) is also considered.

The Final Record of Decision does not include an ecological risk analysis, although there is a statement that the potential effects of the TAN ground water on plants and animals was considered, however since it was ground water, there did not seem to be a basis for exposure. There is also a statement that this will be reevaluated during the comprehensive RI/FS for this Operable Unit (OU) or for the INEL site as a whole.

It is important to note that there is another ambiguity related to environmental risks and contaminated ground water that should be addressed. This ambiguity involves evaluating environmental risk. The fact that ground water has been contaminated should be considered by itself an adverse impact, that there has been "degradation of a natural resource." Perhaps this descriptive phrase should be used explicitly to describe one part of environmental risk analysis, the other being ecological risk.

Do the risk analyses in the documents support the MEM?

The analyses in the documents generally support the MEM. However, there is an underlying "relative risk" issue or ambiguity that should be addressed in the future by DOE in its instructions to the field offices regarding the rating of risks. This has to do with cancer risk. Following the guidance from DOE in evaluating the risks to on-site personnel from ingestion of contaminated ground water, a cancer risk might reasonably be ranked as 2C (Medium), as it was in this RDS, or 3C (Low) depending on judgment and interpretation of the guidance. 2C equates to "Injuries/illness resulting in permanent partial disability or temporary total disability for more than 3 months." 3C is "Injuries /illnesses resulting in hospitalization, temporary, reversible illness with a variable but limited period of disability." The risk analysis for on-site workers ingesting ground water from the production wells yields a 1E-4 to 1E-6 cancer risk. It is not clear how this range of cancer risk maps to the 2C and 3C categories. Because cancer is generally a permanent disability, it could be argued that it is reasonable to categorize this as a 2C. However, viewing the cancer risk as a probability, it is not clear if this is a reasonable categorization.

The issue of how to apply the various worker health risk categories, such as 2C, for cancer risk can also be raised relative to risks associated with other site cleanup activities which do not result in cancer, but pose serious risks which fit the description of 2C and have a high probability of occurrence, much greater than 1E-4 to 1E-6.

The risks analyses in the support documents also do not address the "after" condition. There is an underlying and unstated assumption that remediation will be successful and will reduce risk to acceptable levels defined by the MCLs for water. It is not clear if the technology selected for the remediation will actually achieve the MCLs.

How conservative are the risk analysis assumptions?

The risk analyses and scenarios that were done for public safety and health and site personnel safety and health were quite reasonable and not overly conservative. For some bounding risk analyses, "Worst Case" was assumed, but the reasons for doing these kinds of analyses were well explained and were reasonable in the context of a bounding analysis.

INEL-R96C0041 -- ER119 OU 7-08 Organic Compounds Vadose Zone.

Is there documentation or a rationale provided for the risk characterized in the RDS?

The RDS cites references to several documents related to the risks described in the RDS. One of these, the Record of Decision (ROD), was reviewed.

How good is the documentation itself? Does the methodology incorporate acceptable scientific standards and practices.

The ROD provides descriptions of the risk analyses for the public, on-site workers, and the environment. The risk analyses address all of the reasonable pathways of exposure, although somewhat conservative assumptions are made since there are a number of uncertainties. There are also more potential pathways of exposure that must be considered for this RDS than must be considered for ground water contamination alone. Therefore, the exposure analysis is more complex and each of the exposure pathways has its own set of uncertainties. The model used to evaluate exposures and entry of soil gasses to residences (future land use scenario) is not clearly described. If it addressed only diffusive and not advective transport, the exposure was probably underestimated.

Uncertainties are not quantitatively addressed, i.e., sources of uncertainties in various factors are described and there are statements for each with respect to whether the uncertainties would lead to over- or underestimates of exposures and risks, but without any estimates of the possible magnitudes of these possible under- or overestimates.

The methodology used for risk assessments for the public and site workers generally meets currently acceptable scientific standards and practices for risks associated with volatile organic compounds, carbon tetrachloride, CCl_4, in particular for this RDS.

The ROD considers ecological risk and concludes that this is unlikely to be a significant issue at this site. This analysis is rather cursory. Degradation of ground water via downward migration of

the CCl4 and other associated compounds is not explicitly addressed as degradation of a natural resource, although this is implied.

Do the risk analyses in the documents support the MEM?

The analyses in the ROD generally support the MEM. However, a "before" cancer risk to the public (for a future residential scenario) which is estimated to be 2 x 10-4 is categorized as Low (3C) in this RDS but in the previous RDS, INEL R96C0032, this magnitude of a "before" cancer risk to workers is categorized as Medium (2C). It is not altogether clear from the guidance provided to the field offices which is more "correct." It should be noted that both RDSs were prepared by the same person.

The risks analyses in the support documents also do not address the "after" condition. There is an underlying and unstated assumption that remediation will be successful and will reduce risk to acceptable levels defined by the MCLs for water. It is not clear that the technology selected for the remediation will actually achieve the MCLs.

How conservative are the risk analysis assumptions?

The risk scenarios which were done for public safety and health and site personnel safety and health analyses in the supporting ROD document appeared to be generally reasonable, although somewhat conservative. For example, one "worst case" scenario involved using drinking water drawn from the injection well. There was insufficient detail in the ROD to rigorously evaluate the risk analysis in detail.

3.5.2 Landfills at INEL (Pit 9) and Oak Ridge (SWSA 6)

3.5.2.A. Idaho National Engineering Laboratory (INEL):

Two RDSs were identified pertaining to Pit 9 at INEL.

"A" INEL-R96C00045 -- TRU (transuranic) Pits and Trenches, and
"B" INEL-R96D0149 -- AA101B Pit 9;

For the purposes of the following discussion these RDSs will be referred to as "A" and "B", respectively. Specific references cited in this section are listed following the discussion.

In field 11

RDS "A" refers to RDS "B", whereas "B" does not reference "A" in field 11. Based on the financial information provided in field 39, it would seem that they are part of a continuum with major expenditures in "B" up to the year 2000, and major expenditures in "A" starting in the year 2000.

In field 14, the summary description, "B" includes activities from beginning to end in Pit 9, i.e., from environmental assessments through contractor oversight in the remediation phase. "A" seemingly includes everything associated with the remediation of Waste Area Group 7 (WAG 7) including the Comprehensive Record of Decision and the remedial design/remedial actions

identified in the RI/FS. However, the scope of the work is not adequately described in "A" as it is uncertain whether this also includes the funds for the remediation or only the contractor oversight as called out in "B". "A" does not reference the Record of Decision and the RI/FS, and should; also, the reason for conducting this activity should be stated, i.e., potential contamination of the Snake River Plain Aquifer (SRPA), along with the agents of concern - americium-241, cobalt-60, plutonium-238, plutonium-239, and plutonium-240. In addition, trace levels of volatile organic compounds (VOCs) have been detected in samples from the SRPA near the Radioactive Waste Management Complex (RWMC). Detectable quantities of carbon tetrachloride, chloroform, 1,1,1-trichloroethane, and trichloroethylene were found in several RWMC wells. Analysis has also indicated that carbon tetrachloride present at a concentration of 6 μg/L was the only VOC contaminant found above the maximum concentration level (MCL) of 5 μg/L.

Both RDSs, "A" and "B" should include the above information in the field 14 along with the following information to better able the reviewer to understand and evaluate the RDS. The information that should have been included is as follows:

"...minute amounts of man-made radionuclides have migrated from the Subsurface Disposal Area (SDA) toward the Snake River Plain Aquifer"(p.13). Further, "...actual or threatened releases of hazardous substances from the site, if not addressed by implementing the interim remedial action selected in this ROD, may present a current or future threat to public health, welfare, and the environment because of the potential for radioactive and hazardous material from Pit 9 to contaminate the SRPA" (p.14). Also, "Because the residual contamination in the pit may pose a direct contact threat but does not pose a groundwater threat, relevant and appropriate requirements include: (a) a cover, which may be permeable, to address the direct contact threat; (b) limited long-term management including site and cover maintenance and groundwater monitoring; and institutional controls (e.g., land-use restrictions or deed notices) to restrict access." (p. 14)

Field 21, the Evaluation Scenario

Both "A" and "B" reference both ROD and the RI/FS, and values contained in those documents including frequency, dose and risk.

Field 22, Public Health and Safety

In the "before" condition, both "A" and "B" indicate that if remediation is not performed, risk of contamination from sources within Pit 9 is minimal because tours in the area (at the Experimental Breeder Reactor I -- EBR-1 -- located 2.9 km (2.8 mi) downwind of the RWMC) present the only way possible for the public to be exposed. Notice that this evaluation contradicts what is stated in the ROD. "B" rates this risk as a 1D and "A" rates the risk as a 2C. It is difficult to understand how "B" reached the conclusion that there was risk associated with the immediate or eventual loss of life for this condition. The conclusion reached in "A" is also difficult to justify in view of an assessment of "minimal risk".

For the "during" condition in the evaluation scenario for both "A" and "B" there is a vent release with the design basis of the accident being similar for both RDSs. However in "A" the release only contaminates the workers, whereas in "B" the vent release contaminates the environment, workers and exposes members of the public. Not only are these assessments contradictory, but the "during" condition of the evaluation scenario is not the same as the "during" conditions noted in fields 22-24. The evaluation scenario, which is established in field 21, is to be used to evaluate

fields 22-24 as well. Therefore, in the "A" and "B" the risk values noted in field 15 (matrix) are not based on the same scenario. However, setting that issue aside, in "A" for the during condition the vent release is noted as being similar to that of "B", although the frequency and dose numbers differ. However, even though the frequencies differ, and the doses differ only by a factor of 2, the ratings differ considerably with a 3D for "B" and a 3C for "A" which leads to a Low (L) likelihood for "B" and Medium (Medium) for "A". It is not clear why there are these differences.

For the "after" condition, both "A" and "B" state that risks will be mitigated to within or below regulatory limits though "B" has a 3D rating and "A" has a 3C rating.

Field 23, Site Personnel Safety and Health:

For the "before" condition, both RDSs indicate low probability for occurrence although "A" states that drinking water at the Test Area North (TAN) is so contaminated that bottled water is currently being used by the site workers. Unfortunately for this analysis, TAN in not located in the TRU Pit area and its relevance to this RDS is unknown. Pit 9 ("B") has a 1D rating while TRU Pit ("A") has 2C rating. . The reason for this difference may be the inappropriate use of TAN results for this WAG.

For the "during" condition comments in both "A" and "B" are almost identical yet "A" has a 2C rating while "B" has a 2D rating. The reason for this difference is not known except as indicated above.

For the "after" condition the narrative is similar for both although "A" states that if mitigation is not effective, institutional controls will be utilized until better remediation methods are available. "A" and "B" both have a 4D rating.

Field 24, Environmental Impact:

For the "before" condition, "B" states that aquifer contamination may occur while "A" states that organic contaminants are already in the aquifer, and that if remediation is not performed, aquifer contamination will worsen and plume migration will continue. Why there is this difference is not known. "B" has a 1D rating while "A" has a 1B rating which are consistent with the narrative but are not substantiated by the documentation available.

For the "during" condition identical verbiage is found in both RDSs, and both "A" and "B" have an 3D rating. This rating may be appropriate, but without accident analysis and taking various disturbances into account ,during the cleanup process it is not clear that there would be minimal risk.

For the "after" condition, identical wording is found in both RDSs, as well as an identical risk rating of 3D. This rating seems to be deserved based upon the write-up, however the Reviewers does not have documentation available to verify this assumption.

3.5.2.B. Oak Ridge National Laboratory (Oak Ridge):

Three RDS were found that pertained to Solid Waste Storage Area 6 (SWSA 6) at Oak Ridge. The following RDSs were evaluated:

ORNL-R94H0023 -- ORNL WAG 6 EMP (EW) which dealt with the environmental monitoring program to identify increases in the contaminant flux being released from WAG 6. SWSA 6 is still an active burial site and therefore numbers are subject to change; and,

ORNL-R96Y0010 -- ORNL WAG 6 EMP (EX) which is identical to the previous RDS except for the funding amounts and schedule. This duplication occurred because of DOE's pronouncement that there would not be any cross-funded ADSs; consequently, no cross-funded RDSs as well.

Field 14, Summary Description:

Both radionuclides and hazardous chemicals have been buried at the SWSA 6 and pose potential risks. There are no referenced documents in the RDSs, although risk levels are stated for some perimeter wells and the White Oak Creek Dam (the last control point before release into the Clinch River System). There is also a barrier structure at the mouth of White Oak Creek. The most likely source of data would be the RCRA Facility Investigation Report for Waste Area Grouping 6 (WAG 6) at Oak Ridge, and was the document used to evaluate this RDS. The Annual Environmental Reports should also contain similar data. As stated in the RCRA Facility Investigation Report, SWSA 6 is the principal source of environmental contamination in WAG 6, therefore all of the dose is assumed to result from releases at SWSA 6.

Field 22, Public Safety and Health:

The "before" condition was scored as a 2B which means a high likelihood of excessive exposure and/or injury and results in a Medium (Medium) classification. The no action scenario of a homesteader currently on-site would result in a dose of 2E+5 rem and a risk of 1. This is not likely since the area is fenced and guarded. The more likely scenario with institutional control would have an ORNL employee receiving a dose of 2 rem over 30 years or a risk of 1E-3, which would require intervention if the same standards were used for radionuclides as are used for hazardous chemicals, however, this is well below the Nuclear Regulatory Commission (NRC) limit of 5 rem per year . The hazardous chemical risk to the same employee is 1E-8 which is well below EPA's action level of 1E-4 to 1E-6. A homesteader outside of the WAG would have risks of 6E-5 and 1E-7 for radionuclides and hazardous chemicals, respectively. While these risk levels do not match those in the RDS, which are stated as 1E-4 at the perimeter wells and 1E-5 at White Oak Dam (and are primarily due to tritium) they are similar. The reference for these numbers was not provided in the RDS.

For the "during" condition the RDS states that the Environmental Management Program (EMP), will continue until closure is implemented, therefore one would assume that the risk rating would be the same as it is for the "before" condition. However, that is not the case, and the rating is depicted as a 3C which results in a Low ("L") likelihood of occurrence. There is no justification given for this rating, although one could reason that this is due to the time factor, i.e., projection of further into the future. However, if the consequences are the driver, then they would be presumed to be the same, absent any evidence that the inventory at SWSA 6 was being materially depleted.

For the "after" condition the rating is also 3C because "the benefit of the WAG EMP is to reduce the short-term impacts of widespread public health and ecological effects through early detection of

contaminant releases and interim action may be required". Monitoring, of course, does not reduce impacts.

The true risk of the SWSA 6 will be ameliorated when it is closed in an environmentally sound manner. Yet the hazards during the closure period, and the reduction of hazards after closure, are not what is being evaluated here; what is being evaluated is the cost of the monitoring program. If interim action were required then a new RDS would be required and the costs and risks would change accordingly. Therefore, there is confusion in the write-up, and in the instructions for such a program, which is intended to only alert one to increasing risks. This is certainly required, but does not diminish the risk without further action and money. The risks should be based only on the monitoring program, yet this would miss the bigger picture.

Field 23, Site Personnel Safety and Health:

For the "before" condition the risks are due to monitoring activities, and therefore pertain to the usual industrial type of risks. They were classified as 3A which seems appropriate.

For the "during" condition the activities are the same as for the "before" case, and therefore the same score was given.

For the "after" condition the EMP is discontinued, hence there is no risk from the monitoring activity and the risk is scored a 4C . Since the activity is discontinued, it is not clear why this was not scored a 4D which is the lowest possible score, or noted as not applicable.

Field 24, Environmental Impact:

For the "before" condition there was no discussion of impacts on the biota. Only tritium is discussed, yet in the RCRA document Strontium-90 and Cobalt-60 are indicated as migrating from the WAG. Again, there is confusion between the environmental impact of the monitoring program and the remediation program. Clearly, guidance should be provided concerning this issue. A score of 3C is given due to the contaminants released, not the impacts of the monitoring program.

For the "during" condition the same conditions hold during the monitoring program and consequently the same score is given.

For the "after" condition, once the EMP ceases, then the impact from it is negligible. The same is true once the site is closed since there should be minimal releases, therefore the impact was downgraded to 4D, the minimum possible.

3.5.3 Tanks at Hanford and Savannah River

3.5.3.A. Hanford Tanks:

Two RDSs were selected pertaining to tanks at Hanford.

HANFS - R95W0004 -- TWRS Waste Characterization, and
HANFS - R96N0124 -- TWRS 200-E SST Minimum Safe Operations

HANFS - R95W0004 -- TWRS Waste Characterization..

Field 14 -- Summary Description

Contains a general description of procedures for tank sampling. Lists sampling procedures and methods. There is no statement that samples will in fact be adequate for complete characterization of wastes. There is no description of transfer procedures from tank to analytical lab.

Field 21 -- Evaluation Scenario

The "before" condition is based on doing retrieval of tank wastes without waste characterization. The scenario is a flammable gas burn with breach of tank ventilation. The Draft Environmental Impact Statement of the Tank Waste Remediation System (DOE/EIS-0189D) evaluates this scenario as having 2 Liters of respirable radionuclide and chemical contaminated waste aerialized.

The "during" condition is based on dropping a sample core within the sampling enclosure. Reference document (WHC-SD-WM-ANAL-041, Rev. 0) does not cover this scenario explicitly. The closest scenario is a container loading spill during mechanical waste retrieval. There is no documentation referenced for this scenario.

The "after" condition is based on characterization that has been completed. The "after" condition claims that successful characterization would allow for safe successful remediation. Characterization is a necessary but not a sufficient condition. It is unclear why risks associated with the characterization program are transferred to the retrieval program if the two programs are distinct. "after" completion of characterization, why are there residual characterization risks?

Field 22 -- Public Safety and Health

The "before" condition narrative quotes a value of 8 L of respirable material released which is not consistent with a value of 2 L given in the EIS. However, population and MEI doses quoted are the same as given in the EIS for the 2 L value. This RDS gives a High probability (0.1 - 1.0 per year) for occurrence. The EIS describes the hydrogen burn scenario as having a per tank probability of occurrence of $9x10^{-7}$ per year which for the 25 tanks on the flammable gas watch list for 100 years of operation gives a total occurrence probability of 0.00225 for the period of operations. The RDS probability category ranks the scenario with a High ("H") score, while a probability of less than 0.01 per year would give a Medium ("Medium") rank.

For the "during" condition the core sample drop scenario is not evaluated in the EIS. The closest scenario in the EIS is a "dropped canister". The closest reference document scenario is a container-loading spill during waste retrieval (WHC-SD-WM-ANAL-041, Rev 0). The "During" period evaluation of Low ("L") is appropriate.

For the "after" condition, see comment for field 21, the "after" condition..

Field 23 -- Site Personnel Safety and Health

For the "before" condition, see comment for field 22, the "before" condition.
.

For the "during" condition, the scenario as evaluated indicates that two or three involved workers may receive doses that could exceed regulatory limits but would not result in cancer fatalities. A "2B" score is not justified given the evaluation. A better score would be a "3B" giving an Low ("L") ranking.

For the "after" condition, see comment for field 21, the "after" condition.

Field 24 -- Environmental Impact

For the "before" condition, the scenario of the release of 2 L of waste contaminating thousands of hectares of land is evaluated as "1B" and ranked as High ("H"). Assuming a contaminated land area of 3,000 Ha or $3x10^7$ m^2, a total tank inventory of 10^8 curies, 177 tanks with an average inventory of 6 MCi and a average volume of 500,000 L, the release would carry an average burden of [2 L/500,000 l] x 6mCi = 2.4 Ci and a land contamination concentration of 2.4 Ci/$3x10^7$ = 84 nCi per m^2 of mixed waste beyond the large particle fallout zone. If the tanks on the watch list were significantly hotter than average, say by a factor of 2, the scenario would only yield about 200 nCi/m^2 . This level of contamination would be better scored as category 2 at worst, with a "B" or "C" probability and a Medium ("Medium") ranking rather than a High ("H").

