



Remediation Workers Exposure Assessment Feasibility Study At The Department of Energy's INEEL Site Phase I: Report

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PREFACE

The Department of Health and Human Services (DHHS), subsequent to the implementation of a Memorandum of Understanding (MOU) between the Departments of Energy (DOE) and Health and Human Services, conducts a program of independent occupational and environmental research studies with funding from DOE. Research conducted under this MOU focuses on the examination of health effects that may have resulted from past or current DOE operations. The National Institute for Occupational Safety and Health (NIOSH) within the Centers for Disease Control and Prevention (CDC), DHHS is charged with the conduct of the occupational health research component of this MOU. This document on the DOE Idaho National Engineering and Environmental Laboratory (INEEL) represents the seventh background site document prepared for the development of the NIOSH project entitled: Exposure Assessment of Hazardous Waste (HW), Decontamination and Decommissioning and Cleanup workers at Department of Energy sites.

The purpose of this document is to assemble information relevant to remediation workers performing Hazardous Waste (HW), Deactivation (De), Dismantlement (Di), and Clean Up (CW) task activities at the DOE INEEL site addressing four primary objectives. The objectives are: identification of remediation workers performing HW, De, Di, and CW task activities anticipated or in progress from the recent past through the next five to 10 years; demographic definition of the workforce performing these activities; identification of the technologies in use or proposed to be used (including considerations regarding health and safety impact upon the workforce); and assembly of summary information for potential chemical, mixed, and radiological contaminant exposures that may be encountered during these processes. The information is drawn predominantly from existing DOE and contractor documents or reports. Other source documents may include those assembled for compliance purposes or to define activities dictated by site Decontamination & Decommissioning, restoration, transition, and cleanup agreements with local, state, and federal authorities or as mandated by DOE. This assembly of information is to support research hypothesis development in the next phase of this project. It will also provide insight and initial data for study feasibility and planning considerations.

The depth and scope of the information assembled provides a midrange presentation of data. Grappling with the needs for substantive information while avoiding premature detail and acknowledging changes in data relevance as time elapses influenced both the character and decisions that went into the assembly of this document. The data collection process limited the need for intensive site involvement. This document is descriptive in nature. The resource documents used to assemble the information are referenced. Information that could not be obtained or which did not exist in an accessible form is also identified.

The intended application of this document is to provide an overview of remediation workers performing HW, De, Di, and CW task activities at the DOE INEEL site. The information is presented in two ways, a text assembly of information with references and a tabular presentation. The intent of this approach is to permit disassembly of the document to facilitate combining similar information for different sites, ideally facilitating an assessment of the feasibility of involving multiple sites in a research study.

The limitations of this document should be recognized. The rate of change in organizational structure, workforce composition, and site activities at the DOE sites involving remediation workers performing HW, De, Di, and CW tasks appears to be increasing in frequency and complexity. This coincides with a compression of the time frame committed to cleaning up sites by DOE, resource reductions, and an increase in the use of autonomous multi tiered subcontracting. Numerical data is presented as found in the cited references. No verification of summary data provided by the sites or obtained from pre-existing documents has been performed. Obstacles that may become substantial regarding exposure characterization of workforces on site include cessation of centralized data collection systems; introduction of "just in time" contaminant characterization on an as-justified basis; modification of site programs documenting worker exposures; shifts away from a stable, long-term workforce; and changes in the structure of site management. The information presented may also constitute tangential information related to the objectives specified for this phase of the project.

Note that company names, products or innovative technology does not constitute endorsement by the National Institute for Occupational Safety and Health (NIOSH).

Notification of INEEL prime contractor change: This document ended it's research phase in June of 1999 when Lockheed Martin Idaho Technology Company (LMITCO) was still the INEEL site management and operating (M&O) contractor. On October 1, 1999, the contract was awarded to a new joint venture company formed between Bechtel, Inc. and Babcock & Wilcox Idaho, Inc. called Bechtel BWX Idaho, LLC (BBWI). All LMITCO teaming partners and major subcontractor employees folded into the new company. ⁽¹⁾ BBWI is mentioned in some sections of this report to clarify future organizational structures, activities and projects.