For the "during" condition, the evaluation of the scenario reports that no environmental impacts would occur. A Medium ("Medium") ranking is inconsistent with this evaluation. A Low ("L") ranking would be consistent.

For the "after" condition, see comment for field 21, for the "after" condition.

HANFS - R96N0124 -- TWRS 200-E SST Minimum Safe Operations

Field 14 -- Summary Description

To operate the single shell tanks (SSTs) in a Minimum Safe condition satisfying the operational safety requirements (OSRs).

Field 21 -- Evaluation Scenario

For the "before" condition, a Hydrogen burn leading to dome collapse in a SST. Assumes 8 L of respirable particles released. DOE/ES-0189D indicates estimates of 2 L released for hydrogen burn scenario. A high radioactivity tank is assumed for this RDS.

For the "during" condition, the period describes standard operations for the tank farms.

For the "after" condition, standard operations are described for the tank farms.

Field 22 -- Public Safety

For the "before" condition, the Public dose of 4000 p-rem corresponds to the EIS estimate for 2 L release, not 8 L. The average population dose (114,734 people, EIS section E.2.2.1.4) is 35 mrem. Projection of 2 cancer deaths has high degree of uncertainty. Risk ranking better set at "2B" rather than "1B" (a "Medium", not a "H").

For the "during" and "after" conditions, the scoring is appropriate.

Field 23 -- Site Personnel Safety

For the "before" condition, doses given correspond to the EIS assumption of 2 L not 8 L released. However, ranking is still appropriate.

For the "during" and "after" conditions, the scoring is appropriate.

Field 24 -- Environmental Impact

For the "before" condition, see the discussion for field 24 in HANFS-R96N0004, above. The ranking is better set at Medium ("Medium") rather than High ("H").

For the "during" and "after" conditions, the scenario indicates that there are no environmental impacts. The RDS does not give a ranking. A Low ("L") ranking would be appropriate.

3.5.3.B. Savannah River Site (SRS):

Three RDSs were selected for review pertaining to tanks at SRS.

SRS - R96A0008 -- HLW Tank Farm Minimum Safe - Surveillance and Maintenance
SRS - R96A0009 -- HLW Tank Farm Minimum Safe - Surveillance and Maintenance
SRS - R96A0024 -- HLW Tank Farm and Vitrification Operations.

The first two are identical and cover the minimum surveillance and maintenance activities needed to sustain the status quo safety and operability for the 51 underground high level waste storage tanks in the F and H area tank farms. Estimated expenditures for these activities total about $96 million for FY 98 and continue at that level or greater through 2002.

SRS - R96A0008 and SRS - R96A0009 -- HLW Tank Farm Minimum Safe - Surveillance and Maintenance

Field 14 -- Evaluation Scenario

BEFORE - Not performing minimum S&M was projected to result in ventilation filter failures within 1 year and an in-tank hydrogen burn within 10 years. These frequencies were engineering estimates. Potential consequences for a hydrogen burn of 2-100 rem off-site were referenced from SAR DPSTSA-200-10, Supplement 18, which was not available for review.
DURING - No additional scenario is described, but the frequency of (before) releases was indicated to be greatly reduced.
AFTER - Indicated as not applicable. No discussion of tank closure is given.

Field 22 -- Public Safety

BEFORE: 2A-High

Impact Basis- Consequences of a hydrogen burn are stated as >0.5 rem, consistent with the evaluation scenario description. However, per DOE/EIS-0082-S, pB-14, the MEI consequences of a similar event are listed at only 0.012 rem (category 3).
Likelihood Basis- Per the evaluation scenario, the hydrogen burn would occur within 10 years (category B or C), not the 1 year required for category A.
Risk Rank- Should be category 2B or 3B resulting in a risk rank of Medium, not High.

DURING: 2B-Medium
Impact Basis- Unspecified releases greater than allowable limits are assumed to occur within 10 years. However, per DOE/EIS-0082-S, pB-14, the MEI consequences of anticipated events are estimated to be only 0.004 rem (category 3) occurring at a frequency of once in 20 years.
Likelihood Basis- see above
Risk Rank- Assignment of the described frequency and consequence to category 2B-Medium is appropriate, however, this frequency and consequence assignment is not supported by the documentation available for this review.

AFTER: 2B-Medium
Impact Basis- Not given
Likelihood Basis- Not given
Risk Rank- Ranked the same as "during" without discussion.

Field 23 -- Site Personnel Safety

BEFORE: 2B-Medium
Impact Basis- Consequences of a hydrogen burn are stated as >25 rem, consistent with the evaluation scenario description. However, per DOE/EIS-0082-S, pB-14, the MEI consequences of a similar event are listed at only 1.7 rem for a co-located worker (category 3).
Likelihood Basis- Per the evaluation scenario, the hydrogen burn would occur within 10 years (category B).
Risk Rank- - Assignment of the described frequency and consequence to category 2B-Medium is appropriate, however, the consequence assignment is not supported by the documentation available for this review.

DURING: 2B-Medium
Impact Basis- Unspecified releases greater than 5 rem are assumed to occur within 10 years. However, per DOE/EIS-0082-S, pB-14, the MEI consequences for a co-located worker of anticipated events are estimated to be only 0.56 rem (category 4) occurring at a frequency of once in 20 years.
Likelihood Basis- see above
Risk Rank- The frequency and consequence assigned in the RDS to category 2B-Medium is appropriate, however, this frequency and consequence assignment is not supported by the documentation available for this review as discussed above. Per the frequencies and consequences presented in DOE/EIS-0082-S, the risk ranking would be category 3 or 4C-Low.

AFTER: 2B-Medium

Impact Basis- Not given
Likelihood Basis- Not given
Risk Rank- Ranked the same as "during" without discussion.

Field 24 -- Environmental Impact

BEFORE: 1A-High
Impact Basis- Unspecified releases producing cleanup costs >$1 million in one year and multi-media contamination within 10 years are assumed. No explanation is given for how the evaluation scenarios produce the "catastrophic damages" required for a category 1 assignment. Category 2 seems more reasonable.

Likelihood Basis- Per the evaluation scenario, the unspecified release scenario would occur within 10 years (category B), not the 1 year required for category A.
Risk Rank- Per the above discussion, the described frequency and consequence should be assigned to category 2B-Medium, rather than 1A-High.

DURING: 1B-High
Impact Basis- Unspecified releases producing cleanup costs >$1 million within 10 years are assumed. No explanation is given for how the evaluation scenarios produce the "catastrophic damages" required for a category 1 assignment. Category 2 seems more reasonable.
Likelihood Basis- see above
Risk Rank- Reduction of the impact ranking from category 1 to 2 would change the risk rank from High to Medium.

AFTER: 1B-High
Impact Basis- Not given
Likelihood Basis- Not given
Risk Rank- Ranked the same as "during" without discussion.

SRS - R96A0024 -- HLW Tank Farm and Vitrification Operations.

This RDS covers the operating activities of the F and H area tank farms and the DWPF vitrification facilities at a production level of 200 canisters per year. Estimated expenditures for these activities total about $54 million for FY 98 and continue at that level or greater through 2002.

BEFORE - Not performing waste removal and vitrification requires the continued storage of HLW in tanks. Continued storage would eventually lead to liquid leaks and vapor releases and the

Field 21 -- Evaluation Scenario

discontinuance of waste receipts from canyon stabilization activities. No specific consequences or frequencies of release are quoted.
DURING - Risks are described as "inherent" to workers in vitrification operations.
AFTER - Risks from the initial waste inventory are described as greatly reduced. No discussion of tank closure or residual risk is given.

Field 22 -- Public Safety

BEFORE: 3A-Medium
Impact Basis- Unspecified release scenarios from waste tank storage resulting in consequences "above normal limits within 1 year, greater than allowable within 10 years and >0.1 rem within 100 years" are assumed. Since the normal allowable limit for public MEI exposure is .1 rem per year, per DOE Order 5400.5, all of these generic releases fall within impact category 3.
Likelihood Basis- see above
Risk Rank- Assignment of the described frequency and consequence to category 3A-Medium is appropriate, however, no specific scenarios are described or referenced to support this assignment. It would seem logical that the "before" risk here would equal the "during" risk for tank farm continued surveillance and maintenance activities. That risk was ranked 2B-Medium.

DURING: 3A-Medium
Impact Basis- Not given
Likelihood Basis- Not given
Risk Rank- Ranked the same as "before" without discussion. It seems incredible that no information on operational risks for the DWPF facility could be cited to establish a basis for risk assignments in this element of the RDS.

AFTER: 2C-Medium
Impact Basis- Unspecified residual risks are assumed to result in releases greater than allowable limits within 10 to 100 years (category 2).
Likelihood Basis- see above
Risk Rank- Assignment of the described frequency and consequence to category 2C-Medium is appropriate, however, no specific scenarios are described or referenced to support this assignment.

Field 23 -- Site Personnel Safety

BEFORE: 4A-Medium
Impact Basis- Unspecified releases greater than 5 rem are assumed to occur within 10 years. This consequence level qualifies for category 2 in the MEM. Both the stated consequence level and the category 2 ranking are consistent with the "during" risk assignment for continued tank surveillance and maintenance.
Likelihood Basis- Per the evaluation scenario, the unspecified 5 rem release would occur within 10 years (category B), not the 1 year required for category A.
Risk Rank- - Per the above discussion, the described frequency and consequence should be assigned to category 2B-Medium, rather than 4A-Medium.

DURING: 4A-Medium
Impact Basis- Not given

Likelihood Basis- Not given
Risk Rank- Ranked the same as "before" without discussion. It seems incredible that no information on operational risks for the DWPF facility could be cited to establish a basis for risk assignments in this element of the RDS.

AFTER: 3D-Low
Impact Basis- Unspecified residual risks are assumed to result in releases greater than 5 rem within 100 to 1000 years (category 3).
Likelihood Basis- see above
Risk Rank- Assignment of the described frequency and consequence to category 3D-Low is appropriate, however, no specific scenarios are described or referenced to support this assignment.

Field 24 -- Environmental Impact

BEFORE: 1B-High
Impact Basis- Unspecified releases producing cleanup costs >$1 million in one year and multi-media contamination within 10 years are assumed. No explanation is given for how the evaluation scenarios produce the "catastrophic damages" required for a category 1 assignment. Category 2 seems more reasonable.

Likelihood Basis- Per the evaluation scenario, the unspecified release scenario would occur within 10 years (category B).
Risk Rank- Per the above discussion, the described frequency and consequence should be assigned to category 2B-Medium, rather than 1B-High.

DURING: 1B-High
Impact Basis- Not given
Likelihood Basis- Not given
Risk Rank- Ranked the same as "during" without discussion. Again, it seems incredible that no information on operational risks for the DWPF facility could be cited to establish a basis for risk assignments in this element of the RDS.

AFTER: 2C-Medium
Impact Basis- Unspecified residual risks are assumed to result in releases greater than allowable limits within 10 to 100 years. Assuming the limits referred to are for human exposure, it is not clear how the environmental impact was established.
Likelihood Basis- see above
Risk Rank- Assignment of the described frequency and consequence to category 2C-Medium is appropriate, however, no specific scenarios are described or referenced to support this assignment.

4. Database Analysis

The activities of the Data Analysis component Task of the National Review Panel fell into four general categories: 1) Characterization and summarization of the RDS data for the Panel; 2) Statistical comparison of the RDSs in the sample set to the whole RDS database; and 3) Cross-site comparisons of the Management Evaluation Matrix scores with respect to correlation of impact scores; and 4) Cross-site comparisons of the Management Evaluation Matrix scores with respect to risk reduction. This last activity relates RDS counts for FY 1998 to both MEM "before" risks and to the "before" to "after" change in risks.

4.1 Characterization and summarization of the RDS data for the Panel

Several and various sorts of the RDSs were generated to provide the Panel a sense of how risks and funding are distributed across the complex. Two of the Tables generated are included in Appendix C. Specifically: Table C1 Summary of Risk Data Sheets by Operations Offices and EM Offices; and Table C2 Mean & Range of Total Costs for Operations Office and EM Office Classification. These tables are included to facilitate the interpretation of the latter analyses.

4.2 Statistical comparison of the RDSs in the sample set to the whole RDS database

An analysis investigated how well the sampled set of RDSs represented the full set. This is necessary in order to extrapolate findings from the evaluations of the sample set to whole RDS data set. The activity was accomplished by comparing summary statistics of the sampled set of RDSs with the non-sampled RDSs. The tables generated in this analysis are included in Appendix C, Tables C3a-j Comparison of Risk Data Sheets Sampled for Report Card Analysis to Those Not Sampled. These tables are listed by Operations Offices. Each Table displays the number and percentage of the "not" sampled and the sampled RDSs for each EM office and the "before" risk scores (MEM) for each category. The Table in Appendix C4 compares mean and range of total costs for the sampled and not sampled RDSs by Operations Offices. Table C5 indexes total costs by Operations Office and EM Office.

This analysis indicates that the RDSs in the Stratified Random Sample are representative of the entire RDS database.

4.3 Cross-site comparisons of the Management Evaluation Matrix scores with respect to correlation of impact scores

In a third activity, the seven impact categories (Public Safety and Health -- PS; Site Personnel safety and health -- SP; Environmental Risk -- EN; Compliance -- CO; Mission Impact -- MI; Mortgage Reduction -- MR; and Social Cultural/Economic Impacts -- SCE) were paired. A total of 21 pairs are possible. The analysis shows how frequently pairs of impacts both score High or both score Low in the "before" condition of the Matrix. Table 12 (High/Low Percentage Match for Paired Impact Areas) displays the results from this analysis organized by pairs of impacts and Operations Office.

For each of the possible 21 Pairs of Impact Categories, this table shows how often (in percent) each pair have identical values -- either both are High or both are Low -- in the "before" scenario. For example: If Albuquerque had 250 RDSs, 2 of which cited High for both SP and PS the percentage matching is 1% (2.0/250x100=0.8); and if there were 112 RDSs that cited Low for both PS and SP the Table lists 45% (112/250x100 = 44.8%).

One value of this Table can be gained by scanning horizontally across the 21 pairs within any given operations office. This indicates how the scoring changes within the Operations Office across the different possible impact pairs. One is thus able to gain a sense of the impact categories that have the most correlation in a given Office.

Another value is gained by viewing the vertical columns of the tables. This provides an indication of the how a given pair was treated across all the different Operations Offices. For example one might intuitively think all Offices would score the pair (Compliance and Mission Impact) about the same and probably High. By scanning this column that is indeed what is seen. There is a high percentage of identical pairs for most of the Offices.

This data can also be "indexed" which involves summing all the percentages for High and Low and dividing each by 21. The indicated index expresses an average percentage of the time the Offices matched pairs. A high index indicates that a particular Office was using the same score at a high frequency. The Panel interprets this analysis to mean that Operations Offices took widely different approaches to evaluating risks and that cross-site comparisons of the "before" MEM scores may be of limited value.

Table 12 High/Low Percentage Match for Paired Impact Areas.

4.4 Cross-site comparisons of the Management Evaluation Matrix scores with respect to risk reduction.

The fourth activity conducted in the Data Analysis task was to compare the sites with respect to risk reduction of their activities as scored in the RDSs. In this analysis each RDS was scored "before" (Be), "during"(Du), and "after"(Af) by using a logarithmic progression of N/A=0; Low=1; Med=3; High=9. The highest scored change then would be from a "before" (High), to a "after" of N/A of 0. However this was rare. Nearly always the highest score for an impact area would be 32 summing (High to Low = 8), for each of the four impact areas examined, Public Safety (PS); Site Personnel (SP); Environmental (EN); Social/Cultural/Economical (SO). The before and after would always have to be a "before"-High, and "after"-Low to score 32 points. Each Impact Category for each RDS was scored and summed to arrive at total points (p) for all RDSs listed for each Operations Office. This total (p) was then divided by the total number of RDSs (N) to arrived at an INDEX of Change. The data from this analysis are summarized in Table 13.

Analysis of the data produced by this comparison seems to indicate that there is indeed something different happening at the various Operations Offices as the Offices which tended to score their RDSs Low (as viewed by inspection) computed a Low value for the index, while those Offices which seemed to score their RDSs High (as viewed by inspection) had a much higher Index.

Table 13: Index of Change Between "before" and "after" as a Look at Cross Site Consistency

Ordinal Rank	Operations Office	Total RDS	Total "Points"	Index
8	Albuquerque	250	1391	5.56
6	Chicago	80	804	10.00
7	Idaho	155	1337	8.62
10	Nevada	45	119	2.64
3	Oakland	77	1000	12.99
1	Ohio	54	939	17.39
2	Oak Ridge	203	3153	15.53
9	Rocky Flats	30	123	4.10
4	Richland	249	3055	12.27
5	Savannah River	270	3284	12.16

5. Conformity of Risk Data Sheets with DOE Guidance (RDS "Report Card")

5.1 Overview

The stratified random sample of 300 RDSs was reviewed to determine whether significant sections of the documents were completed according to DOE guidance. Criteria for the review and a computerized review form (the "report card") were prepared for this activity. Using this material two trial reviews were conducted to enhance the internal evaluation consistency

The review was completed by the four CRESP staff members supporting the National Review Panel. Each staff member read 75 RDSs, distributed evenly across field offices and randomly selected from the base sample. A "report card" was completed for each RDS. Following the review, panel members also worked with the staff to further check the consistency of the results and develop the conclusions presented below.

5.1.1 Components of the RDS "Report Card"

The "report card" was designed to facilitate assessment of three key components of the RDS: summary description, scenario development, and matrix support. Figure 1. shows a sample of the RDS Report Card evaluation form. Additional documents were also used as reference materials. First, *Required Elements of Risk Data Sheets, an Analysis of Key Fields* was used to evaluate the RDSs on a field by field basis. Also, a Report Card Guidance Document was also created to promote rigor and consistency among reviewers, during the "report Card" evaluation procedure itself. These two documents can be found in Appendices F1 and F2 Respectively. A sample RDS is included in Appendix A.

The summary description (RDS field 14) was reviewed to determine whether it described the activities included in the RDS, why the activities were needed, and the results of completing the activities. Also reviewed was whether the activities are within the scope of the RDS, and whether the summary is readable and coherent. Each of these factors were called for in the RDS guidance developed by DOE.

DOE's guidance also asks for the RDS to contain a scenario (in field 21) describing possible conditions before, during, and after funding the activities. The before, during, and after components of the scenario were each reviewed to determine whether the description is reasonable and credible, the activities are within the scope of the RDS, and basic elements for assessing risk (hazards, pathways, and receptors) are identified.

This scenario is then supposed to be used as a basis for qualitatively evaluating the possible likelihood of potential impacts in at least four of the seven impact areas: public safety and health, site personnel safety and health, environmental impact, and social/cultural/economic impacts. For each of these areas, as well as for Compliance, Mission Impact and Mortgage Reduction, the RDS should contain a brief narrative (fields 22-28) and a corresponding score indicating the potential severity of expected impacts and the likelihood of those impacts occurring (field 15). The "Report Card" review assessed whether the narrative for five of these seven areas is consistent with the before, during, and after scenario and whether the narrative supports the corresponding impact and likelihood scores, as called for in DOE's guidance. Mission impact and mortgage reduction were not reviewed because these elements are outside the panel's scope of work and are being addressed separately by DOE.

5.2 Conclusions from the RDS "Report Card" Review

300 RDSs were reviewed to determine whether they were completed according to DOE guidance. The answer for a clear majority of the RDSs is "no." The most significant lapse was in the development of credible scenarios and narrative explaining the potential impact before, during, and after funding of the activities described in the RDSs.

5.2.1 Summary Description

Results of the Summary description are summarized in Table 14, below. About half the RDSs reviewed contain summary descriptions that met expectations set forth in the DOE guidance. The rest fall short in some way, and about ten percent miss the mark entirely. The most common problem is that the description simply fails to communicate the range of activities that are covered in the RDS and what end result is expected of completing the activities. Often the description covers a broad sequence of activities, of which the activities described in the RDS are only a part. However, the description does not clearly explain which portion of the effort is being addressed within the RDS.

Table 14. Percentage of RDSs within the Sample 0f 300 with Sufficient Summary Descriptions Described in Field 14[12]

Operations Office	# Submitted	# Reviewed	% Sufficient
Albuquerque	250	43	33%
Chicago	80	16	38%
Idaho	153	30	33%
Nevada	45	10	10%
Oakland	77	12	58%
Ohio	55	9	78%
Oak Ridge	203	30	33%
Rocky Flats	30	30	33%
Richland	249	60	67%
Savannah River	270	60	53%

5.2.2 Scenario Development

Results of Scenario Development are summarized in Table 15, below. A substantial majority of the RDSs do not describe scenarios that meet the basic criteria of the DOE guidance, i.e., to identify hazards, pathways, and receptors, and provide a credible description of what happens before, during, and after the activities. This is perhaps the most significant weakness identified in the RDS "Report Card" review because a good scenario is essential to communicating the potential impacts of the activities. Parts of the scenario in many of the RDSs are useful, but only about a quarter are entirely sufficient. (see Table 15.)

Table 15. Percentage of RDSs within the Sample 0f 300 with Sufficient "before" Scenarios Described in Field 21[13]

Operations Office	Submitted	# Reviewed	% Sufficient
Albuquerque	250	43	23%
Chicago	80	16	13%
Idaho	153	30	40%
Nevada	45	10	20%
Oakland	77	12	50%
Ohio	55	9	67%
Oak Ridge	203	30	13%
Rocky Flats	30	30	3%
Richland	249	60	45%
Savannah River	270	60	5%

[12] These were RDSs which received a Yes for every field in Section I of the RDS Report Card. (see Appendix D2, for additional detail).

[13] These were RDSs which received a Yes for the three before scenario criteria in Section II of the RDS Report Card. (see Appendix D2, for additional detail).

5.2.3 Matrix Support

Results of the Matrix Support are summarized in Table 16, below. Only a small number, on the order of ten to twenty percent, of the RDS's fully explain the rationale for the matrix score (impact and likelihood) in each of the five areas reviewed. Typically, the scenario is not followed through to describe the basis for the estimate of impact and likelihood. Often some portion of this description is provided for one or more of the five impact areas, but in total it is very lacking.

Table 16. Percentage of RDSs within the Sample 0f 300 whose MEM "before" Values were Sufficiently Supported in Fields 22-24 & 28.[14]

Operations Office	# Submitted	# Reviewed	Public Health	Worker Safety	Environ.	Comp.	Social/ Cult./Econ.
Albuquerque	250	43	12%	16%	9%	12%	9%
Chicago	80	16	19%	19%	19%	25%	25%
Idaho	153	30	30%	27%	27%	27%	3%
Nevada	45	10	10%	10%	10%	30%	10%
Oakland	77	12	25%	17%	17%	33%	8%
Ohio	55	9	22%	33%	22%	44%	22%
Oak Ridge	203	30	17%	7%	7%	27%	0%
Rocky Flats	30	30	10%	0%	3%	7%	27%
Richland	249	60	20%	18%	20%	28%	12%
Savannah River	270	60	5%	3%	3%	8%	0%

Figures 1 and 2, the Report Card Evaluation Forms can be found on the next few pages.

[14] These were RDSs which received a Yes for the three criteria in Section III of the RDS Report Card for each before impact category. (see Appendix D2, for additional detail).

Figure 1 = Report Card Evaluation Form I. RDS Summary Description

Figure 2 = Report Card Evaluation Form II. Scenario Development and Form III. Matrix Support

6. Lessons Learned - Panel Thoughts on Improvements for the Future

A host of findings, conclusions, and recommendations are to be found throughout the body of this Report. The Panelists and staff devoted a brief period of time on the last day they met discussing items they thought could materially improve the process. Some describe organic changes in the RDS while others suggest process change. Many are captured in some form throughout the Report text. Their recapitulation here merely reinforces the fervor with which they are held and the lack of time to refine the document. They are offered in the hope that they may prove valuable to DOE/EM and to the CRESP Independent Review Panel.

6.1 General Comments on the Process Itself

- The full range of expertise available at the sites should be drawn upon to fill out RDSs. Thus the panel recommends a TEAM APPROACH to facilitate development of reasonable and credible evaluation scenarios and accurate matrix values. Such a team should include experts from (at a minimum) all the technical fields represented by impact categories.
- The Management Evaluation Process should integrate the Risk Data Sheets, Activity Data Sheets, BEMR concepts, Work Breakdown Structures, Multi-year analysis, ultimate land use determinations, and strategic planning. Assumptions for all these activities should be standardized as much as possible.
- The Risk Data Sheets should be developed as a precursor to and an integral component of the Internal Review of Budget activity, held each May.
- The matrix does not provide an opportunity to address the following within its existing framework. The overall process could be improved by addressing these in future iterations.
    - Alternative activities or technologies
    - Uncertainties with regard to impacts and likelihood's
    - Geographical location of problems/activities.
- The power of a comparison between the "before" and "after" scenarios is under-utilized, and should have a greater emphasis in future iterations.
- The process should be initiated for FY 1999 as early as possible.
- Unit of Analysis is not comparable across sites. Many of the specific improvements suggested elsewhere in this document aim to improve this component. The unit of analysis issue requires improvement in the next iteration. (See Section 2.7.1)

6.2 General Improvements to the Management Evaluation Matrix

- The Matrix must include a more discriminating range of impacts for each Impact Category.
    - To a certain extent, this can be done by improving the definitions for each impact.

- In addition, new impacts should be defined (for example, each Impact category should include an impact for "background levels" or "negligible risks" so the use of NA is not required in the matrix values.)
- Also, the same number of impacts should be available for each Category to facilitate comparability among them.

- A fundamental improvement is required for both the Social/Cultural/Economic impact categories and the Environmental impact categories. These were consistently mis-used or mis-interpreted in the FY 1998. The process to improve these categories should include stakeholders as well as technical experts, again using a Team Approach.
- Better distinction between EM Program activities is required. In some cases, activities completed by EM 40 seemed identical to the activities completed by EM 60.

6.3 Documentation of qualitative or quantitative judgments needs to be improved.

- In general, documentation this year was poor. The "Independent Verification group identified many different documents that were not referenced, such as Records of Decision (RODs) containing a great deal of economic data as well as stakeholder concerns.
- The quantitative evaluation field should rarely be blank, but it is also not a place to list every relevant document. Only the most applicable documents and sources should be listed.
- Professional opinions are appropriate within the RDS. However, enough detail must be provided to be credible to internal and external reviewers.

6.4 Evaluation Scenarios

- The full range of agents and expected exposure scenarios should be provided
- Guidance must be improved to foster development of a consistent scenario upon which Management Evaluation Matrix values are based.

6.5 Guidance Manual and Training.

- Improve instruction explaining what is desired in each RDS field. For example, the Panel felt the "Required Elements" document assembled by CRESP from key guidance documents was a more efficient and concise method of describing what was needed in each field than the official guidance manuals.
- This year's data set illustrates that there was great variety in the understanding of impact categories and likelihood determinations in the matrix. The guidance must be clarified so that a better understanding of risk is expressed in the RDSs. Likelihood determinations specifically need work, the guidance must be improved to show how quantitative data in the form of probabilities and frequencies should be used to determine matrix values.

- The Panel suggests that workshops be developed at different sites and nationally to accomplish this, particularly for the environmental and social/cultural/economic impact categories. In addition, contact and interaction with FCOG (the Facility Contractors Organizational Groups) should be developed.
- Training for Risk Data Sheets should not only include training on Software, and basic instruction for filling out RDSs, but should place a greater emphasis on evaluating (and understanding) risk and understanding the process itself.

6.6 Management activities

- Describe cost, schedule and quality of management activities.
- Convey the proportion of management associated with general overhead, as well as that associated with specific projects.
- Merge the Activity Data Sheets and Risk Data Sheets.
- Improve the expression of the relationship among RDSs. Currently, it is very difficult to understand how one RDS is related to another, thus a Map of inter-relationships would be useful. (own section?)

6.7 "Minimum Safe" Activities

- A full description of activities that provide the absolute minimum level of safety must be available to managers as they make decisions.
- A better definition is needed. (It should be developed from the Safety Analysis Reports, and in general NOT include monitoring.)
- Min-safe descriptions belong in RDSs, but need work for next year.

6.8 Complex-wide Assumptions

- The National Review Panel did not focus on the complex-wide Assumptions provided in the guidance, with the exception of Land Use assumptions (generally found to be inadequate). The complex-wide assumptions need further scrutiny, and the Panel recommends that the Tier 3 Evaluation complete such a task.

6.9 Site review of Risk Data Sheets

- This year's process required the sites to review risk data sheets internally, but was very open with regard to what the review activity should look like. The Panel recommends that a rigorous review of the Risk Data Sheets for internal accuracy and completeness occur before review groups such as the NRP look at the RDSs for cross site consistency.
- A lack of accurate information in the Risk Data Sheets stymied the National Review Panel.

6.10 Software

- Numerology should be improved
    - The eight-digit number most frequently used when referring to an RDS is comprised of R9XYZZZZ, where R stands for RDS, 9X is presumably the year created, Y is an unknown (seemingly arbitrary) letter designation, and ZZZZ is a numerical sequence. This RDS number is generally connected to a Facility Code, but does not necessarily have to be (i.e, it can be exported without a facility code attached). This causes confusion because several facilities have RDSs addressing drastically different activities with the same exact number. For example in the National Review Panel stratified random sample, there are at least five sites (EML, LBL, PINEL RMI and WIPP) citing R96A0001. With only 1500 - 2000 RDSs expected from the sites, an 8 digit number should be more than adequate to incorporate a one digit code for facilities or Operations Offices.
    - The number should be specific to a given year. This year's database is troublesome because some RDSs have 96 in the number, others have 95, and still others have 94. If this is to become an iterative process, comparable from year to year, each year's numbers should be unique and non transferable to the next year.
- Glossaries of certain chemicals would be helpful for searching the database for particular substances
- Conceptual diagrams or "trees" of related RDSs would also be an invaluable search tool.

Appendix A1

National Review Panelists Participating in the Cross-Site Consistency Review

Dr. Joanna Burger, Rutgers University (CRESP), Piscataway, NJ
Mr. Bruce Church, Desert Research Institute, University of Nevada, Logandale, NV.
Mr. Brian Costner, Energy Research Foundation, Charleston, SC
Dr. Elaine Faustman, University of Washington (CRESP), Seattle, WA
Dr. Loren Habegger, Argonne National Laboratory, Argonne, IL
Dr. Rogene Henderson, Inhalation Toxicology Research Institute, Albuquerque, NM
Dr. Jack Moore, Institute for Evaluating Health Risks, Washington, D.C.
Dr. Sally O'Connor, Xavier University, New Orleans, LA
Dr. Maurice Robkin, University of Washington (CRESP), Seattle, WA

Appendix A2.

Distribution of Stratified Random Sample for Cross Site Consistency.

Public Health "A"

FACILITY	RDS #
SAVANNAH RIVER	
SR	R96A0155
SR	R96A0156
SR	R96A0132
SR	R96A0199
SR	R96A0065
SR	R96A0103
ROCKY FLATS	
RFP	R96A0037
RFP	R96A0049
RFP	R96A0056
RICHLAND	
HANFS	R96N0184
HANFS	R96N0196
HANFS	R96N0009
HANFS	R96N0114
HANFS	R95T0005
HANFS	R96N0294
OAK RIDGE	
K25	R94A0022
ORNL	R96D0007
WSRAP	R96L0004
IDAHO	
INEL	R96C0065
INEL	R96C0044
INEL	R96D0002
OTHER	
ANLE	R96A0005
ANLE	R96A0007
ANLW	R96A0005
BNL	R96Z0003
GASD	R95D0001
GJPO	R96S0004
LLNL	R96B0001
MOUND	R96W0006
PANTE	R96A0004

Public Health "B"

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0036
RFP	R96A0020
RFP	R96A0032
SAVANNAH RIVER	
SR	R96A0036
SR	R96A0138
SR	R96A0077
SR	R95C0007
SR	R96A0189
SR	R96A0215
RICHLAND	
HANFS	R96N0141
HANFS	R95N0001
HANFS	R95N0293
HANFS	R95N0234
HANFS	R95N0102
HANFS	R95N0014
OAK RIDGE	
K25	R96H0007
ORNL	R95B0087
ORNL	R96Y0011
IDAHO	
INEL	R96B0030
INEL	R96B0010
INEL	R96D0008
OTHER	
SNL	R96A0035
ANLW	R96A0007
SNL	R96P0009
PPPL	R96A0008
NTS	R96A0003
LLNL	R96A0010
LANL	R96E0067
BNL	R96Z0001
ETEC	R96A0009

Occupational "A"

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0025
RFP	R96A0033
RFP	R96A0041
SAVANNAH RIVER	
SR	R96A0201
SR	R96A0046
SR	R96A0083
SR	R96A0131
SR	R96A0169
SR	R96A0196
RICHLAND	
HANFS	R96N0178
HANFS	R96N0028
HANFS	R96N0239
HANFS	R96N0096
HANFS	R96N0283
HANFS	R96N0075
OAK RIDGE	
ORNL	R94H0016
PADUC	R94F0057
Y12	R94C0005
IDAHO	
INEL	R96A0009
INEL	R96C0067
INEL	R96B0036
OTHER	
AMES	R96A0008
BNL	R96Z0007
GJPO	R96A0014
GJPO	R96A0017
GJPO	R96A0024
LLNL	R96A0020
SNL	R96A0014
SNL	R96A0026
WIPP	R96A0001

Occupational "B".

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0024
RFP	R96A0029
RFP	R96A0040
SAVANNAH RIVER	
SR	R96A0208
SR	R96A0217
SR	R96A0025
SR	R96A0124
SR	R96A0168
SR	R96A0206
RICHLAND	
HANFS	R95B0029
HANFS	R96N0220
HANFS	R96N0004
HANFS	R96N0207
HANFS	R95B0028
HANFS	R96N0230
OAK RIDGE	
K25	R96H0008
PADUC	R94F0018
Y12	R94C0004
IDAHO	
INEL	R96C0057
INEL	R96C0084
INEL	R96B0013
OTHER	
FN	R96A0014
GJPO	R96A0016
GJPO	R96A0018
GJPO	R96A0025
LANL	R96E0002
LANL	R96E0064
NTS	R95D0006
RMI	R96A0001
SNL	R96A0024

Environment

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0046
RFP	R96A0043
RFP	R96A0030
RFP	R96A0039
RFP	R96A0051
RFP	R96A0035
SAVANNAH RIVER	
SR	R96A0026
SR	R96A0044
SR	R96A0102
SR	R96A0080
SR	R96A0132
SR	R96A0193
SR	R96C0003
SR	R96B0005
SR	R96A0143
SR	R96A0049
SR	R96A0090
SR	R96A0165
RICHLAND	
HANFS	R96N0187
HANFS	R96N0027
HANFS	R96N0115
HANFS	R96N0169
HANFS	R96N0073
HANFS	R96N0082
HANFS	R95C0007
HANFS	R96N0056
HANFS	R95T0001
HANFS	R96N0186
HANFS	R95B0024
HANFS	R96N0098

OAK RIDGE	
K25	R9600009
K25	R96W0003
ORNL	R94H0013
ORNL	R94A0011
PORTS	R94G0006
PORTS	R94G0017
IDAHO	
INEL	R96D0159
INEL	R96C0034
INEL	R96C0040
INEL	R96D0137
INEL	R96B0024
INEL	R96A0006
OTHER	
ANILE	R96A0002
BNL	R96Z0005
EML	R96A0001
KCP	R96A0022
LANL	R96E0045
LLNL	R96B0011
LLNL	R96A0012
NTS	R95D0015
NTS	R96A0004
SNL	R96P0032
SNL	R96A0013
NVO	R95D0003
FNAL	R96A0005
BNL	R96A0009
GJPO	R96A0011
LANL	R96E0055
MOUND	R96T0006
PANTE	R96A0024

Social Cultural/Economic

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0018
RFP	R96A0031
RFP	R96A0052
RFP	R96A0053
RFP	R96A0050
RFP	R96A0021
SAVANNAH RIVER	
SR	R96A0040
SR	R96A0230
SR	R96A0128
SR	R96A0136
SR	R96A0144
SR	R96A0173
SR	R96A0176
SR	R96A0182
SR	R96A0185
SR	R96A0186
SR	R96A0207
SR	R96A0219
RICHLAND	
HANFS	R95C0008
HANFS	R96N0121
HANFS	R96N0018
HANFS	R96N0099
HANFS	R96N0248
HANFS	R96N0087
HANFS	R96N0237
HANFS	R96N0058
HANFS	R96N0172
HANFS	R96N0017
HANFS	R96N0290
HANFS	R96N0284
OAK RIDGE	
K25	R94H0037
K25	R9600002
OR	R96G0017
Y12	R96B0012
ORNL	R94H0023
PADUC	R96T0001
IDAHO	
INEL	R96C0072
INEL	R96C0076
INEL	R96B0015
INEL	R96B0018
INEL	R96D0116
INEL	R96C0160
OTHER	
BNL	R96Z0011
AMES	R96A0009
FN	R96A0008
GASD	R96A0001
GJPO	R96A0037
LANL	R96E0038
LANL	R96E0048
LANL	R96E0059
SNL	R96A0034
PANTE	R96A0013
OH	R96H0002
UCD	R95D0004
SNL	R96P0002
MOUND	R96E0023
LLNL	R96A0024
LANL	R96E0019
LANL	R96W0053
NTS	R96A0016

Unit of Analysis

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0026
RFP	R96A0034
RFP	R96A0042
SAVANNAH RIVER	
SR	R96D0005
SR	R96A0223
SR	R96A0194
SR	R96A0058
SR	R96A0119
SR	R96B0001
RICHLAND	
HANFS	R96N0191
HANFS	R95W0006
HANFS	R6N0049
HANFS	R6N0097
HANFS	R6N0231
HANFS	R5C0006
OAK RIDGE	
ORNL	R96D0006
K25	R96S0012
K25	R96S0003
IDAHO	
INEL	R96B0031
INEL	R96D0089
INEL	R96D0001
OTHER	
AL	R96P0002
GEV	R95D0002
LANL	R96W0022
LANL	R96E0050
MOUND	R96T0001
NTS	R95D0015
NTS	R96A0010
NVO	R96A0003
PINEL	R96A0002
SNL	R96A0017

Land Use

FACILITY	RDS #
ROCKY FLATS	
RFP	R96A0028
RFP	R96A0038
RFP	R96A0054
SAVANNAH RIVER	
SR	R96A0191
SR	R96A0042
SR	R96A0007
SR	R96A0061
SR	R96A0197
SR	R96A0087
RICHLAND	
HANFS	R96N0224
HANFS	R96N0034
HANFS	R96N0143
HANFS	R96N0228
HANFS	R96N0249
HANFS	R95J0001
OAK RIDGE	
ORNL	R96F0002
K25	R96W0001
K25	R96S0007
INEL	R96C0088
INEL	R96B0026
INEL	R96D0090
OTHER	
FN	R96A0012
GJPO	R96S0008
LANL	R96E0020
LBL	R96A0001
NTS	R95A0006
NTS	R96A0004
NVO	R95C0002
PINEL	R96A0001
SNL	R96P0015
SNL	R96A0015

Management. 1

ROCKY FLATS	
RFP	R96A0121
SAVANNAH RIVER	
SR	R96A0001
RICHLAND	
HANFS	R95N0121
OAK RIDGE	
OR	R96J0001
IDAHO	
INEL	R96C0090
OTHER	
AL	R96P0003
CH	R96W0008
NVO	R96A0002
OH	R96H0002
OAK	R96E0001