Notification of primary labor union change: In January 1999, the Oil, Chemical and Atomic Workers (OCAW) union merged with the Paper Allied Industrial Chemical and Energy Workers International union (PACE). ⁽²⁾ In May 1999 at the INEEL, all workers with OCAW became a part of PACE. Labor agreements have yet to be revised. For this reason, this document will refer to the primary labor union as OCAW and not PACE. PACE is mentioned, however, in appropriate sections of this report.

Notification of Naval Reactors Facility Exclusion: The Naval Reactors Facility (NRF) area at INEEL operated by Westinghouse Electric Corporation (*Bechtel Bettis, Inc. in mid 1999*) is not included in the scope of this report. However, in Sections 9.0 and 10.0 of this document, the NRF is included in descriptions of waste management and environmental remediation. Exposure and demographic information regarding NRF employees remain excluded from relevant sections of the document.

Notification of Research Phase: The research phase of this document ended in June 1999. The reader should be aware of possible tense issues within certain sections of this report. For example, actions or events noted as taking place in the future may have already past.

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Acronym List

ACL	Administrative Control Levels
ACM	Asbestos Containing Material
AEC	Atomic Energy Commission
AFL-CIO	American Federation of Labor - Congress of Industrial Organizations
AFSR	Argonne Fast Source Reactor
AFVFS	Army Reentry Vehicle Facility Site
AGCR	Army Gas-Cooled Reactor
ALARA	As Low As Reasonably Achievable
ALPR	Argonne Low Power Reactor
AMWTP	Advanced Mixed Waste Treatment Project
ANL-E	Argonne National Laboratory - East
ANL-W	Argonne National Laboratory - West
ANP	Aircraft Nuclear Propulsion
APIT	Aquifer Pumping and Infiltration Test
AR	Administrative Record
ARA	Auxiliary Reactor Area
ARVFS	Army Reentry Vehicle Facility Site
ATR	Advanced Test Reactor
ATRC	Advanced Test Reactor Critical
ATSDR	Agency for Toxic Substances and Disease Registry
ATU	Amalgamated Transit Union
B&W	Babcock & Wilcox Idaho, Inc.
BA	Bachelor of Arts
BBWI	Bechtel B&W (Babcock & Wilcox) Idaho, Ltd. Liability Company
BEMR	Baseline Environmental Management Report
BERT TM	Barometrically Enhanced Remediation Technology
BNFL	British Nuclear Fuels, Ltd.
BORAX	Boiling Reactor Experiment
BS	Bachelor of Science
BWXT	Bechtel B&W (Babcock & Wilcox) Idaho, Ltd. Liability Company
CAA	Clean Air Act
CAIRS	Computerized Accident and Incident Record Keeping and Reporting System
CDC	Centers for Disease Control and Prevention
CEDE	Committed Effective Dose Equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CH	Contact Handled

CHP	Certified Health Physicist
Ci	Curies
CMS	Community Monitoring Station
Co	Cobalt
CO ₂	Carbon Dioxide
COC	Contaminant Of Concern
COCA	Consent Order and Compliance Agreement
CPP	Chemical Processing Plant
CPR	Cardio Pulmonary Resuscitation
Cr	Chromium
Cs	Cesium
CTF	Contained Test Facility
CW	Cleanup Worker
CWA	Clean Water Act
CWP	Chemical Waste Pond
CWSP	Chemical Waste Storage Pad
CRZ	Contamination Reduction Zones
CS	Chemistry Section
DAWP	Dual Arm Work Platform
D&D	Decontamination & Decommissioning
DDE	Deep Dose Equivalent
DDROPS	D&D, and Remediation Optimal Planning System
De	Deactivation, Decommissioning, Decontamination, and Small Scale Dismantlement Worker Task
DEAR	Department of Energy Acquisition Regulations
DE&S	Duke Engineering & Services
DEQ	Idaho Department of Environmental Quality
DF	Dairy Farm
DF-T	Diesel Fuel Tank
DHHS	Department of Health and Human Services
Di	Dismantlement Worker Task
DNFSB	Defense Nuclear Facilities Safety Board
DOD	United States Department of Defense
DOE	United States Department of Energy
DOE-CH	United States Department of Energy -Chicago Operations Office
DOE-ID	United States Department of Energy - Idaho Operations Office
DOELAP	Department of Energy Laboratory Accreditation Program
DOF	Degree-Of-Freedom
DOT	Department of Transportation
DSHEFS	Division of Surveillance Hazard Evaluation and Field Studies
DUCRETE	Depleted Uranium Concrete
DVS	Drum Vent System