Appendix A3
Risk Data Sheets Evaluated as Part of the Cross-Site Consistency Review of Groundwater Remediation Activities

	OPS OFFICE	Facility	EM OFFICE	RDS Number
1	AL	LANL	40	R96E0018
2	ID	INEL	30	R96C0142
3	ID	INEL	30	R96C0164
4	ID	INEL	40	R96C0032
5	ID	INEL	40	R96C0035
6	ID	INEL	40	R96C0036
7	ID	INEL	40	R96C0040
8	ID	INEL	40	R96C0041
9	ID	INEL	40	R96C0045
10	ID	INEL	40	R96D0149
11	OR	K25	40	R94A0018
12	OR	K25	40	R94A0022
13	OR	K25	40	R96W0004
14	OR	K25	40	R96W0005
15	OR	K25	40	R96W0006
16	OR	OR	40	R96G0020
17	OR	OR	40	R96G0021
18	OR	ORNL	30	R96D0006
19	OR	ORNL	30	R96D0007
20	OR	ORNL	40	R94A0011
21	OR	ORNL	40	R94H0012
22	OR	ORNL	40	R94H0016
23	OR	ORNL	40	R94H0019
24	OR	ORNL	40	R94H0023
25	OR	ORNL	40	R95M0063
26	OR	ORNL	40	R96Y0001
27	OR	ORNL	40	R96Y0010
28	OR	ORNL	40	R96Y0011
29	OR	Y12	30	R96B0003
30	OR	Y12	30	R96B0004
31	OR	Y12	30	R96B0009
32	OR	Y12	30	R96B0010
33	RL	HANFS	30	R96N0108
34	RL	HANFS	30	R96N0120
	OPS OFFICE	Facility	EM OFFICE	RDS Number
35	RL	HANFS	30	R96N0174

36	RL	HANFS	30	R96N0232
37	RL	HANFS	40	R96N0071
38	RL	HANFS	40	R96N0072
39	RL	HANFS	40	R96N0073
40	RL	HANFS	40	R96N0074
41	RL	HANFS	40	R96N0075
42	RL	HANFS	40	R96N0086
43	RL	HANFS	40	R96N0087
44	RL	HANFS	40	R96N0088
45	RL	HANFS	40	R96N0090
46	RL	HANFS	40	R96N0137
47	RL	HANFS	40	R96N0251
48	RL	HANFS	40	R96N0252
49	SR	SR	40	R96A0018
50	SR	SR	40	R96A0064
51	SR	SR	40	R96A0065
52	SR	SR	40	R96A0066
53	SR	SR	40	R96A0067
54	SR	SR	40	R96A0074
55	SR	SR	40	R96A0075
56	SR	SR	40	R96A0076
57	SR	SR	40	R96A0078
58	SR	SR	40	R96A0080
59	SR	SR	40	R96A0098
60	SR	SR	40	R96A0100
61	SR	SR	40	R96A0101
62	SR	SR	40	R96A0102
63	SR	SR	40	R96A0103
64	SR	SR	40	R96A0104
65	SR	SR	40	R96A0106

Appendix B1

Panelists Participating in the Independent Verification of RDS Values

Dr. Joan M. Daisey, Lawrence Berkeley National Laboratory, Berkeley, CA
Mr. John Kindinger, PLG Incorporated, Newport Beach, CA
Dr. Frank Parker, Vanderbilt University, Nashville, TN
Mr. Ralph Patt, Oregon Department of Water Resources, Salem, OR
Dr. Maurice Robkin, University of Washington (CRESP), Seattle, WA

Appendix B2

Risk Data Sheets Reviewed for Independent Verification of RDS Values

HANFS -- R96N0075
HANFS --R96N0088
INEL -- R96C0032
INEL -- R96C0041
INEL -- R96C00045;
INEL -- R96D0149
ORNL -- R94H0023
ORNL -- R96Y0010
HANFS -- R95W0004
HANFS -- R96N0124
SRS -- R96A0008
SRS -- R96A0009
SRS -- R96A0024

Complete Hard Copies of these Risk Data Sheets

Appendix B3

Bibliography of Supporting Documentation used for Independent Verification of RDS Values

Section I. Plumes

1. Auditable Safety Analysis for Test Area North TSF-05 Injection Well and Surrounding Groundwater Contamination Interim Action Groundwater Remediation Operable Unit 1-07A.; INEL; Doc. No. 01.07A.1.1.110.01, Rev. 2 , Dec. 20. 1993.
2. Record of Decision -- Technical Support Facility (TSF) Injection Well (TSF-05) and Surrounding Groundwater Contamination(TSF-23), Operable Unit 1-07A, Waste Area Group 1; INEL; Sept. 1992.
3. Record of Decision -- Declaration for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscelaneous No Action Sites Final Remediation Action, Operable Unit 1-07B, Waste Area Group 1; INEL; August 4, 1995.
4. Record of Decision -- Declaration for Organic Contamination in the Vadose Zone, Radioactive Waste Management Complex, Subsurface Disposal Area, Operable Unit 7-08; INEL; November 1994.
5. Z Plant Aggregate Area Management Study Report, Hanford; DOE/RL-91-58, Rev. 0, pp. 3-35; 1993.
6. Hanford Site Ground Water Protection Management Plan; DOE/RL-89-12, Rev. 2, pp. 5-21; 1994.

Section II: Landfills

1. Record of Decision -- Declaration for Pit 9 at the Radioactive Waste Management Complex, Subsurface Disposal Area; INEL; October 1993.
2. Record of Decision -- Declarations for Pad A at the Radioactive Waste Management Complex, Subsurface Disposal Area, Operable Unit 7-12; INEL; January 1994.
3. Auditable Safety Analysis for Environmental Restoration Activities at INEL; INEL-95/0088, Rev. 3; June 1995.
4. Hazard Classification of Environmental Restoration Activities at the INEL; R.G. Peatross; INEL-96/0054, Rev. 0; April 1996.
5. Draft RCRA Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, TN; Vol. 3, App. 1-8; ORNL/ER/Sub-87-99053/5/V3; Sept. 1991.
6. Draft RCRA Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, TN; Vol. 1, Section 1-3; ORNL/ER/Sub-87-99053/5/V1; Sept. 1991.
7. Draft RCRA Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory -- Closure Plan, Oak Ridge, TN; Vol. 1; ORNL/RAP/Sub-87/99053/9&V1/R1; Aug. 1988.
8. Draft “Risks and the Risk Debate -- Searching for Common Ground, The First Step”; Vol. 1; U.S. DOE; June 1995.

Section III. Tanks

1. Draft Environmental Impact Statement for the Tank Waste Remediation System; Vol. 4, App. E-F; DOE/EIS-0189D; April 1996.
2. “Potential Accidents with Radiological and Toxicological Source Term for Hanford Tank Waste Remediation System Environmental Impact Statement”; WHC-SD-WM-ANAL-041, Rev. 0; June 1995.

Appendix C
Data Analysis

Contents

Table C1. Summary of Risk Data Sheets By Operations Offices and EM Offices

		EM Office						
		20	30	40	60	70	Others	Total
Total	N	9	465	538	248	99	49	1408
Albuquerque	N	0	77	160	0	11	0	248
	% EM Office	0	16.6	29.7	0	11.1	0	17.6
	% From AL	0	31.0	64.5	0	4.4	0	100.0
	% Total	0	5.5	11.4	0	0.8	0	17.6
Chicago	N	0	35	38	0	5	2	80
	% EM Office	0	7.5	7.1	0	5.1	4.1	5.7
	% From CH	0	43.8	47.5	0	6.3	2.5	100.0
	% Total	0	2.5	2.7	0	0.4	0.1	5.7
Idaho	N	0	62	21	51	18	0	152
	% EM Office	0	13.3	3.9	20.6	18.2	0	10.8
	% From ID	0	40.8	13.8	33.6	11.8	0	100.0
	% Total	0	4.4	1.5	3.6	1.3	0	10.8
Nevada	N	0	25	17	1	2	1	46
	% EM Office	0	5.4	3.2	0.4	2.0	2.0	3.3
	% From NV	0	54.3	37.0	2.2	4.3	2.2	100.0
	% Total	0	1.8	1.2	0.1	0.1	0.1	3.3
Oakland	N	1	27	48	1	0	0	77
	% EM Office	11.1	5.8	8.9	0.4	0	0	5.5
	% From OA	1.3	35.1	62.3	1.3	0	0	100.0
	% Total	0.1	1.9	3.4	0.1	0	0	5.5
Ohio	N	2	2	21	1	28	0	54
	% EM Office	22.2	0.4	3.9	0.4	28.3	0	3.8
	% From OH	3.7	3.7	38.9	1.9	51.9	0	100.0
	% Total	0.1	0.1	1.5	0.1	2.0	0	3.8
Oak Ridge	N	0	46	127	8	4	17	202
	% EM Office	0	9.9	23.6	3.2	4.0	34.7	14.3
	% From OR	0	22.8	62.9	4.0	2.0	8.4	100.0
	% Total	0	3.3	9.0	0.6	0.3	1.2	14.3
Rocky Flats	N	0	0	30	0	0	0	30
	% EM Office	0	0	5.6	0	0	0	2.1
	% From RF	0	0	100.0	0	0	0	100.0
	% Total	0	0	2.1	0	0	0	2.1

		EM Office						
		20	30	40	60	70	Others	Total
Richland	N	4	135	34	25	22	29	249
	% EM Office	44.4	29.0	6.3	10.1	22.2	59.2	17.7
	% From RL	1.6	54.2	13.7	10.0	8.8	11.6	100.0
	% Total	0.3	9.6	2.4	1.8	1.6	2.1	17.7
Savannah	N	2	56	42	161	9	0	270
River	% EM Office	22.2	12.0	7.8	64.9	9.1	0	19.2
	% From SR	0.7	20.7	15.6	59.6	3.3	0	100.0
	% Total	0.1	4.0	3.0	11.4	0.6	0	19.2

% EM Office = The percentage of total number of RDSs from an EM Office that have come from a particular Operations Office. For example 77 Rds came from AL EM-30. This is 16.6 % of the total number of RDSs from EM-30 (465).

% From Ops Office (e.g. % From AL) = The percentage of total number of RDSs from an Operations Office that have come from a particular EM Office. For example 77 Rds came from AL EM-30. This is 31.0 % of the total number of RDSs from AL (248).

% Total = The pecentage of the total number of RDSs (1408) which came from a particular EM Office within an Operations Office. For example 77 Rds came from AL EM-30. This is 5.5% of the total number of RDSs (1408).

Table C2. Mean and range of total costs (in thousands of dollars) for 1998 for Each Operations Office and EM Office classification.

		EM Program Office						
Operations Office		**20**	**30**	**40**	**50**	**60**	**70**	**ALL**
Albuquerque	N	0	77	160	0	11	0	248
	Mean	0	1735	1260	0	1535	0	1419
	Max	0	13633	14753	0	8601	0	14753
	Min	0	51	5	0	0	0	0
Chicago	N	0	35	38	0	5	2	80
	Mean	0	700	886	0	1040	3000	867
	Max	0	2469	9385	0	0	5500	9385
	Min	0	0	0	0	0	0	0
Idaho	N	0	62	21	51	18	0	152
	Mean	0	2390	3995	3303	1710	0	2838
	Max	0	12903	48758	17091	7046	0	48758
	Minv	0	25	66	0	152	0	0
Nevada	N	0	25	17	1	2	1	46
	Mean	0	744	3257	0	0	0	1608
	Max	0	3543	15475	0	0	0	15475
	Min	0	0	0	0	0	0	0
Oakland	N	1	27	48	1	0	0	77
	Mean	9286	2236	758	13700	0	0	1555
	Max	9286	12794	3655	13700	0	0	13700
	Min	9286	90	0	13700	0	0	0
Ohio	N	2	2	21	1	28	0	54
	Mean	13981	60000	12332	2195	4290	0	9801
	Max	22600	66700	54226	2195	17354	0	66700
	Min	5362	53300	0	2195	0	0	0
Oak Ridge	N	0	46	127	8	4	17	202
	Mean	0	4107	3831	1442	2832	1061	3546
	Max	0	30000	29785	30271	5800	3370	30000
	Min	0	56	0	221	100	45	0

Operations Office		EM Program Office 20	30	40	50	60	70	ALL
Rocky Flats	N	0	0	30	0	0	0	30
	Mean	0	0	17978	0	0	0	17978
	Max	0	0	90208	0	0	0	90208
	Min	0	0	63	0	0	0	63
Richland	N	4	135	34	25	22	29	249
	Mean	17531	7419	4282	12137	2609	2359	6613
	Max	57122	280000	5492	68050	12219	13949	280000
	Min	0	0	0	0	0	0	0
Savannah	N	2	56	42	161	9	0	270
River	Mean	30555	9975	2687	3956	3086	0	5175
	Max	51000	94324	23866	51168	117151	0	94324
	Min	10110	0	-213	-60	625	0	-213

Mean = The average total cost (in thousands of dollars) for 1998 for each Operations Office and EM Office classification.

Max = The maximum total cost (in thousands of dollars) for 1998 for each Operations Office and EM Office classification.

Min = The minimum total cost (in thousands of dollars) for 1998 for each Operations Office and EM Office classification.

Explanation of Table C3. Comparison of Risk Data Sheets Sampled for Report Card Analysis to Those Not Sampled.

This series of tables compares the RDS sheets that were sampled for the Report Card analysis to those that were not sampled. The tables are listed by operations office. Each table displays the number and percent of the not sampled and sampled RDS's for each EM office and the Before risk level (MEM) for each categories.

This table compares mean and range of total costs for 1998 for the sampled and not sampled RDS's by operations office.

Note: There were a total of 30 RDS's from Rocky Flats. All were included for the report card analysis.

NA = An NA was placed in the field or the field was left blank.

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

a. Operations Office: Albuquerque

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	30	64	31.2	13	30.2	77
	40	132	64.4	28	65.1	160
	70	9	4.4	2	4.7	11
Public Safety Before	H	5	2.4	0	0	5
	L	117	57.1	23	53.5	140
	M	62	30.2	13	30.2	75
	NA	21	10.2	7	16.3	28
Site Personnel Before	H	4	2.0	0	0	4
	L	100	48.8	21	48.8	121
	M	58	28.3	10	23.3	68
	NA	43	21.0	12	27.9	55
Environmental Before	H	19	9.3	2	4.7	21
	L	76	37.1	17	39.5	93
	M	92	44.9	18	41.9	110
	NA	18	8.8	6	14.0	24
Compliance Before	H	144	70.2	26	60.5	170
	L	15	7.3	5	11.6	20
	M	40	19.5	10	23.3	50
	NA	6	2.9	2	4.7	8
Mission Impact Before	H	65	31.7	10	23.3	75
	L	20	9.8	8	18.6	28
	M	65	31.7	14	32.6	79
	NA	55	26.8	11	25.6	66
Mortgage Reduction Before	H	46	22.4	5	11.6	51
	L	17	8.3	1	2.3	18
	M	69	33.7	21	48.8	90
	NA	73	35.6	16	37.2	89
Social/Cultural Before	H	46	22.4	11	25.6	57
	L	31	15.1	2	4.7	33
	M	93	45.4	23	53.5	116
	NA	35	17.1	7	16.3	42
	ALL	205	100.0	43	100.0	248

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

b. Operations Office:Chicago

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	30	27	42.2	8	50.0	35
	40	31	48.4	7	43.8	38
	70	4	6.3	1	6.3	5
	Other	2	3.1	0	0	2
Public Safety	H	9	14.1	4	25.0	13
Before	L	29	45.3	8	50.0	37
	M	26	40.6	4	25.0	30
Site Personnel	H	9	14.1	4	25.0	13
Before	L	25	39.1	5	31.3	30
	M	30	46.9	7	43.8	37
Environmental	H	14	21.9	6	37.5	20
Before	L	6	9.4	3	18.8	9
	M	44	68.8	7	43.8	51
Compliance	H	36	56.3	9	56.3	45
Before	L	4	6.3	0	0	4
	M	24	37.5	7	43.8	31
Mission Impact	H	32	50.0	11	68.8	43
Before	L	5	7.8	2	12.5	7
	M	27	42.2	3	18.8	30
Mortgage	H	18	28.1	4	25.0	22
Reduction	L	5	7.8	3	18.8	8
Before	M	40	62.5	9	56.3	49
	NA	1	1.6	0	0	1
Social/Cultural	H	23	35.9	3	18.8	26
Before	L	20	31.3	6	37.5	26
	M	20	31.3	7	43.8	27
	NA	1	1.6	0	0	1
	ALL	64	100.0	16	100.0	80

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

c. Operations Office:Idaho

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	30	50	40.7	12	41.4	62
	40	17	13.8	4	13.8	21
	60	41	33.3	10	34.5	51
	70	15	12.2	3	10.3	18
Public Safety	H	2	1.6	1	3.4	3
Before	L	55	44.7	16	55.2	71
	M	22	17.9	6	20.7	28
	NA	44	35.8	6	20.7	50
Site Personnel	H	14	11.4	2	6.9	16
Before	L	42	34.1	12	41.4	54
	M	41	33.3	12	41.4	53
	NA	26	21.1	3	10.3	29
Environmental	H	9	7.3	3	10.3	12
Before	L	48	39.0	11	37.9	59
	M	25	20.3	11	37.9	36
	NA	41	33.3	4	13.8	45
Compliance	H	71	57.7	20	69.0	91
Before	L	4	3.3	1	3.4	5
	M	31	25.2	7	24.1	38
	NA	17	13.8	1	3.4	18
Mission Impact	H	77	62.6	20	69.0	97
Before	L	1	0.8	1	3.4	2
	M	32	26.0	5	17.2	37
	NA	13	10.6	3	10.3	16
Mortgage	H	20	16.3	8	27.6	28
Reduction	L	2	1.6	0	0	2
Before	M	31	25.2	8	27.6	39
	NA	70	56.9	13	44.8	83
Social/Cultural	H	53	43.1	15	51.7	68
Before	L	10	8.1	2	6.9	12
	M	34	27.6	10	34.5	44
	NA	26	21.1	2	6.9	28
	ALL	123	100.0	29	100.0	152

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

d. Operations Office:Nevada

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	30	20	55.6	5	50.0	25
	40	13	36.1	4	40.0	17
	60	1	2.8	0	0	1
	70	1	2.8	1	10.0	2
	Other	1	2.8	0	0	1
Public Safety	H	1	2.8	0	0	1
Before	L	21	58.3	7	70.0	28
	M	4	11.1	0	0	4
	NA	10	27.8	3	30.0	13
Site Personnel	L	26	72.2	6	60.0	32
Before	M	4	11.1	1	10.0	5
	NA	6	16.7	3	30.0	9
Environmental	H	1	2.8	0	0	1
Before	L	24	66.7	6	60.0	30
	M	7	19.4	2	20.0	9
	NA	4	11.1	2	20.0	6
Compliance	H	22	61.1	7	70.0	29
Before	L	4	11.1	0	0	4
	M	8	22.2	3	30.0	11
	NA	2	5.6	0	0	2
Mission Impact	H	26	72.2	8	80.0	34
Before	L	2	5.6	0	0	2
	M	7	19.4	1	10.0	8
	NA	1	2.8	1	10.0	2
Mortgage	H	14	38.9	4	40.0	18
Reduction	L	5	13.9	1	10.0	6
Before	M	15	41.7	5	50.0	20
	NA	2	5.6	0	0	2
Social/Cultural	H	4	11.1	0	0	4
Before	L	9	25.0	3	30.0	12
	M	16	44.4	2	20.0	18
	NA	7	19.4	5	50.0	12
	ALL	36	100.0	10	100.0	46

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

e. Operations Office:Oakland

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	20	1	1.5	0	0	1
	30	23	35.4	4	33.3	27
	40	41	63.1	7	58.3	48
	60	0	0	1	8.3	1
Public Safety Before	H	7	10.8	4	33.3	11
	L	16	24.6	2	16.7	18
	M	32	49.2	6	50.0	38
	NA	10	15.4	0	0	10
Site Personnel Before	H	5	7.7	1	8.3	6
	L	9	13.8	2	16.7	11
	M	39	60.0	9	75.0	48
	NA	12	18.5	0	0	12
Environmental Before	H	15	23.1	3	25.0	18
	L	11	16.9	5	41.7	16
	M	30	46.2	4	33.3	34
	NA	9	13.8	0	0	9
Compliance Before	H	54	83.1	8	66.7	62
	L	2	3.1	1	8.3	3
	M	7	10.8	3	25.0	10
	NA	2	3.1	0	0	2
Mission Impact Before	H	45	69.2	8	66.7	53
	L	3	4.6	0	0	3
	M	13	20.0	3	25.0	16
	NA	4	6.2	1	8.3	5
Mortgage Reduction Before	H	42	64.6	9	75.0	51
	L	3	4.6	0	0	3
	M	9	13.8	2	16.7	11
	NA	11	16.9	1	8.3	12
Social/Cultural Before	H	36	55.4	7	58.3	43
	L	8	12.3	2	16.7	10
	M	11	16.9	2	16.7	13
	NA	10	15.4	1	8.3	11
	ALL	65	100.0	12	100.0	77

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

f. Operations Office:Ohio

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	20	1	2.2	1	11.1	2
	30	2	4.4	0	0	2
	40	17	37.8	4	44.4	21
	60	1	2.2	0	0	1
	70	24	53.3	4	44.4	28
Public Safety	H	24	53.3	5	55.6	29
Before	L	4	8.9	0	0	4
	M	12	26.7	1	11.1	13
	NA	5	11.1	3	33.3	8
Site Personnel	H	13	28.9	2	22.2	15
Before	L	5	11.1	2	22.2	7
	M	22	48.9	2	22.2	24
	NA	5	11.1	3	33.3	8
Environment	H	31	68.9	5	55.6	36
Before	L	1	2.2	0	0	1
	M	8	17.8	1	11.1	9
	NA	5	11.1	3	33.3	8
Compliance	H	41	91.1	7	77.8	48
Before	M	3	6.7	2	22.2	5
	NA	1	2.2	0	0	1
Mission Impact	H	42	93.3	8	88.9	50
Before	M	2	4.4	0	0	2
	NA	1	2.2	1	11.1	2
Mortgage	H	39	86.7	8	88.9	47
Reduction	M	2	4.4	0	0	2
Before	NA	4	8.9	1	11.1	5
Social/Cultural	H	40	88.9	8	88.9	48
Before	M	3	6.7	1	11.1	4
	NA	2	4.4	0	0	2
	ALL	45	100.0	9	100.0	54

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

g. Operations Office:Oak Ridge

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	30	39	22.7	7	23.3	46
	40	109	63.4	18	60.0	127
	60	7	4.1	1	3.3	8
	70	3	1.7	1	3.3	4
	Other	14	8.1	3	10.0	17
Public Safety Before	H	58	33.7	12	40.0	70
	L	3	1.7	1	3.3	4
	M	86	50.0	12	40.0	98
	NA	25	14.5	5	16.7	30
Site Personnel Before	H	68	39.5	15	50.0	83
	L	3	1.7	3	10.0	6
	M	76	44.2	9	30.0	85
	NA	25	14.5	3	10.0	28
Environmental Before	H	74	43.0	10	33.3	84
	L	8	4.7	2	6.7	10
	M	66	38.4	15	50.0	81
	NA	24	14.0	3	10.0	27
Compliance Before	H	148	86.0	26	86.7	174
	L	2	1.2	1	3.3	3
	M	4	2.3	0	0	4
	NA	18	10.5	3	10.0	21
Mission Impact Before	H	140	81.4	25	83.3	165
	L	2	1.2	0	0	2
	M	9	5.2	3	10.0	12
	NA	21	12.2	2	6.7	23
Mortgage Reduction Before	H	117	68.0	20	66.7	137
	L	12	7.0	4	13.3	16
	M	12	7.0	2	6.7	14
	NA	31	18.0	4	13.3	35
Social/Cultural Before	H	77	44.8	14	46.7	91
	L	32	18.6	5	16.7	37
	M	29	16.9	6	20.0	35
	NA	34	19.8	5	16.7	39
	ALL	172	100.0	30	100.0	202

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

h. Operations Office:Richland

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	20	3	1.6	1	1.7	4
	30	102	54.0	33	55.0	135
	40	26	13.8	8	13.3	34
	60	19	10.1	6	10.0	25
	70	17	9.0	5	8.3	22
	Other	22	11.6	7	11.7	29
Public Safety Before	H	30	15.9	7	11.7	37
	L	52	27.5	17	28.3	69
	M	84	44.4	31	51.7	115
	NA	23	12.2	5	8.3	28
Site Personnel Before	H	44	23.3	12	20.0	56
	L	31	16.4	10	16.7	41
	M	92	48.7	34	56.7	126
	NA	22	11.6	4	6.7	26
Environmental Before	H	49	25.9	16	26.7	65
	L	28	14.8	8	13.3	36
	M	83	43.9	31	51.7	114
	NA	29	15.3	5	8.3	34
Compliance Before	H	116	61.4	44	73.3	160
	L	6	3.2	0	0	6
	M	55	29.1	14	23.3	69
	NA	12	6.3	2	3.3	14
Mission Impact Before	H	118	62.4	40	66.7	158
	L	8	4.2	3	5.0	11
	M	46	24.3	14	23.3	60
	NA	17	9.0	3	5.0	20
Mortgage Reduction Before	H	90	47.6	35	58.3	125
	L	11	5.8	0	0	11
	M	44	23.3	12	20.0	56
	NA	44	23.3	13	21.7	57
Social/Cultural Before	H	111	58.7	39	65.0	150
	L	18	9.5	4	6.7	22
	M	43	22.8	12	20.0	55
	NA	17	9.0	5	8.3	22
	ALL	189	100.0	60	100.0	249

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

i. Operations Office:Savannah River

		Sampled				
		No		Yes		All
		N	%	N	%	N
EM Office	20	1	0.5	1	1.7	2
	30	44	21.0	12	20.0	56
	40	33	15.7	9	15.0	42
	60	125	59.5	36	60.0	161
	70	7	3.3	2	3.3	9
Public Safety Before	H	45	21.4	9	15.0	54
	L	21	10.0	4	6.7	25
	M	111	52.9	37	61.7	148
	NA	33	15.7	10	16.7	43
Site Personnel Before	H	13	6.2	2	3.3	15
	L	55	26.2	18	30.0	73
	M	117	55.7	37	61.7	154
	NA	25	11.9	3	5.0	28
Environmental Before	H	75	35.7	20	33.3	95
	L	3	1.4	0	0	3
	M	104	49.5	33	55.0	137
	NA	28	13.3	7	11.7	35
Compliance Before	H	136	64.8	40	66.7	176
	L	7	3.3	1	1.7	8
	M	46	21.9	13	21.7	59
	NA	21	10.0	6	10.0	27
Mission Impact Before	H	166	79.0	49	81.7	215
	M	26	12.4	6	10.0	32
	NA	18	8.6	5	8.3	23
Mortgage Reduction Before	H	143	68.1	45	75.0	188
	M	34	16.2	7	11.7	41
	NA	33	15.7	8	13.3	41
Social/Cultural Before	H	148	70.5	40	66.7	188
	M	35	16.7	14	23.3	49
	NA	27	12.9	6	10.0	33
	ALL	210	100.0	60	100.0	270

Table C3 Comparison of RDS Sheets Sampled for the Report Card Analysis to Those Not Sampled by Operations Office, EM Office, and 'Before' Risk Levels for Each Category.

j. Operations Office:Rocky Flats (Note All RDSs from Rocky Flats were sampled.)

		Sampled		
		Yes		All
		N	%	N
EM Office	40	30	100.0	30
Public Safety	H	2	6.7	2
Before	L	13	43.3	13
	M	6	20.0	6
	NA	9	30.0	9
Site Personnel	H	6	20.0	6
Before	L	16	53.3	16
	M	7	23.3	7
	NA	1	3.3	1
Environmental	H	2	6.7	2
Before	L	13	43.3	13
	M	10	33.3	10
	NA	5	16.7	5
Compliance	H	9	30.0	9
Before	L	5	16.7	5
	M	13	43.3	13
	NA	3	10.0	3
Mission Impact	H	14	46.7	14
Before	L	2	6.7	2
	M	12	40.0	12
	NA	2	6.7	2
Mortgage	H	15	50.0	15
Reduction	L	4	13.3	4
Before	M	5	16.7	5
	NA	6	20.0	6
Social/Cultural	H	2	6.7	2
Before	L	2	6.7	2
	M	1	3.3	1
	NA	25	83.3	25
	ALL	30	100.0	30

Table C4 Comparison of RDS Sheets in the Stratified Random Sample and Those Not Sampled by Total Costs for the Operations Office.

Operations Office		Sampled: No	Sampled: Yes	All
Albuquerque	N	205	43	248
	Mean	1352	1743	1419
	Range	0 - 14753	45 - 13633	0 - 14753
Chicago	N	64	16	80
	Mean	859	897	867
	Range	0 - 9385	0 - 2469	0 - 9385
Idaho	N	123	29	152
	Mean	2932	2438	2838
	Range	0 - 48758	66 - 8300	0 - 48758
Nevada	N	36	10	46
	Mean	1914	507	1608
	Range	0 - 15475	0 - 2320	0 - 15475
Oakland	N	65	12	77
	Mean	1193	3516	1555
	Range	0 - 12794	20 - 13700	0 - 13700
Ohio	N	45	9	54
	Mean	9157	13022	9801
	Range	0 - 66700	595 - 54226	0 - 66700
Oak Ridge	N	172	30	202
	Mean	3579	3363	3546
	Range	0 - 30000	0 - 14330	0 - 30000
Rocky Flats	N	0	30	30
	Mean	0	17978	17978
	Range	0	63 - 90208	63 - 90208
Richland	N	189	60	249
	Mean	5857	8994	6613
	Range	0 - 147000	0 - 280000	0 - 280000
Savannah River	N	210	60	270
	Mean	5790	3023	5175
	Range	-60 - 94324	-213 - 26333	-213 - 94324

Table C5. EM Management Plan, NRP Task #1, Indexed by Ops Office, EM Office, and FY 1998 Total Costs, Stratified Random Sample of 300.

This table was created directly from the EMMP Software. It sorts the RDSs by Ops Office and EM Office and Total Cost for FY 1998 (from highest to lowest).

Appendix D1
Required elements of Risk Data Sheets; An analysis of Key fields

This document was pulled together as an aid to individuals reviewing Risk Data Sheets, tools developed by the Department of Energy's Office of Environmental Management for collecting information to be used during the budget formulation process. Only the following narrative fields have been emphasized below:

Field 14. RDS Summary Description
Field 21. Evaluation Scenario
Field 22. Public Safety and Health
Field 23. Site Personnel Safety and Health
Field 24. Environmental protection
Field 25. Compliance
Field 26. Mission Impact
Field 27. Cost-effectiveness, including Mortgage Reduction
Field 28. Social/Economical/Cultural Impacts

In addition, guidance for Determining the Risk Data Sheet Scope (Unit of Analysis) and Standard Assumptions have also been provided for the information of evaluators.

Field 14. RDS Summary Description Section.

This field outlines the activity evaluated in the Management Evaluation Matrix.

Specify:

- a complete description of the activities being documented on the RDS
- underlying causes or issues driving the activities
- complete description of the problem being addressed
- physical actions being conducted
- end state of the project
- provide sufficient detail to allow an unfamiliar reader to understand the proposed activity without referencing additional documents
- if entire activity is S&H this field should include complete description, key milestones and accomplishments (if less than 100% S&H, enter these elements in field 46.

Note: during an evaluation of the RDS, this field should be reviewed for an appropriate unit of analysis. (See pages 6-7 for discussion of unit of analysis and standard assumptions.)

Field 21. Evaluation Scenario

The purpose of this field is to help the field focus on the "story(ies) behind what could cause harmful impacts and when they could occur. From a QA/QC viewpoint, this would facilitate the field's review of the RDS scenarios. Justifying RDS evaluations in the pas have beena problem beause of the lack of or realistic scenarios. Three conditions are developed in the evaluation scenario:

1 the **Before** condition establishes a situation where the activity described in the RDS is not completed.
2 the **During** condition describes the situation while the activity is conducted; and
3 the **After** condition describes the situation after the activity has been completed.

In each of these conditions, the activity should be described, then the site determines what reasonable probable impacts might occur and the time-frame in which the impacts could occur. Only one scenario should be used to evaluate all the applicable categories. This process is repeated for each of the conditions. Impacts in the MEM are then appraised in fields 22-28 based on these three conditions.

Field 22. Public Safety and Health

including potential adverse impacts on the health and safety of the off-site population surrounding a facility.

For each of the three conditions established in the evaluation scenario:

What is the impact?

1. **Immediate or eventual loss of life/permanent disability**; includes immediate deaths and disabling injuries, as well as future cancer deaths or genetic damage and effects that might result from releases of hazardous or radioactive materials that breach site boundaries;
2. **Excessive exposure and/or injury**; excessive exposures are those that exceed published acceptable exposure limits;
3. **Moderate to low-level exposure;** indicates the potential for exposure of the off-site population to hazardous or radioactive materials, but these exposures are not greater than published acceptable limits. Immediate deaths or injuries are not expected. Rates of cancer incidence in the population would not detestably increase

Specify:

- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Hazard source (chemicals, radionuclides, physical event)
- Estimated quantities of release
- Exposure setting/pathways
- Potentially exposed populations
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

Field 23. Site Personnel Safety and Health

including potential adverse impacts on the safety and health of individuals inside the facility boundary. This includes site workers and visitors.

For each of the three conditions established in the evaluation scenario:

What is the impact?

1. **Catastrophic** - Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure, or death; must have both of the following characteristics: effects spread over a wide are and are not easily containable in a limited area and the effects are irreversible or may only be reversed over a period of several years.
2. **Critical** - Injuries/illnesses resulting in permanent partial disability or temporary total disability > 3 months, or serious overexposure;
3. **Marginal** - Injuries/illnesses resulting in hospitalization, temporary, reversible illnesses with a variable but limited period of disability of < 3 months, slight overexposure, or exposure near limits (20-100%);
4. **Negligible** - Injuries/illnesses not resulting in hospitalization, temporary reversible illnesses requiring minor supportive treatment, or exposures below 20% of limits.

Specify:

- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Hazard source (chemicals, radionuclides, physical event)
- Estimated quantities of release
- Exposure setting/pathways
- Potentially exposed populations
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

Field 24. Environmental protection

including potential adverse harmful impact on natural resources (air, water, land, wildlife).
For each of the three conditions established in the evaluation scenario:

What is the impact?

1. **Catastrophic damage** to the environment (widespread and long-term or irreversible effects); or
2. **Significant damage** to the environment (widespread and short-term effects, or localized and long-term or irreversible effects); or
3. **Minor to moderate damage** to the environment (localized and short-term effects)?

Specify:

- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Hazard source (chemicals, radionuclides, physical event)

- Estimated quantities of release
- Exposure setting/pathways
- Ecological receptors
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

Field 25. Compliance

including failures to comply with laws, regulations, enforceable agreements, orders, permits and Implementation Plans for Defense Nuclear Facility Safety Board recommendations. Such failures may adversely affect the confidence of Department of Energy or other agencies in the ability of the facility to operate while protecting the public, workers, and the environment.

For the before and after conditions established in the evaluation scenario:

What is the impact?

1. **Major noncompliance with Federal, state, or local laws**; Enforcement Actions; or Compliance Agreements significant to ES&H and involving significant potential fines or penalties;
2. **Major noncompliance with Executive Orders**; DOE Orders; or Secretary of Energy Directives (Notices or Guidance Memoranda) significant to ES&H and not involving significant potential fines and penalties;
3. **Marginal noncompliance** with Federal, State, Local Laws; Enforcement Actions; Compliance Agreements; Executive Orders; DOE Orders; or Secretary of Energy Directives significant to ES&H;
4. **Significant deviation from good management practices**

Specify

- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

Field 26. Mission Impact*

including potential adverse impacts on the ability to perform the current and future missions of the facility or the ability to carry out important parts of the missions.

For the before and after conditions established in the evaluation scenario:

What is the impact?
1. **Serious negative impact** on ability to accomplish major program mission; includes conditions that seriously curtail or prevent accomplishment of the mission of a major program at a site. Threatens the continuation of at least one of the facility's major missions.
2. **Moderate negative impact** on ability to accomplish major program mission. Interruption of activities, but not to the same length as impact 1.

Specify:
- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

*This category not evaluated in the Tier 2 National Review Panel's look at RDSs across sites.

Field 27. Cost-effectiveness, including Mortgage Reduction*

including potential accidental losses to a facility's capital investment (buildings, equipment) or an existing opportunity for cost savings, such as infrastructure upgrades, management systems upgrades, or improved program development, or reduced operational cost.

For the before and after conditions established in the evaluation scenario:

What is the impact?
1. **Significant avoidable cost** (today's dollars) due to degraded infrastructure, inefficient management systems or program implementation, accident-related capital loss, or operational expense (annual cost > 1% of annual site EM budget or > $5M); loss of capital investment due to accidents or an existing opportunity for cost avoidance.
2. **Moderate avoidable cost** (today's dollars) due to degraded infrastructure, inefficient management systems or program implementation, accident-related capital loss, or operational expense (annual cost .1-1% of annual site EM budget or $1-5M)

Specify
- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Amount of the annual cost savings used to determine the impact severity.
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections

- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

*This category not evaluated in the Tier 2 National Review Panel's look at RDSs across sites.

Field 28. Social/Economical/Cultural

including the various attitudes, interests, and community activities that will/could be inadvertently affected or disrupted by an activity. This includes important community activities, traditions or ceremonies practiced by specific populations or groups, impacts on the local economy, and other community values.

For each of the three conditions established in the evaluation scenario:

What is the impact?

1. **Significant adverse**: Damage so severe to a social, economic, or cultural value, e.g., a Tribal burial ground, that no mitigation is possible, i.e., the value would be irrevocably lost; Should only apply if the above effects lead to organized public outcries or unfavorable media coverage.
2. **Moderate adverse**: Damage the social/cultural/economic value. Mitigation may be possible, but would involve a considerable investment of time and money. Primary difference from 1 is severity of impacts and lack of organized public outcries/unfavorable media coverage.

Specify:

- Complete appraisal of the risk justifying the MEM cell selection (complete for Before, During and After conditions)
- Any potential beneficial impacts from this activity
- Likelihood of occurrence. A, B, C or D from Likelihood Table. (For the before condition, specify "P" probability or "T" time to impact).
- Discuss the basis for both severity and likelihood selections
- Documentation supporting this evaluation. (Risk evaluations, Safety Analysis Reports, Environmental Impact Statements, Vulnerability Studies, etc.)
- Specific references to sources of quantitative data, when it is utilized in the evaluation
- Enough detail to allow an unfamiliar reader to understand and justify the RDS's "risk" scenario.

Determining the Risk Data Sheet Scope -- Unit of Analysis

Activities need to be packaged into distinct units for risk evaluation and decision-making purposes. When possible, Risk Data Sheets should be packaged to address problems with specific physical conditions in an attempt to track with the Baseline Environmental Management Report process.

In deciding how to package Risk Data Sheets, consider how the Risk Data Sheets will be used by the sites, Operations Offices, and Headquarters for Quality Review Budget preparation and presentation as well as subsequent budget downsizing exercises. Along these lines, consideration could be given to the following questions. If the answers are "yes", the Risk Data Sheet will probably be at the appropriate level and composition for evaluation:

- Do all of the activities contained in the Risk Data Sheet need to be completed before the objective of the Risk Data Sheet can be met? If not, are the results of the risk and non-risk evaluation categories approximately the same for each activity? Independent lower risk activities should not be "carried" within higher Risk Data Sheets.