EAFS	Exposure Assessment Feasibility Study
EBR	Experimental Breeder Reactor
ECA	Environmentally Controlled Area
ECC	Emergency Command Center
ECF	Expended Core Facility
EDE	Number of Personnel with Measurable Exposure
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EMI	Energy Measurements, Inc.
EMT	Emergency Technical Technician
EOC	Emergency Operations Center
EO	Equipment Operator
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPRO	Experimental Power Reactor Operator
ER	Environmental Remediation
ES&H	Environmental Safety and Health
ETA	Engineering Task Authorization
ETR	Engineering Test Reactor
FAST	Fluorinel And Storage Facility
FCF	Fuel Conditioning Facility
FEMP	Fernald Environmental Management Project
FFACO	Federal Facility Agreement and Consent Order
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FO-T	Fuel Oil - Tank
FRC	Federal Records Center
FRR	Foreign Research Reactor Fuels Video System
FTE	Full Time Equivalents
FY	Fiscal Year
GCRE	Gas-Cooled Reactor Experiment
GCREF	Gas-Cooled Reactor Experiment Facility
GM	Geiger Meter
GSLS	Gamma Spectroscopy Logging System
HASP	Health and Safety Plan
HASS	Hazard Assessment Sampling System
HDWG	Highest Dose Work Group
HEO	Heavy Equipment Operator
HEPA	High Efficiency Particulate Air
HERB	Health-related Energy Research Branch
HFEF	Hot Fuel Examination Facility

HLLW	High Level Liquid Waste
HLW	High-Level Waste
HMUs	Hazardous Material Units
HPGe	High-Purity Germanium Detectors
HPT	Health Physics Technician
HR	Human Resources
HRIS	Human Resource Information System
HVAC	Heating Ventilation and Air Conditioning
HVDS	Heat Vacuum Drying System
HW	Hazardous Waste
HWMA	Hazardous Waste Management Act
HWMU	Hazardous Waste Management Unit
I&C	Instrument and Control
I&T	Information and Technology
IBC	Interior Building Coffin
IBEW	International Brotherhood of Electrical Workers
ICPP	Idaho Chemical Processing Plant
ID	Identification
IDCS	Internal Duct Characterization System
IDHW	Idaho Department of Health & Welfare
IET	Initial Engine Test
IF	Idaho Falls
IFR	Integral Fast Reactor
IH	Industrial Hygiene
IHDE	INEL Historical Dose Evaluation
IHT	Industrial Hygiene Technician
ILTSF	Intermediate Level Transuranic Storage Facility
INEEL	Idaho National Engineering & Environmental Laboratory
INEL	Idaho National Engineering Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
INWMIS	INEEL Non-radiological Waste Management Information System
IRC	INEEL Research Center
ISB	In Situ Bioremediation
ISFSI	Independent Spent Fuel Storage Installation
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISOCS	In Situ Object Counting System
ISS	In Situ Sampler
ISV	In Situ Vitrification
IUOE	International Union of Operating Engineers
IWLS	Industrial Waste Lift Station
IWMIS	Industrial Waste Management Information System