- If budget downsizing occurs, can the Risk Data Sheet be postponed or delayed in its entirety? If not, it may make more sense to relocate into another Risk Data Sheet, the activity(s) that you may want to fund for other reasons (e.g., needed for meeting the objective of another Risk Data Sheet).

- Will the Risk Data Sheet stand up to an internal and/or external Quality Assurance review (e.g., Risk Data Sheet completed within the parameters established in training, instructional and/or guidance documents)?

Standard Assumptions

To allow comparison among sites and introduce further consistency into the prioritization process, activities should be evaluated using the following definitions and assumptions. The following standard assumptions are assumed to apply, unless exceptions are noted in the "Standard Assumptions Exception/Additions", entry (#20), of the Risk Data Sheet]:

- Institutional, administrative, and surveillance and maintenance program controls are assumed constant and continuous for an activity at its specific site for as long as they are needed (e.g., restricted public access, worker Safety and Health programs, etc.).

- Landlord responsibility will be commensurate with the activities required to support accomplishment of the site mission. Also, landlord responsibilities will not deviate from accepted DOE practices.

- Populations and distribution (on and off-site) are assumed to be fixed at current levels.

- Current land use plans, consistent with other Environmental Management planning documents such as the Baseline Environmental Management Report, will be used when evaluating activities.

- Stakeholders include the surrounding affected, interested and/or concerned public, labor unions, employees, interest groups, affected Indian Nations, State and local governments, regulatory agencies and Site-Specific Advisory Boards.

- Where risk documentation for an activity exists, it should be used to facilitate this evaluation **[Care should be taken to review the assumptions and scope of any documented qualitative or quantitative data to insure that it is applicable to the Risk Data Sheet]**.

- All DOE-owned transuranic waste will be disposed of at the Waste Isolation Pilot Plant, which will receive a No Migration Variance and open in April, 1998. In general, treatment of mixed transuranic waste to meet Land Disposal Restrictions will not be necessary; however, proposals for waste treatment to levels more prescriptive than the Waste Isolation Pilot Plant Waste Acceptance Criteria will be considered and evaluated on a case-by-case basis when additional treatment is demonstrated to be more cost effective from a total waste management systems perspective.

- Yucca Mountain Complex will begin waste acceptance in FY 2010.

- All High-Level Waste will be stored on site in an interim storage facility until a Federal repository is available for permanent storage.

- Information contained in the Site Treatment Plans for the treatment of mixed waste will be used in this evaluation.

- Affected parties will successfully negotiate timely on-site/off-site shipment of waste.

- Requested permits/licenses will be granted in a timely manner.

- The necessary and appropriate Safety and Health programs are in place to provide worker protection during all phases of the activity **[This is also covered in the first assumption]**.

- Radiological criteria for free release of buildings and grounds will remain constant, and any changes will not require reassessment or rework of areas already released (site-specific DOE order).

- All waste will be packaged in approved containers that meet waste disposal facility regulations and, where applicable, Department of Transportation regulations.

Management Evaluation Matrix: Likelihood levels

The Management Evaluation Matrix columns constitute the levels of likelihood (probability or time to impact) used in assessing the impact reduction benefit of activities. The matrix uses four levels of likelihood:

A. Very High likelihood indicates a probability of occurrence of 1 per year, or representing impacts that already exist or will occur within the year. For example, if a facility is known to be out of compliance with a DOE Safety and Health Order, then the likelihood of this impact falls into the *very high* category. If a condition at a facility has historically resulted in one or more lost-time worker injuries per year and the condition has not been corrected, then the likelihood of this impact also fits this category.

B. High likelihood indicates a probability of occurrence of between 0.1 and 1 per year, or representing impacts that expected to occur at least once within ten years but no sooner than in a year. Such impacts are expected to occur within the operating history of the facility, but have not occurred regularly every year.

C. Medium likelihood indicates a probability of occurrence of between 0.01 and 0.1 per year, or representing impacts that expected to occur at least once within 100 years but no sooner than in ten years. Impacts with this likelihood are not expected frequently within the operating life of a facility, but may occur once in the facility's life.

D. Low likelihood impacts are unlikely to occur within the operating life of a facility, but are not completely precluded from occurring. For example, impacts in this category may occur once in the operating life of one facility out of a population of 100 similar facilities. Impacts with this

likelihood indicate a probability of occurrence of less than 0.01 per year, or representing impacts that expected to occur no sooner than within 100 years.

MANAGEMENT EVALUATION MATRIX: LIKELIHOOD LEVELS

	A	B	C	D
Likelihood	Very High	High	Medium	Low
Numerical Probability of Occurrence	1 per year	≥ 0.1 per year < 1 per year	≥ 0.01 per year < 0.1 per year	<0.01 per year
Expected Time to Impact	≤ 1 year	> 1 year ≤ 10 years	> 10 years ≤ 100 years	> 100 years

Compiled by C Drew and T Ewers, CRESP (created March 20, revised April 16, 1996)
Sources: FY 1998 Budget Formulation Guidance;
1998 Management Evaluation Matrix Training Package and Reference Material

Attachments Management Evaluation Matrix
MEM Likelihood Levels

Appendix D2
Risk Data Sheet Report Card Evaluation Guidelines

This document accompanies the National Review Panel (NRP) Risk Data Sheet (RDS) Report Card Evaluation. It has been prepared to describe what the Report Card Evaluation is and how it is performed.

What is the RDS Report Card Evaluation?

The RDS Report Card Evaluation of the Tier 2 National Review Panel is a systematic examination of a pool of RDSs sampled from the FY 1998 RDSs submitted to DOE-HQ on April 15, 1996. The Report Card Evaluation is intended to:

1. examine the Summary Description (RDS Field 14)
2. examine the Evaluation Scenario (RDS Field 21); and
3. compare the Management Evaluation Matrix (Field 15) with the supporting evaluation memo fields (RDS Fields 21-25; 28)

The Panel will not be reviewing RDS Fields 26 and 27, pertaining to Mission Impact and Mortgage Reduction, respectively, as these fields are not part of the Panel's mandate (see Action Plan).

The Report Card Evaluation examines whether or not the RDS guidelines were followed for these fields and most importantly whether the narratives of an RDS support the MEM values. The Report Card Evaluation does not question the veracity of narratives in the RDS.

The size of this sample (~300) was based on an original estimate of 10% of the expected number of RDSs and on the expected number of Data Sheets that could be reviewed in the time allotted.

How are the RDSs evaluated using the RDS Report Card Evaluation?

A computerized Report Card Evaluation Form has been developed to facilitate collection of the comments from this review and to help ensure uniformity of the evaluation of the RDSs. The 300 RDSs will be randomly distributed to each of four evaluators (75 each). An overview of this evaluation form is found below, and a blank form is attached.

All the evaluators have an extensive knowledge of the components of RDSs and each has been working closely with DOE's Management Evaluation Process for at least 4 months. Efforts to ensure uniformity have been rigorous. First, the Guidance was reviewed and a document entitled, Required Elements of an RDS was created as a field by field analysis of a Risk Data Sheet. This document was made available to the Report Card Evaluators and all Panelists. In addition, prior to conducting the actual Report Card Evaluations, the four staff 'calibrated' their evaluations in two sessions by comparing and discussing their results from evaluating the same set of RDSs. Finally, this RDS Report Evaluation Guidelines were created to document the instructions for the Report Card itself.

Several National Review Panelists (led by Brian Costner, Energy Research Foundation) will review and discuss the Report Cards with the four evaluators before the Panel convenes on 4/23/96. An overview will be presented to the Panel at large on the first day of the conference.

Fields reviewed in the Report Card Evaluation

The purpose of the RDS Summary Description, Field 14, is to indicate what activities are conducted in the RDS, why those activities will be conducted, and what the end state (or results) of the

activities will be. From this description the Evaluation scenario, Field 21, is provided to expand upon the problems being addressed by this RDS (i.e., why the activities will be conducted). Three scenarios should be included in this description to characterizing: what impacts there might be if the activities are not conducted (Before condition); what impacts there might while the activities are being conducted (During condition); and what impacts there might be after the activities are complete (After condition). Then, from the scenarios, narrative Fields 22-28 are to be used to express the severity and likelihood of impacts to each of the seven categories examined in the process, for each temporal condition. RDS Field 15 is provided to simply collate the impact/likelihood values.

General guidelines for the RDS Report Card Evaluation

1. When a question on the Report Card Evaluation is not applicable to a particular RDS, check the "not applicable" (N/A) selection for that question.
2. If questions arise on how to evaluate a particular RDS, bring the questions up at the evaluators conference call, to be held daily with all four evaluators.
3. Throughout the form, all check boxes are set to a default of 'No', and radio buttons are set to a default of 'N/A.'

Overview of the Report Card Evaluation Form
Section I: RDS Summary Description

The questions in this section reflect the content required by the guidance. Each has three possible answers, 'Yes', 'No' and 'Not Applicable', (N/A). These are only somewhat subjective because the guidance for Field 14 is clear, and the Report Card questions are basic. In general, a 'Yes' implies an element of sufficiency i.e., the narrative contains not only text that addresses the element in question, but addresses it 'well' in the opinion of the reviewer. A 'No' means that supporting text is either absent or insufficient. 'N/A' is included as an option in the event that exceptions can be made for a particular RDS. They should be used rarely in this section. When either 'No' or 'N/A' are marked, an explanation should be given in the comment box g.) below.

a.) Does the description explain what the activity is and how it is being conducted?

The RDS guidance requests for this field, "... a complete description of the activities being documented on the RDS, ... the physical actions being conducted." Furthermore, the guidance requires that the Summary should, "... provide sufficient detail to allow an unfamiliar reader to understand the proposed activities without referencing additional documents."

Answering 'Yes' for this question indicates that the activities were explained. It is recognized in the evaluation that it is possible to describe what an activity is by explaining how it is being conducted. Some description of physical activity should be found in most cases. 'No' indicates the evaluator can not decipher what is being done.

b.) Does the description explain why the activity is being conducted?

Answering 'Yes' for this question indicates that there is a sufficient description of the underlying problems being addressed by the activities found within the RDS. Answering 'No' indicates that the reviewer isn't explicitly told why the activities are being conducted, or that the explanation is insufficient or unclear.

c.) Does the description describe the end state of the activity?

Answering 'Yes' for this question indicates that there is a description of the results or conditions remaining after the completion of the activities. 'No' indicates an absence of end state in field 14. If end state is found elsewhere in the RDS, but not in field 14, 'No' should be indicated, but a comment to this effect should be made in g.)

d.) Are all of the described activities within the scope of the RDS?

The Summary Description is supposed to be a concise explanation of the activities covered by the RDS. Answering 'Yes' indicates appropriate description of activities (not necessarily equal to an appropriate unit of analysis.) A 'No' to this question indicates that activities or situations not directly relevant to the RDS were described. For example, in an RDS about a managerial activity, consequences of the operations of that activity should not be discussed.

e.) Is the description readable and does it provide a coherent statement?

Answering 'Yes' indicates sufficient clarity and readability. This question is only answered 'No' if the description is nonsensical or illogical, or if the use of unexplained jargon or acronyms is to such an extent that the description is rendered meaningless to the reviewer.

f.) Management Activity.

This button is provided for internal use of the Panel to electronically 'flag' RDSs that directly encompass management activities. 'Y' if it is management, 'N' if not.

g.) RDS Summary Description Comments

Reviewers should use this field to provide explanation for the evaluations on an as needed basis. Reviewers should also use this field to 'flag' Unit of Analysis problems when an RDS is grouping activities of dissimilar risk. Serious overall concerns regarding the Summary Description section should also be included here.

Section II: Scenario Development.

Questions h.) i.) and j.) are asked of each of the Before, During and After conditions provided in Field 21. There are three possible answers: 'Yes', 'No' and 'Not Applicable' (N/A). In general 'N/A' will be chosen when the question does not apply to the given RDS. An explanation of 'N/As' should be given in the Scenario Development Comment field m.) below. Two 'flags' are provided for purposes of overall characterization of the database, found in k.) and l.)

h.) Is the scenario reasonable/credible?

Answering 'Yes' indicates the scenario is reasonable and credible in the opinion of the reviewer. A 'No' indicates that the scenario is not reasonable and/or credible given the activities and problems described in the Summary Description (Field 14). If no scenario is given, the answer should be 'No' because a scenario should have been given. An effort will be made by reviewers to indicate why the scenario is not reasonable in the Comments Field for this section. 'N/A' should rarely be used.

i.) Is the scenario within the scope of the RDS?

The purpose of this question is to ensure that the scenario relates and examines only the impacts of activities being described in this particular RDS. The scope is found in the Summary Description (Field 14). Answering 'Yes' indicates the scenario is consistent with the activities described in Field 14, while

answering 'No' indicates that the scenario includes events that are not directly related to the activities or conditions outlined in field 14. In addition, if no scenario is given, the answer should be 'No' because a scenario should have been given. 'N/A' indicates not applicable, for example, if no coherent scenario (story) is provided. Specifically, when question h.) is answered with 'No', and no activities are described in the scenario, 'N/A' should be marked.

j.) Are the hazards, pathways, and receptors identified?

In order to evaluate risks to the public, workers and the environment, there should be a description of the hazard source (i.e., the radionuclides, chemicals, etc.), the exposure setting/pathways and potentially exposed human and ecological receptors. Answering 'Yes' for this question indicates sufficient description of hazards, pathways and receptors. 'No' indicates one or more of these are deficient. This description may be captured in the memo fields for the categorical impact. For some RDSs that do not encompass activities directly addressing hazards, this question will not be applicable. In such cases, 'N/A' should be marked. However, if the problems described directly involve radioactive or chemical substances, and a scenario is absent, the question should be marked 'No,' implying insufficiency, (not 'N/A'). Answers of 'No' and 'N/A' should be explained in comment field m.)

k.) Are support documents cited?

This field provides a 'flag' for RDSs that cite documents to support the scenario. Inclusion of specific documents listed anywhere in fields 14, 21-24 or 28 would cause this box to be checked 'Yes,' otherwise the default is no. Note, this question is NOT to be marked yes if the only supporting documents are compliance related. Please make reference to 'Yes' answers in comment field m.)

l.) Are the Standard Assumptions modified?

This field provides a 'flag' to indicate RDSs in which the evaluations of the impacts were based on assumptions other than or contrary to the Standard Assumptions in the RDS guidance. Standard assumptions are to be changed in field 20, so if any text in field 20 changes assumptions, mark 'Yes.' otherwise, the default is 'No.'

m.) Scenario Development Comments.

Reviewers should include the rationale behind negative evaluations, and highlight any significant overall concerns for the Scenario Development section.

Section III: Matrix Support

The purpose of this evaluation is to ensure that the Management Evaluation Matrix (MEM) values summarized in RDS Field 15 are supported by the narratives developed in Evaluation Memo Fields (Fields 22-25 and 28). Note that the Report Card Evaluation examines only 5 of the 7 categories. The Mission Impact and Mortgage Reduction Matrix values are not examined for narrative support as these are not part of the National Review Panel's mandate.

Three questions are asked of each impact narrative [in n.) o.) p.) q.) and r.)] for each of the Before, During and After scenarios. Possible answers are 'Yes' and 'No'. When the question seems non-applicable for some questions, reviewers should mark 'No' and make comments in the comment section s.)

Cons. Scen. = Is the narrative consistent with the scenario?

The intent of narratives is to describe specific impacts of the scenarios developed in RDS Field 21. Scenarios must be completed in order to answer this question. Only one scenario is to be used for

evaluating the impacts for a given time frame. For example, the narrative supporting the impact in the Before condition should be consistent with the Before scenario. A 'No' indicates that the narrative is inconsistent with the appropriate Before, During or After condition developed in Field 21.

Sup. Imp. = Does the narrative support the severity of impact (i.e., the 1, 2, 3 or 4) given in the Matrix (Field 15)?

The RDS guidelines provide criteria for each of the levels of severity for each of the impact categories. These guidelines are used to cross-check the values given in the Matrix. In this question, it is expected that the narrative expressly describes the severity for each category of impact. 'Yes' indicates the narrative supports the impact described. A 'No' answer to this question indicates that the narrative does not support the numerical value given to the impact category.

Sup. Likeli. = Does the narrative support the likelihood of occurrence (i.e., the A, B, C or D) given in the Matrix (Field 15)?

The RDS guidelines provide criteria for indicating the likelihood of the impact described in the scenario. These guidelines are used to cross-check the values given in the Matrix. In this evaluation, it is expected that the narrative explicitly indicates the likelihood of occurrence for the impact described. A 'No' to this question indicates that the narrative does not support the letter value given in the Matrix.

The Before condition has an added complexity. The programs were instructed to indicate whether the likelihood of occurrence of the impacts from the Before condition were evaluated based on a Probability (P) or Time to Impact (T). A 'Yes' answer on the Report Card for the question of supporting the likelihood in the Before condition means that a probability or time-to-impact was given AND it supports the value.

s.) Matrix Support Comments:

General comments with regard to narratives supporting the Matrix values should be entered in this field. RDSs indicating MEM values for impacts described as having no impact or risk will be 'flagged' in this field.

t.) Overall Comments:

General comments with regard to the entire RDS should be entered in this field. For example, an early problem that appeared in Draft RDSs used in the calibration exercises is that the narrative states essentially
"no risk" or impact, but the lowest impact category, such as 3D (Public Safety) or 2D (Social Cultural Economic) is chosen. Reviewers should note this phenomenon in this field by entering the following:

"no risk" should yield N/A in the matrix.

Appendix D3
Report Card Evaluation Summary Tables.

Table D3-1.

Distribution of RDSs across Operations and EM Offices in the Sample of 300

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	0	12	29	0	2	0	43
Chicago	0	8	7	0	1	0	16
Idaho	0	12	4	10	3	1	30
Nevada	0	5	4	0	1	0	10
Oakland	0	4	7	1	0	0	12
Ohio	1	0	4	0	4	0	9
Oak Ridge	0	7	18	1	1	3	30
Rocky Flats	0	0	30	0	0	0	30
Richland	1	33	8	6	5	7	60
Savannah River	1	12	9	36	2	0	60
Total	3	93	120	54	19	11	300

Table D3-2.

Number and Percentage of RDS Receiving Yes (Y, Y, Y/NA, Y/NA, Y) Answers to all 5 Criteria for the Summary Description Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	5(42%)	8(28%)	NA	1(50%)	NA	14(33%)
Chicago	NA	2(25%)	4(57%)	NA	0(0%)	NA	6(38%)
Idaho	NA	6(50%)	0(%)	1(10%)	2(67%)	1(100%)	10(33%)
Nevada	NA	0(0%)	1(25%)	NA	0(0%)	NA	1(10%)
Oakland	NA	2(50%)	5(71%)	0(%)	NA	NA	7(58%)
Ohio	1(100%)	NA	2(50%)	NA	4(100%)	NA	7(78%)
Oak Ridge	NA	3(43%)	5(28%)	0(0%)	0(0%)	2(67%)	10(33%)
Rocky Flats	NA	NA	10(33%)	NA	NA	NA	10(33%)
Richland	1(100%)	22(67%)	5(63%)	4(67%)	3(60%)	5(71%)	40(67%)
Savannah River	1(100%)	4(33%)	3(33%)	23(64%)	1(50%)	NA	32(53%)
Total	3(100%)	44(47%)	43(36%)	28(52%)	11(58%)	8(73%)	137(46%)

Table D3-3.