IWP	Industrial Waste Pond
IWTS	Integrated Waste Tracking System
JON	Judgement Of Need
LAN	Local Area Network
LANL	Los Alamos National Laboratory
LAW	Low Activity Waste
LDAU	Light Duty Utility Arm
LLMW	Low-Level Mixed Waste
LLRW	Low-Level Radiological Waste
LLW	Low-Level Waste
LMITCO	Lockheed Martin Idaho Technologies Company
LOFT	Loss Of Fluid Test
LPN	Licensed Practitioner Nurse
LTD	Limited
M&O	Management & Operations
MACT	Maximum Achievable Control Technology
MCTBD	Main Cooling Tower Blowdown Ditch
MDAS	Multi-detector Analysis System
MEMP	Miamisburg Environmental Management Program
MK	Morrison Knudsen Corporation
MK-FIC	Morrison Knudsen Corporation
ML	Mobile Low-Power
MLLW	Mixed Low Level Waste
MOU	Memorandum of Understanding
MPC	Multipurpose Canister
MS	Master of Science
MSB	Multi-Purpose Sealed Basket
MSC	Monitoring and Surveillance Committee
MSDS	Material Safety Data Sheet
MSIS	Medical Surveillance Information System
MTC	Multipurpose Transfer Cask
MTR	Materials Test Reactor
MW	Mixed Waste
MWSF	Mixed Waste Storage Facility
NDA	Nondestructive Assay
NDE	Nondestructive Examination
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants

NIOSH	National Institute for Occupational Safety and Health
NLRB	National Labor Relations Board
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
Nox	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NR	Not Reported
NRAD	Neutron Radiography Reactor
NRC	Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NSA	North Storage Area
NWCF	New Waste Calcining Facility
OCAW	Oil, Chemical, and Atomic Workers International Union
OMP	Occupational Medical Program
OMRE	Organic-Moderated Reactor Experiment
OMSS	Occupational Medical Surveillance System
ORD	Ordnance Area
ORNL	Oak Ridge National Laboratory
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
OST	Office of Science and Technology
OU	Operable Unit
PACE	Paper Allied Industrial Chemical and Energy Workers International Union
PAN	Passive/Active Neutron
PBF	Power Burst Facility
PCB	Polychlorinated Biphenyl
PDF	Portable Document File
PEL	Permissible Exposure Limit
PEW	Process Equipment Waste
PGNAA	Pulsed Gamma Neutron Activation Analysis
pH	logarithm scale of hydrogen ions, measures acids-bases
PhD	Doctor of Philosophy
PICS	Personal Ice Cooling System
PINS	Portable Isotopic Neutron Spectroscopy
PIP	Patient In Progress
P.O.	Post Office
POC	Point of Contact
PPE	Personal Protective Equipment
PSP	Preliminary Scoping Package
PTI	Protection Technology Idaho, Inc.

QA	Quality Assurance
RA	Remedial Action
RACS	Reduced Access Characterization System
RCIMS	Radiological Control Information Management System
RCRA	Resource Conservation and Recovery Act
RCT	Radiation Control Technician
RD/RA	Remedial Design/Remedial Action
REMS	Radiological Exposure Monitoring System
RESL	Radiological and Environmental Sciences Laboratory
RFETS	Rocky Flats Environmental Technology Site
RGS	Rapid Geophysical Surveyor
RH	Remotely Handled
RI/FS	Remedial Investigation/Feasibility Study
RMRS	Rocky Mountain Remediation Services, L.L.C.
RN	Registered Nurse
ROD	Record Of Decision
RPE	Radioactive Protective Equipment
RPSSA	Radioactive Parts, Service, and Storage Area
RSWF	Radioactive Scrap Waste Facility
RTR	Real-Time Radiography
RTRAX	Radiation Tracking System
RUCS	Remote Underwater Characterization System
RW	Radiation Worker
RWMC	Radioactive Waste Management Complex
RWMIS	Radioactive Waste Management Information System
RWP	Radiological Work Permit
S&M	Surveillance & Maintenance
SAIC	Science Applications International Corporation
SAR	Safety Analysis Report
SCBA	Self Contained Breathing Apparatus
SCMS	Sodium Components Maintenance Shop
SDA	Subsurface Disposal Area
SDE-ME	Shallow Dose Equivalent: Skin
SDE-WB	Shallow Dose Equivalent: Extremity
SDW	Safe Drinking Water Act
SEAR-NB	Surfactant-Enhanced Aquifer Remediation at Neutral Buoyancy
SGRS	Gamma Ray Spectrometer System
SGS	Segmented Gate System
SITE	Superfund Innovative Technology Evaluation
SMF	Special Manufacturing Facility
SNC	Sierra Nuclear Corporation