Number and Percentage of RDS Receiving No Answers to all 5 Criteria for the Summary Description Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	3(10%)	NA	1(50%)	NA	4(4%)
Chicago	NA	0(0%)	0(0%)	NA	0(0%)	NA	0(0%)
Idaho	NA	0(0%)	0(0%)	1(10%)	0(0%)	0(0%)	1(3%)
Nevada	NA	0(0%)	0(0%)	NA	0(0%)	NA	0(0%)
Oakland	NA	0(0%)	0(0%)	1(100%)	NA	NA	1(8%)
Ohio	0(0%)	NA	0(0%)	NA	0(0%)	NA	0(0%)
Oak Ridge	NA	1(14%)	3(17%)	0(0%)	1(100%)	0(0%)	5(17%)
Rocky Flats	NA	NA	6(20%)	NA	NA	NA	6(20%)
Richland	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Savannah River	0(0%)	3(25%)	0(0%)	5(14%)	0(0%)	NA	8(13%)
Total	0(0%)	4(4%)	12(10%)	7(13%)	2(11%)	0(0%)	25(8%)

Table D3-4.

Number and Percentage of RDS Receiving Yes (Y, Y, Y/NA) Answers to all 3 Criteria for the Before Scenario Development Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	2(17%)	7(24%)	NA	1(50%)	NA	8(19%)
Chicago	NA	1(13%)	1(14%)	NA	0(0%)	NA	2(13%)
Idaho	NA	6(50%)	1(25%)	3(30%)	2(67%)	0(0%)	12(40%)
Nevada	NA	1(20%)	0(0%)	NA	1(100%)	NA	2(20%)
Oakland	NA	2(50%)	4(57%)	0(0%)	NA	NA	6(50%)
Ohio	1(100%)	NA	3(75%)	NA	2(50%)	NA	6(67%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	1(100%)	0(0%)	4(13%)
Rocky Flats	NA	NA	3(17%)	NA	NA	NA	4(13%)
Richland	1(100%)	12(36%)	5(63%)	2(33%)	3(60%)	4(57%)	27(45%)
Savannah River	0(0%)	1(8%)	1(11%)	1(3%)	0(0%)	NA	3(5%)
Total	2(67%)	25(27%)	26(22%)	6(11%)	10(53%)	4(36%)	73(24%)

Table D3-5.

Number and Percentage of RDS Receiving Yes (Y, Y, Y/NA) Answers to all 3 Criteria for the During Scenario Development Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	1(8%)	7(24%)	NA	0(0%)	NA	8(19%)
Chicago	NA	0(0%)	0(0%)	NA	0(0%)	NA	0(0%)
Idaho	NA	4(33%)	1(25%)	3(30%)	1(33%)	0(0%)	9(30%)
Nevada	NA	1(20%)	0(0%)	NA	1(100%)	NA	2(20%)
Oakland	NA	1(25%)	2(29%)	0(0%)	NA	NA	3(25%)
Ohio	1(100%)	NA	0(0%)	NA	2(50%)	NA	3(33%)
Oak Ridge	NA	3(43%)	2(11%)	0(0%)	1(100%)	(%)	6(20%)
Rocky Flats	NA	NA	1(3%)	NA	NA	NA	1(3%)
Richland	1(100%)	11(33%)	5(63%)	2(33%)	4(80%)	2(29%)	25(42%)
Savannah River	0(0%)	0(0%)	0(0%)	2(22%)	3(8%)	NA	5(8%)
Total	2(67%)	21(23%)	20(17%)	8(15%)	9(47%)	2(18%)	62(21%)

Table D3-6.

Number and Percentage of RDS Receiving Yes (Y, Y, Y/NA) Answers to all 3 Criteria for the After Scenario Development Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	1(8%)	7(24%)	NA	0(0%)	NA	8(19%)
Chicago	NA	1(13%)	1(14%)	NA	0(0%)	NA	2(13%)
Idaho	NA	4(33%)	0(0%)	4(40%)	1(33%)	0(0%)	9(30%)
Nevada	NA	1(20%)	0(0%)	NA	1(100%)	NA	2(20%)
Oakland	NA	0(0%)	1(14%)	0(0%)	NA	NA	1(8%)
Ohio	1(100%)	NA	1(25%)	NA	1(25%)	NA	3(33%)
Oak Ridge	NA	3(43%)	2(11%)	0(0%)	1(100%)	0(0%)	6(20%)
Rocky Flats	NA	NA	4(13%)	NA	NA	NA	4(13%)
Richland	1(100%)	9(27%)	2(25%)	0(0%)	2(40%)	2(29%)	16(27%)
Savannah River	0(0%)	0(0%)	2(22%)	3(8%)	0(0%)	NA	5(8%)
Total	2(67%)	19(20%)	20(17%)	7(13%)	6(32%)	2(18%)	56(19%)

Table D3-7.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Public Health Before Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	4(14%)	NA	1(50%)	NA	5(12%)
Chicago	NA	0(0%)	3(43%)	NA	0(0%)	NA	3(19%)
Idaho	NA	6(50%)	1(25%)	2(20%)	0(0%)	0(0%)	9(30%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	2(50%)	1(14%)	0(0%)	NA	NA	3(25%)
Ohio	1(100%)	NA	0(0%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	3(43%)	2(11%)	0(0%)	0(0%)	0(0%)	5(17%)
Rocky Flats	NA	NA	3(10%)	NA	NA	NA	3(10%)
Richland	0(0%)	5(15%)	2(25%)	2(33%)	2(40%)	1(14%)	12(20%)
Savannah River	0(0%)	1(8%)	0(0%)	2(6%)	0(0%)	NA	3(5%)
Total	1(33%)	17(18%)	16(13%)	6(11%)	5(26%)	1(9%)	46(15%)

Table D3-8.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Worker Safety Before Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	6(21%)	NA	1(50%)	NA	7(16%)
Chicago	NA	0(0%)	3(43%)	NA	0(0%)	NA	3(19%)
Idaho	NA	4(33%)	1(25%)	3(30%)	0(0%)	0(0%)	8(27%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	1(14%)	0(0%)	NA	NA	2(17%)
Ohio	1(100%)	NA	1(25%)	NA	1(25%)	NA	3(33%)
Oak Ridge	NA	0(0%)	2(11%)	0(0%)	0(0%)	0(0%)	2(7%)
Rocky Flats	NA	NA	0(0%)	NA	NA	NA	0(0%)
Richland	0(0%)	5(15%)	1(13%)	2(33%)	2(40%)	1(14%)	11(18%)
Savannah River	0(0%)	2(17%)	0(0%)	0(0%)	0(0%)	NA	2(3%)
Total	1(33%)	12(13%)	15(13%)	5(9%)	5(26%)	1(9%)	39(13%)

Table D3-9.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Environmental Before Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	3(10%)	NA	1(50%)	NA	4(9%)
Chicago	NA	0(0%)	3(43%)	NA	0(0%)	NA	3(19%)
Idaho	NA	6(50%)	1(25%)	1(10%)	0(0%)	0(0%)	8(27%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	2(50%)	0(0%)	0(0%)	NA	NA	2(17%)
Ohio	1(100%)	NA	0(0%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	2(11%)	0(0%)	0(0%)	0(0%)	2(7%)
Rocky Flats	NA	NA	1(3%)	NA	NA	NA	1(3%)
Richland	0(0%)	6(18%)	1(13%)	1(17%)	3(60%)	1(14%)	12(20%)
Savannah River	0(0%)	2(17%)	0(0%)	0(0%)	0(0%)	NA	2(3%)
Total	1(33%)	16(17%)	11(9%)	2(4%)	6(32%)	1(9%)	37(12%)

Table D3-10.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Compliance Before Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	1(8%)	3(10%)	NA	1(50%)	NA	5(12%)
Chicago	NA	0(0%)	4(57%)	NA	0(0%)	NA	4(25%)
Idaho	NA	0(0%)	0(0%)	1(10%)	0(0%)	0(0%)	1(3%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	0(0%)	0(0%)	NA	NA	1(8%)
Ohio	0(0%)	NA	2(50%)	NA	0(0%)	NA	2(22%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	8(27%)	NA	NA	NA	8(27%)
Richland	0(0%)	4(12%)	0(0%)	2(33%)	1(20%)	0(0%)	7(12%)
Savannah River	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	NA	0(0%)
Total	1(33%)	9(10%)	19(16%)	2(4%)	6(32%)	2(18%)	39(13%)

Table D3-11.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Social/Cultural/Economic Before Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	1(8%)	2(7%)	NA	1(50%)	NA	4(9%)
Chicago	NA	0(0%)	4(57%)	NA	0(0%)	NA	4(25%)
Idaho	NA	0(0%)	0(0%)	1(10%)	0(0%)	0(0%)	1(3%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	0(0%)	0(0%)	NA	NA	1(8%)
Ohio	0(0%)	NA	2(50%)	NA	0(0%)	NA	2(22%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	8(27%)	NA	NA	NA	8(27%)
Richland	0(0%)	4(12%)	0(0%)	2(33%)	1(20%)	0(0%)	7(12%)
Savannah River	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	NA	0(0%)
Total	0(0%)	6(6%)	16(13%)	3(6%)	3(16%)	0(0%)	28(9%)

Table D3-12.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Public Health During Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	5(17%)	NA	1(50%)	NA	6(14%)
Chicago	NA	0(0%)	2(29%)	NA	0(0%)	NA	2(13%)
Idaho	NA	3(25%)	1(25%)	1(10%)	0(0%)	0(0%)	5(17%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	0(0%)	0(0%)	NA	NA	1(8%)
Ohio	1(100%)	NA	0(0%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	2(11%)	0(0%)	0(0%)	0(0%)	2(7%)
Rocky Flats	NA	NA	6(20%)	NA	NA	NA	6(20%)
Richland	0(0%)	5(15%)	3(38%)	1(17%)	3(60%)	2(29%)	14(23%)
Savannah River	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	NA	0(0%)
Total	1(33%)	9(10%)	19(16%)	2(4%)	6(32%)	2(18%)	39(13%)

Table D3-13.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Worker Safety During Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	3(10%)	NA	1(50%)	NA	4(9%)
Chicago	NA	0(0%)	2(19%)	NA	0(0%)	NA	2(13%)
Idaho	NA	5(42%)	1(25%)	2(20%)	0(0%)	0(0%)	8(27%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	0(0%)	0(0%)	0(0%)	NA	NA	0(0%)
Ohio	1(100%)	NA	1(25%)	NA	1(25%)	NA	3(33%)
Oak Ridge	NA	0(0%)	1(6%)	0(0%)	0(0%)	0(0%)	1(3%)
Rocky Flats	NA	NA	2(7%)	NA	NA	NA	2(7%)
Richland	0(0%)	5(15%)	2(25%)	1(17%)	3(60%)	2(29%)	13(22%)
Savannah River	0(0%)	1(8%)	0(0%)	0(0%)	0(0%)	NA	1(2%)
Total	1(33%)	11(12%)	12(10%)	3(6%)	6(32%)	2(18%)	35(12%)

Table D3-14.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Environmental During Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	4(14%)	NA	1(50%)	NA	5(12%)
Chicago	NA	0(0%)	4(57%)	NA	0(0%)	NA	4(25%)
Idaho	NA	4(33%)	1(25%)	1(10%)	0(0%)	0(0%)	6(20%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	0(0%)	0(0%)	NA	NA	1(8%)
Ohio	1(100%)	NA	0(0%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	2(11%)	0(0%)	0(0%)	0(0%)	2(7%)
Rocky Flats	NA	NA	3(10%)	NA	NA	NA	3(10%)
Richland	0(0%)	4(12%)	0(0%)	1(17%)	3(60%)	2(29%)	10(17%)
Savannah River	0(0%)	2(17%)	0(0%)	0(0%)	0(0%)	NA	2(3%)
Total	1(33%)	11(12%)	14(12%)	2(4%)	6(32%)	2(18%)	36(12%)

Table D3-15.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Social/Cultural/Economic During Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	2(7%)	NA	1(50%)	NA	3(7%)
Chicago	NA	0(0%)	3(43%)	NA	0(0%)	NA	3(19%)
Idaho	NA	3(25%)	1(25%)	2(20%)	0(0%)	0(0%)	6(20%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	1(25%)	2(29%)	0(0%)	NA	NA	3(25%)
Ohio	0(0%)	NA	1(25%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	7(23%)	NA	NA	NA	7(23%)
Richland	0(0%)	5(15%)	0(0%)	1(17%)	2(40%)	2(29%)	10(17%)
Savannah River	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	NA	0(0%)
Total	0(0%)	1(10%)	8(13%)	3(6%)	5(26%)	2(18%)	35(12%)

Table D3-16.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Public Health After Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	5(17%)	NA	1(50%)	NA	6(14%)
Chicago	NA	0(0%)	0(0%)	NA	0(0%)	NA	0(0%)
Idaho	NA	5(42%)	1(25%)	1(10%)	0(0%)	0(0%)	7(23%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	0(0%)	0(0%)	0(0%)	NA	NA	0(0%)
Ohio	1(100%)	NA	0(0%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	3(10%)	NA	NA	NA	3(10%)
Richland	0(0%)	8(24%)	0(0%)	1(13%)	2(40%)	2(29%)	11(18)(%)
Savannah River	0(0%)	1(8%)	0(0%)	3(8%)	0(0%)	NA	4(7%)
Total	1(33%)	12(13%)	8(7%)	4(7%)	5(26%)	2(18%)	32(11%)

Table D3-17.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Worker Safety After Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	2(7%)	NA	1(50%)	NA	3(7%)
Chicago	NA	0(0%)	0(0%)	NA	0(0%)	NA	0(0%)
Idaho	NA	5(42%)	1(25%)	1(10%)	0(0%)	0(0%)	7(23%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	0(0%)	0(0%)	0(0%)	NA	NA	0(0%)
Ohio	1(100%)	NA	2(50%)	NA	1(25%)	NA	4(44%)
Oak Ridge	NA	0(0%)	2(11%)	0(0%)	0(0%)	0(0%)	2(7%)
Rocky Flats	NA	NA	0(0%)	NA	NA	NA	0(0%)
Richland	0(0%)	6(18%)	1(13%)	0(0%)	2(40%)	2(29%)	11(18%)
Savannah River	0(0%)	1(8%)	0(0%)	3(8%)	0(0%)	NA	4(7%)
Total	1(33%)	12(13%)	8(7%)	4(7%)	5(26%)	2(18%)	32(11%)

Table D3-18.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Environmental After Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	3(10%)	NA	1(50%)	NA	4(9%)
Chicago	NA	0(0%)	2(29%)	NA	0(0%)	NA	2(13%)
Idaho	NA	4(33%)	1(25%)	1(10%)	0(0%)	0(0%)	6(20%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	0(0%)	0(0%)	0(0%)	NA	NA	0(0%)
Ohio	1(100%)	NA	2(50%)	NA	1(25%)	NA	4(44%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	1(3%)	NA	NA	NA	1(3%)
Richland	0(0%)	8(24%)	0(0%)	0(0%)	2(40%)	2(29%)	12(20%)
Savannah River	0(0%)	2(17%)	0(0%)	3(8%)	0(0%)	NA	5(8%)
Total	1(33%)	14(15%)	7(6%)	4(7%)	4(21%)	2(18%)	32(11%)

Table D3-19.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Compliance After Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	6(21%)	NA	1(50%)	NA	7(16%)
Chicago	NA	0(0%)	2(29%)	NA	0(0%)	NA	2(13%)
Idaho	NA	6(50%)	0(0%)	3(30%)	0(0%)	0(0%)	9(30%)
Nevada	NA	0(0%)	1(25%)	NA	1(100%)	NA	2(20%)
Oakland	NA	0(0%)	2(29%)	0(0%)	NA	NA	2(17%)
Ohio	0(0%)	NA	1(25%)	NA	1(25%)	NA	2(22%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	1(3%)	NA	NA	NA	1(3%)
Richland	0(0%)	10(30%)	5(63%)	2(33%)	2(40%)	1(14%)	20(33%)
Savannah River	0(0%)	3(25%)	0(0%)	3(8%)	0(0%)	NA	6(10%)
Total	0(0%)	19(20%)	18(15%)	8(15%)	5(26%)	1(9%)	51(17%)

Table D3-20.

Number and Percentage of RDS Receiving Yes Answers to all 3 Criteria for the Social/Cultural/Economic After Matrix Support Section of the NRP Report Card by Operations and EM Offices

	EM Office						
Ops Office	**20**	**30**	**40**	**60**	**70**	**Unknown**	**Total**
Albuquerque	NA	0(0%)	4(14%)	NA	1(50%)	NA	5(12%)
Chicago	NA	0(0%)	3(43%)	NA	0(0%)	NA	3(19%)
Idaho	NA	4(33%)	1(25%)	2(20%)	0(0%)	0(0%)	7(23%)
Nevada	NA	0(0%)	0(0%)	NA	1(100%)	NA	1(10%)
Oakland	NA	0(0%)	2(29%)	0(0%)	NA	NA	2(17%)
Ohio	0(0%)	NA	1(25%)	NA	0(0%)	NA	1(11%)
Oak Ridge	NA	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Rocky Flats	NA	NA	8(27%)	NA	NA	NA	8(27%)
Richland	0(0%)	9(27%)	0(0%)	0(0%)	2(40%)	1(14%)	12(20%)
Savannah River	0(0%)	0(0%)	0(0%)	3(8%)	0(0%)	NA	3(5%)
Total	0(0%)	13(14%)	19(16%)	5(9%)	4(21%)	1(9%)	42(14%)

Appendix E
Biographies of National Review Panelists

Gerald van Belle

Gerald van Belle, Ph.D., is professor and chairman of the department of Environmental Health and professor of biostatistics at the University of Washington (UW). Dr. van Belle also serves as Director of the UW Consortium for Risk Evaluation with Stakeholder Participation (CRESP) program, and Leader for CRESP's Data Characterization, Analysis and Statistics Task Group. His areas of expertise are biostatistics, environmental risk factors for neurodegenerative diseases and risk communication. Dr. van Belle received his Ph.D. in mathematical statistics in 1967, from the University of Toronto, Toronto, Ontario, Canada.

National activities include:

1. Health Effects Institute: Member of the Research Committee of the Health Effects Institute. The Institute is a congressionally mandated NGO (Non-Governmental Organization) sponsoring research in the area of health effects of mobile sources of air pollution. He serves as chair of the Oversight Committee. He also is involved with the Institutes review of the use of fuel oxygenates.
2. Board on Environmental Studies and Toxicology (BEST), National Research Council. BEST is the group within NRC that sponsors reviews of all environmentally related issues. I am the BEST representative on the review of oxygenated fuels.
3. National Urban Air Toxics Center (Leland Center). I am a member of the governing Board of the Mickey Leland National Urban Air Toxics Center (NUATC). The Center was formed by congressional mandate with Board members appointed by the Senate, House and President. The Board supervises a Research Committee which is actively defining a research agenda.

Brian Costner

As director since June 1989 of the Energy Research Foundation, a non-profit environmental organization, Costner's primary roles have included public education about the Savannah River Site and other facilities in the Department of Energy's nuclear weapons complex, as well as involvement in decision making processes related to these facilities. This work covers a broad range of issues in areas such as environmental protection, worker and public health and safety, nonproliferation, and arms control. Costner has addressed these issues at congressional hearings, national and international conferences, and through the media, as well as in various editorials, articles, and other written materials. He has also coordinated many related activities with other public interest groups across the country. He is currently a member of DOE's Environmental Management Advisory Board.