SNF	Spent Nuclear Fuel
SNL	Sandia National Laboratory
SNM	Special Nuclear Materials
SO	Landlord Secretarial Office
SOW	Statement of Work
SPF	Sodium Process Facility
SPERT	Special Power Excursion Reactor Test
Sr	Strontium
SRD	Self Reading Dosimeter
SREX	Strontium Extraction
SRS	Savannah River Site
SSN	Social Security Number
STCG	Site Technology Coordination Group
STF	Security Training Facility
STP	Sewage Treatment Plant
SVOC	Semi-Volatile Organic Compound
SW	Site Wide
SW	Sanitary Waste
SWEPP	Solid Waste Experimental Pilot Plant
SWB	Standard Waste Box
SWLS	Sanitary Waste Lift Station
SWMU	Solid Waste Management Unit
TAN	Test Area North
TBA	To Be Announced
TBD	To Be Determined
TCE	Trichloroethylene
TDOP	Ten Gallon Drum Overpack
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescence Dosimeter
TLF	TRUPACT II Loading Facility
TMI	Three Mile Island
TQM	Total Quality Management
TRA	Test Reactor Area
TREAT	Transient Reactor Test Facility
TRIPS	Transuranic Reporting, Inventory and Processing System
TRU	Transuranic Waste
TRUEX	Transuranic Extraction
TRUPACT	Transuranic Package Transporter
TSA	Transuranic Storage Area
TSA-RE	Transuranic Storage Area - Retrieval Enclosure
TSCA	Toxic Substances Control Act
T/S/D	Treatment / Storage / and final Disposition

TSF	Technical Support Facility
TWA	Time Weighted Average
TWMIS	Transuranic Waste Management Information System
UPGWA	United Plant Guard Workers of America
UPR	Unplanned Release Site
US	United States of America
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VETEM	Very Early Time Electromagnetic
VOC	Volatile Organic Compound
VPP	Voluntary Protection Program
VSC	Ventilated Storage Cask
WAG	Waste Area Group
WBC	Whole Body Counting
WCB	Willow Creek Building
WEC	Westinghouse Electric Corporation
WEDF	Waste Engineering Development Facility
WERF	Waste Experimental Reduction Facility
WINCO	Westinghouse Idaho Nuclear Company
WIP	Work In Progress
WIPP	Waste Isolation Pilot Plant
WM	Waste Management
WMF	Waste Management Facility
WMFS	Waste Management Federal Services of Idaho, Inc.
WMO	Waste Management Office
WMT0	Waste Management TAN Operations
WROC	Waste Reduction Operations Complex
WRRTF	Water Reactor Research Test Facility
ZPPR	Zero Power Physics Reactor
ZPR	Zero Power Reactor

1.0 Abstract

This document entitled **Remediation Workers Exposure Assessment Feasibility Study (EAFS) at the United States Department of Energy's (DOE) Idaho National Engineering and Environmental Laboratory (INEEL)** addresses and identifies historic (November 1989 to June 1998), present (June 1998 - June 1999), and proposed (June 1999 and beyond) remediation worker demographics, available radiological and chemical exposure data, worker activities, and demonstrated/deployed INEEL remediation technologies.

In many cases, accelerated clean up schedules are planned for DOE sites across the country with the intention of site remediation within the scope of a ten year period. This worker population, which might encounter hazards that it's predecessors (i.e., production workers) were not exposed to, may vanish upon completion of these tasks. The first phase of this study will address, identify, and summarize documentation regarding this work force for use as a foundation upon which further studies will be built.

For the purpose of this study, only workers with "hands-on" or full involvement/ participation in site remediation activities will be addressed; no administrative support (i.e., office managers, clerical support, etc.), or security support (i.e guards) will be included in the defined remediation worker population. Site remediation efforts undertaken prior to November 1989, when INEEL was not yet included on the National Priorities List (NPL), are not addressed in this study. Workers that utilize buildings or structures which have been "free released" for public or private industry will also not be addressed in this study.

2.0 Purpose

This study involves the assembly of background information necessary to address health hazards to remediation workers involved with waste streams at the INEEL site. The objectives of this study are:

1. Define and characterize the remediation workforce demographically.
2. Determine if exposure characterization data exists and categorize the available exposure information into the following groups: chemical, mixed, and radiological.
3. Identify and catalog historic, in progress, and anticipated remediation worker activities at the site.
4. Identify past, present, and proposed future technologies DOE will use for the work categories.

Information assembled as a result of this study will serve as a catalyst for subsequent exposure assessment and epidemiological studies of this work force.

3.0 Research Approach

3.1 Information Resources

Information utilized to fulfill the objectives of this study was collected from publicly available documents and INEEL site contacts. Publicly available documents were obtained from Internet sites, the National Institute for Occupational Safety and Health (NIOSH), Health-related Energy Research Branch (HERB) Library located at 5555 Ridge Road in Cincinnati, Ohio, and from DOE Public Reading Rooms. INEEL contacts were identified prior to the research phase of this project.

The INEEL Home page ⁽³⁾ (<http://www.inel.gov>) was the most comprehensive publicly available source of information for INEEL via the Internet. Links to web-site documentation on a variety of topics were also available through this site, however these and other sites constantly changed throughout the research phases of this study presenting new information and deleting old. For purposes of this study, a hard copy of each on-line document was obtained and filed within a reference tracking database system. This system is described prior to Section 14.0: Works Cited on page 324.

Other web-sites were also used as references in this document. Examples include: 1) the Department of Energy's (DOE) Independent Oversight Home Page (<http://tis-hq.eh.doe.gov/oversight/>), 2) the DOE Environment, Safety and Health Information Portal (<http://tis-hq.eh.doe.gov/portal/>), 3) the DOE Environmental Management Home Page (<http://www.em.doe.gov/>), and 4) DOE's Idaho Operations Office web-site (<http://www.id.doe.gov/>). Other Internet sites not mentioned above are cited in applicable sections of this document.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) driven DOE Public Reading Room at INEEL served as a repository for the Administrative Record established under Section 113 (k) of CERCLA. The documents involved in creating the INEEL Administrative Record form the basis for the selection of a particular response (remedial response action) at the site. Section 113 (k) requires that the Administrative Record act as a vehicle for public participation in selecting a remedial response action. The Administrative Record and other DOE INEEL documents located at the DOE INEEL Public Reading Room were used as references in this report. The Administrative Record could also be accessed online at INEEL's Administrative Record and Information Repository (<http://ar.inel.gov>).

NIOSH identified DOE site contacts acted as a liaison between NIOSH contracted study personnel, DOE and INEEL site contractors. These site contacts provided information not available from public information sources, i.e., documents and data sources pertaining to past, present, and proposed remediation worker demographics and exposures which have been historically difficult to obtain through publicly available documents. Specifics pertaining to activities and technologies were also obtained through INEEL contacts. All information obtained from these resources excluded worker personal identifiers and focused on group or summary data only.

3.2 Exposure Assessment Feasibility Study (EAFS) Format

Information gathered to fulfill the objectives stated previously in Section 2.0 on page 2 is presented using two complimentary approaches. These are descriptive “text / information sections” and “exhibits / tables / figures” which present in an overview fashion the categories and type of information necessary to address each objective identified in the Statement of Work (SOW) for this EAFS.