Joanna Burger

Joanna Burger is a Professor of Biology at Rutgers University, and was the Director of the Graduate Program in Ecology and Evolution for 15 years. She teaches Ecological Risk and Behavioral Biology; advises Ph.D. students; and is also a member of The Toxicology Graduate Program. Dr. Burger serves as the Leader of CRESP's Ecological Hazard Identification Task Group. Her research interests include behavioral neurotoxicology, behavioral development, ecological risk and biomonitoring and social behavior of vertebrates. Most recently, she has been working with low level effects of lead, chromium and manganese on development in birds. In addition she has edited or written 7 books, and published about 250 papers in referenced journals on ecology, evolution, neurotoxicology, behavioral development,

biomonitoring and effects of lead. She served on the Committee to review the Ecological Risk Assessment Guidelines for EPA. She has served on the Board of Environmental Science and Toxicology (BEST) of the NRC, Scientific Committee on Problems of the Environment (SCOPE), and served on SCOPE committees (on mercury, hazardous waste, estuarine processes) and NRC committees (currently on Endocrine Disruption.) She is a Fellow of the American Ornithological Union and an Elected Member of the Society of Toxicology. She is currently a member of the Environmental and Occupational Health Sciences Institute (EOHSI).

Bruce Church

Bruce W. Church, formerly the Assistant Manager for Environment, Safety ,Security and Health for the Nevada Operations Office of the U.S. Dept. of Energy is presently, affiliated with the Desert Research Institute of the University of Nevada as a Senior Research Physicist, as Adjunct Research Professor of Health Physics, University of Cincinnati and is President of BWC Enterprises, Inc. He has served as a Sr. Advisor to the Government of Australia on remedial actions since 1986 and is currently serving as a member of the Maralinga Rehabilitation Technical Advisory Committee(MARTAC). Mr. Church recently served as CoChairperson of the Risk Team, Office of Integrated Risk Management, Environmental Management, U.S. Dept. of Energy.

Work Experience: During his 26 years with the Dept. of Energy Mr. Church rose from the ranks as a staff Health Physicist (1969-1974)to Chief of the Radiological Branch (1974-1980), Director of the Health Physics Division(1980-1986),Deputy Assistant Manager for Engineering and Safety(1986-1987), Assistant Manager for Environment, Safety and Health(1987-1992), and as Assistant Manager for Environment, Safety, Security and Health(1992-1995). These duties included serving as Radiological Project officer for seven remedial action projects both Nationally and Internationally.

Major Career Awards and Honors:
* Public Health Service Fellowship (1965,1966).
* Southern Nevada Federal Executive Association's "Presidents Outstanding Achievement Award,(1989)".
* United States Dept. of Energy Presidential "Meritorious Rank" Award (1991).
* Selected as "Fellow of the Health Physics Society of America" (1991).
* United States Dept. Energy's "Distinguished Career Service Award",(1995).

Publications and Presentations:
* Authored/Co-authored 18 professional publications In the general areas of measuring radioactivity in the environment and determining dose to man through environmental pathways.

Joan M. Daisey

Dr. Daisey is a Senior Scientist and the Program Head of the Indoor Environment Program in the Energy and Environment Division at the Ernest Orlando Lawrence Berkeley National Laboratory (LBNL). The Program, with a staff of approximately 50, conducts research on indoor air quality and energy use in buildings. Her research focuses on human exposures to toxic and carcinogenic organic compounds in indoor and outdoor air, and understanding the sources, transport, transformation and fate of airborne pollutants. She has over 120 scientific publications in these areas.

She is also the Head of the Center for Atmospheric and Biospheric Effects of Technology at LBNL. The Center plans, coordinates and develops integrated, interdisciplinary research that addresses the

atmospheric and biospheric effects of technology, and the sources and processes leading to those effects. Emphasis is placed on providing scientific information that can be used in developing scientifically-based solutions for environmental problems and environmental policy options with respect to energy and environmental impacts.

Dr. Daisey has served on a number of national scientific advisory committees, including the National Research Council Committee on Advances in Assessing Human Exposures to Airborne Pollutants, and the Board of Scientific Counselors of the Agency for Toxic Substances and Disease Registry. She is currently Chair of the EPA Science Advisory Board (SAB) Committee on Indoor Air Quality and Total Human Exposure Assessment and a member of the SAB Executive Committee and the Research Strategies Advisory Committee. She was one of the founding members of the International Society for Exposure Analysis and is currently the President.

Elaine Faustman

Elaine Faustman is Professor and Associate Chair of the Department of Environmental Health at the University of Washington. Dr. Faustman serves as the co-director of the UW CRESP Program and Leader of CRESP's Health Hazard Identification Task Group. She has expertise in developmental toxicology, risk assessment methodologies, and the toxicology of N-nitroso compounds. Her research accomplishments include national and international recognition as an expert on reproductive and developmental toxicology with over 13 years of experience in toxicology and environmental risk assessment research. Her research has been well-funded at the national level with sustained funding from the National Institutes of Environmental Health (over 13 years) and US EPA (6 years). Her numerous research publications and presentations represent a commitment to cross-disciplinary research efforts with her co-authors coming from epidemiology, mathematics, biostatistics, chemistry, medicine and industrial hygiene. She currently serves on the National Toxicology Program Board of Scientific Counselors and in this role serves to review the national toxicology testing agenda. She also is a member of the National Academy of Sciences Committee on Toxicology.

Dr. Faustman is board certified in toxicology (DABT), serves as an Associate Editor of Fundamental and Applied Toxicology and is a member of the editorial board of three additional toxicology journals. She has held numerous elected position in national and regional professional societies. For over 13 years she has taught a multi-disciplinary environmental risk assessment course with Dr. Gil Omenn, Dean, UW School of Public Health and Community Medicine, to students in environmental health, epidemiology, engineering, public affairs and environmental studies.

Loren J. Habegger

Loren Habegger (Ph.D., Nuclear Engineering, Purdue University, 1968) is the Associate Director of the Environmental Assessment Division at the Department of Energy's Argonne National Laboratory. This Argonne division focuses on interdisciplinary health and environmental assessments of federal facility operations, alternative energy systems, and other industrial developments. Dr. Habegger also co-chairs the multidivisional Risk Working Group at Argonne. He joined Argonne as a reactor safety engineer in 1968 with responsibilities for technical analysis and program management IN various studies of water availability, water and air quality, solid waste disposal, and health impacts of alternative energy technologies. From 1981 until 1988 he was the manager of the Physical Environmental Sciences Section, which evaluated the effectiveness of alternative technologies in controlling environmental impacts and reducing risk to human health and safety. Between 1988 and 1992 he served as director of the Argonne

Radiological and Risk Assessment Group. During 1989 and 1990, his responsibilities included providing a focal point for Argonne's Energy, Environmental and Biological Research programs in interaction with related energy and environmental programs in the Asia and the Pacific regions.

Rogene Henderson

Dr. Rogene Henderson received her bachelor's degree with a double major in chemistry and biology from Texas Christian University and spent one year at the Ludwig Maximillian Universität in München on a Fulbright Scholarship prior to completing her doctorate in chemistry from The University of Texas in Austin. After a six year stay at the University of Arkansas School of Medicine as a Research Associate, she joined the staff of the Lovelace Medical Foundation in Albuquerque, NM. In 1970, she transferred to the Inhalation Toxicology Research Institute, Lovelace Biomedical and Environmental Research Institute where she is currently a Senior Scientist. She is a diplomate of the American Board of Toxicology and a Clinical Professor in the College of Pharmacy of the University of New Mexico.

Currently Dr. Henderson has a half-time appointment with the US Department of Energy, Environmental Management headquarters in Washington, DC in the Office of Science and Risk Policy. She has served on the National Academy of Sciences/ National Research Council's Committee on the Epidemiology of Air Pollution, Committee on Toxicology (currently Chair), Committee on Biological Markers, and Committee on Risk Assessment Methodology. She has served on the National Institutes of Health Toxicology Study Section and the Advisory Council of the National Institute of Environmental Health Sciences. She was a member of the Environmental Health Committee of the Environmental Protection Agency's Scientific Advisory Board and has served as President of the regional Mountain West Society of Toxicology, the Central New Mexico chapter of the American Chemical Society, and the Inhalation Specialty Section of the Society of Toxicology. Her major research interests are in the use of bronchoalveolar lavage fluid analyses to detect and characterize the pulmonary response to inhaled toxins, toxicokinetics of inhaled vapors and gasses, and the use of biological markers of exposure in assessing exposure to xenobiotics.

John P. Kindinger

John P. Kindinger is a senior consultant and Director of Advanced Technology for the consulting firm of PLG, Inc. in Newport Beach, CA. Prior to joining PLG in 1985, Mr. Kindinger was employed for 13 years as a staff engineer for the Consumers Power Company in Jackson, Michigan working on power plant design and construction including seven years on the Midland Nuclear Plant Project. Mr. Kindinger has extensive experience in risk assessment and cost/benefit analysis for the nuclear (commercial, DOE and DoD), electric power, chemical and petroleum industries. DOE facilities for which Mr. Kindinger has performed risk analyses include the Savannah Contained Tritium System (SCOTS) at LLNL, Hanford high level waste storage tanks (for LAHL), the LAHL plutonium processing facility (TA-55), the LAHL hazardous and mixed waste storage and treatment facility and the Waste Isolation Pilot Plant (WIPP) engineered alternatives. He holds a BS in Mechanical Engineering from Michigan State University and a SM in the Management of Technology from the Massachusetts Institute of Technology Sloan School of Management.

John A. Moore

John A. (Jack) Moore assumed the position of President and Chief Executive Officer of the Institute for Evaluating Health Risks (IEHR) in September 1989. He also serves as Director of Science Coordination for the Consortium for Risk Evaluation with Stakeholder Participation (CRESP). IEHR is established as a non-profit institution to serve government, industry and the public on issues that address the health risk of

chemicals. For six years Jack was Assistant Administrator of the Office of Pesticides and Toxic Substances at the U.S. Environmental Protection Agency. During his last year at the Agency he served as Acting Deputy, and for a brief time was EPA's senior official as Acting Administrator. He is credited with restoring scientific and management credibility to the pesticides program, developing a sound approach to managing the risk of asbestos in our nations' buildings, defining EPA's policies in the developing area of biotechnology and the development of scientific policy for the Agency's use of risk assessment.

Before joining EPA through a Presidential Appointment and U.S. Senate confirmation, Jack spent fourteen years at the National Institute for Environmental Health Sciences, NIH. There he rose through positions of increasing responsibility to finally serve in the dual positions of Director, Toxicology Research and Testing, and Deputy Director of the National Toxicology Program.

Jack received a Doctor of Veterinary Medicine degree from Michigan State University in 1963; he is also a Certified Diplomate of the American Board of Toxicology. Among his many honors and achievements as a scientist and a manager is recognition by his alma mater as a Distinguished Alumnus and being selected for the highest Presidential Rank award of Distinguished Executive in 1986.

Sally O'Connor

Dr. Sally O'Connor serves as Director for the Center for Environmental Programs at Xavier University. She is the official University representative to the Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) Environmental Technology Consortium, a consortium of seventeen universities led by Clark Atlanta University, and the Hanford Environmental Science and Engineering Consortium (HESEC), a consortium of six HBCU/MIs. These consortia focus on addressing the manpower needs of DOE's cleanup activities with particular emphasis on increasing the pool of qualified minority scientists and engineers. Dr. O'Connor is the Xavier Director of the Hazardous Materials in the Aquatic Environment of the Mississippi River Basin Program, a research program in partnership with Tulane University. She also serves as Co-PI of Consortium for Environmental Risk Evaluation (CERE) project. Dr. O'Connor has been very active in influencing curriculum changes in the environmental science/studies areas at Xavier, with new degree programs currently being developed. She has served in review panels for the National Institutes of Health, the Department of Energy, the National Science Foundation and the Environmental Protection Agency.

Dr. O'Connor served as Director of Region VI of the Alliance for Environmental Education in 1993-94. She is a Research Scientist Affiliate with Battelle Pacific Northwest National Laboratory. She is a member of several professional organizations including the American chemical Society, the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers, the Beta Xi Chapter of the Phi Lambda Upsilon Honorary Chemical Society, the Association for the Advancement of Computing in Education, the National Association of Environmental Professionals, and the Hazardous Materials Control Research Institute.

Dr. O'Connor received a Ph.D. in chemistry form the University of Illinois at Chicago in 1977. She was an Instructor/Postdoctoral at the University of Virginia from 1977-79. She is a Professor of Chemistry at Xavier University where she has been since 1983. Dr. O'Connor has an active research program on the development of new materials (novel phosphazene polymers) for use in the remediation of hazardous materials including radionuclides. She is an author of 22 publications.

Frank L. Parker

Frank L. Parker is Distinguished Professor of Environmental and Water Resources Engineering at Vanderbilt University. Dr. Parker served as Chairman of the Board o Radioactive Waste Management of NAS/NRC and is a member of several environmental advisory committees including the Environmental Management Advisory Board o the Department of Energy. He is a member of the National Academy of Engineering. He received his BS from the Massachusetts Institute of Technology and his Ph.D. in civil engineering from Harvard University.

Ralph Patt

1948-1952 B.S. Geology University of Pittsburgh
1952-1955 U.S. Army
1955-1958 M.A. Manhattan School of Music
1958-1972 Professional Musician, New York City
1972-1978 Graduate Studies in Hydrogeology, University of Nevada: Research Associate, Desert Research Institute, University of Nevada
1978-1981 Hydrogeologist, U.S. Geological Survey
1981-1986 Hydrogeologist, Century West Engineering Bend, Oregon
1986-1996 Hanford Hydrogeologist, Oregon Water Resources Department, Salem, Oregon

Maurice A. Robkin

Dr. Robkin, a Professor in the Department of Environmental Health at the University of Washington, is also a member of the CRESP Data Characterization, Analysis and Statistics Task Group. He has been associated with nuclear issues since 1953. He holds the Ph.D. degree in Nuclear Engineering from M.I.T. (1961), is a graduate of the Oak Ridge School of Reactor Technology (1954), and is a licensed professional engineer (Nuclear) in the State of Washington. He is a member of the American Nuclear Society and the Health Physics Society. He has held a license as a Senior Reactor Operator, 1984-1988.

He has worked in industry where he has done shielding research for the development both of nuclear powered ships and commercial nuclear power and is intimately familiar with nuclear technology issues. Since arriving at the University of Washington he has taught in the areas of classical nuclear engineering and in the environmental assessment of radioactive releases to the environment. He has done research in nuclear engineering, in environmental assessment and in embryology.

From 1988 to 1994 he was an active member of the Technical Steering Panel (T.S.P.) directing the Hanford Environmental Dose Reconstruction Project (H.E.D.R.). As Source Term Subcommittee chairman, he was responsible for liaison with and direction of the Source Term research group of the primary contractor and has done independent research relating to the historical releases from the Hanford nuclear facilities.

He was a member of the Peer Review Panel for the environmental impact statement on Environmental Restoration and Waste Management at the Idaho National Engineering Laboratory. Dr. Robkin has served as a Member and as Chair, Safety Committee, School of Public Health and Community Medicine, 1982-1988; as a Member, University Radiation Safety Committee, 1970-1975; and as Chair of the University Radiation Safety Committee from 1977 to 1982.

National Review Panel Staff

Christina H. Drew

Christina H. (Christie) Drew, a Research Associate at the Institute for Evaluating Health Risks (IEHR) holds a B.A. in Government from the College of William and Mary (1991) and a Masters of Health Science (M.H.S.) in International Health Systems Management from Johns Hopkins University (1995). Ms. Drew has several years of experience working on risk assessment projects at IEHR, including projects on Bioaccumulation and Developmental and Reproductive Toxicity. From 1994-1995 she spent eight months as an intern in the Environment and Health Department of the World Health Organization, Regional Office for Europe (Copenhagen, Denmark). She returned IEHR in August, 1995, and currently serves in a liaison role between the Consortium for Risk Evaluation with Stakeholder Participation(CRESP) and the Department of Energy. She is a member of the American Public Health Association, and the National Council for International Health.

Timothy Ewers

Timothy G. Ewers is a Research Scientist in the Department of Environmental Health at the University of Washington. He Mr. Ewers received his B.S. Chemistry and B.A in Biology (1985) from Seattle University and his M.S. in Toxicology from the University of Washington (1993). He has over ten years experience as a laboratory scientist in the study of reproductive biology and reproductive toxicology.

Karen Nakhjiri

Karen Nakhjiri Associate and Senior Project Manager at Sanford Cohen & Associates. She holds a B.S. Biology, Portland State University, 1978, a B.S. Chemistry, Portland State University, 1979, and a M.S.P.H. Environmental Health and Engineering, University of Washington, 1982. She has over 17 years of experience associated with environmental projects. She has extensive experience in site characterization and selection, permitting, regulatory analysis, and public involvement, which has included facilitating the activities of government and citizen advisory committees and managing public participation activities that are integrated with technical studies and planning and policy issues. She has been responsible for analyzing and applying environmental regulations, including preparation of regulatory guidance, and has experience in all phases of risk assessment, including hazard identification, dose-response relationships, exposure analysis, and risk characterization. Ms. Nakhjiri has been involved with and/or managed projects ranging from radioactive and hazardous waste management, and the siting, design and construction management of a state-of-the-art regional municipal solid waste landfill to CERCLA remedial actions and wastewater treatment facilities.

Walter G. Whimpenny

Walter Whimpenny is currently a Technical Project Manager for the Institute for Evaluating Health Risks in Washington, D.C. Over the past 3 years at the Institute he has participated in the Developmental and Reproductive Toxicity Project, the IEHR Dioxin Initiative and with the Consortium for Risk Evaluation with Stakeholder Participation (CRESP). He holds a B.S. Degree in Environmental Science from Allegheny College and a M.S. in Natural Resource Management from the State University of New York, College of Environmental Science and Forestry. Mr. Whimpenny is currently working towards a M.S. Degree in Software Engineering at the George Washington University, Washington, D.C.

Appendix F

What is CRESP?

The *Consortium for Risk Evaluation with Stakeholder Participation* (CRESP) is a university-based national organization created specifically to develop a credible strategy for providing the information needed for risk-influenced clean-up of complex contaminated environments, especially those for which the U.S. Department of Energy is responsible. CRESP is not a decision maker at DOE sites. CRESP has three fundamental commitments:

- To draw upon stakeholders and Tribal Nations for definition and redefinition of priorities and evaluation of technical data.
- To include consideration of social, cultural, and economic values side-by-side with human health and ecosystem impacts in risk-based investigations and analyses at each site.
- To work actively and collegially with all other organizations whose skills and capabilities can contribute to the better definition, understanding, and reduction of these risks.

CRESP seeks to elicit and incorporate the input of Stakeholders, government agencies, the public, and Tribes. CRESP has undertaken original research projects on various scientific, technical, occupational, and behavioral aspects of risk-based environmental management of DOE sites.

CRESP is funded through a cooperative agreement with the Office of Environmental Management, Department of Energy. Its principal institutions are the Environmental and Occupational Health Sciences Institute (a joint program of University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School and Rutgers University), Piscataway, NJ; the University of Washington, School of Public Health, Seattle, WA; and the Institute for Evaluating Health Risks, Washington, D.C.

Principal Investigator - Bernard D. Goldstein, MD, Director, Environmental and Occupational Health Sciences Institute (EOHSI)
Co-Principal Investigator - Gilbert S. Omenn, MD, PhD, Dean, University of Washington, School of Public Health and Community Medicine
Executive Director - Charles W. Powers, PhD, Environmental and Occupational Health Sciences Institute (EOHSI)
Director, Science Coordination - John A. Moore, DVM, President, Institute for Evaluating Health Risks

Director, Independent Peer Review - Arthur C. Upton, MD, Former Director, National Cancer Institute

Appendix G

Comments

The National Review Panel Report was originally released on May 2 with a "draft final" status, in order to permit a quality check for errors of a factual nature. Six sets of comments were received from the following:

Date Received	Commentor	Organization
May 9, 1996	Ker-Chi Chang	EM-30
May 6, 1996	Virginia Gardner	DOE-SR
May 9, 1996	Gene Higgins	DOE-RL
May 9, 1996	Joe Letourneau	EM-52
May 10, 1996	Dennis Long	DOE-OH
May 9, 1996	Theresa Perry	DOE-ORO

Comments of a factual nature or requesting points of clarification have been reflected in the Final Report. Full text is found on the following pages.