Text / Information Sections include:

INEEL History and General Site Information (Section 4.0)

A general ecological description of the site is presented to include pertinent site facts, years of operation, site activity during production, a brief description of key facilities, current mission, future disposition of the site, and stakeholder / public involvement.

INEEL Regulatory Drivers (Section 5.0)

An overview of legal driving forces behind INEEL clean up is presented in this section. It includes the regulatory agencies and applicable legislation governing INEEL site remediation.

INEEL Waste Stream and Remediation Worker Task Definitions / Task-Based Classification Approach (Section 6.0)

This section is the basis for classification and decision logic in this EAFS. Waste types are described in detail. Remediation worker demographics, activities, potential exposures, and technologies are categorized according to the task definitions defined in this section.

INEEL Past, Present, and Proposed Remediation Worker Demographics, Site Safety Management, Remediation Worker Training and Demographic Data Systems (Section 7.0)

This section provides a demographic description of the remediation worker group at the INEEL site and includes, but is not limited to: overall numbers of remediation workers, union information, numbers of workers per contractor, turnover rates, job titles, tasks or categories, number of workers per job task or category, indication of where workers came from [e.g., former site workers, young unskilled laborers, etc.], industry profiles, construction trades, equipment operators, health and safety support / management, and remediation worker training. This section also identifies INEEL databases containing demographic information available for future epidemiology studies.

INEEL Remediation Worker Exposure Information (Section 8.0)

This section presents an overview of INEEL data systems providing information on radiological, industrial hygiene, and occupational medical data and the availability of past, present, and proposed information on the remediation worker population. Names of systems, data fields of interest, and system descriptions are available in this section.

Summary exposure data on the remediation worker population is also discussed in this section along with the use of DOE-HQ (Headquarter) databases accessible on the Internet.

Overview of Integrated Environmental Waste Management at the INEEL (Section 9.0)

This section provides an overview of INEEL integrated environmental waste management. The treatment, storage and disposition of each INEEL waste stream is also explained in this section with the use of waste stream disposition flow charts.

INEEL Past, Present, and Future Remediation Worker Activities (Section 10.0)

This section presents 24 independent past, present, and future remediation worker activities by INEEL project. They are described and defined relative to remediation worker task definitions and the physical location of those activities. While each of the 24 independent activities presented identify the major contaminant of concern expected to be encountered at each operation, it is likely that additional, unrecognized contaminants of concern may be encountered with some of these activities. Historic and current remediation worker exposure data was accessed, defined, and delineated into the following groups: chemical (i.e. hazardous), radiological, and mixed (i.e. radiological and hazardous material). Regulatory drivers specific to remediation worker group activities, activity duration, and number of workers per activity are also presented.

Identification of Past, Present, and Future Remediation Worker Task Technologies at the INEEL (Section 11.0)

Provided is a listing of 34 independent past, present and proposed future technologies for remediation workers. The list was indexed according to worker task and includes a brief description of technologies used, the number of workers required/proposed to use the technology, exposure risks (remote versus hands-on, Personal Protective Equipment (PPE) requirements, etc.), and perceived advantages and disadvantages of each technology.

Exhibits (Section 12.0)

This section presents, in a variety of formats (i.e. tables, charts), information relative to worker group activities, demographics, technologies, and exposures.

Tables (Section 13.0)

The required tabular format presentation of the data accompanies and summarizes in an overview fashion the material presented in the written text which is given with greater detail, explanatory information, sources, limitations, etc.

Works Cited/References (14.0)

Section 14.0 presents a listing of sources of information from points of contact and publicly available documents. An overview provides an explanation of reference tracking.

Note: Italics script within this document indicates direct quotes from the information resource.

Points of Contact (15.0)

Section 15.0 presents names, addresses, and phone numbers of INEEL DOE representatives and site contractor personnel that were contacted for information necessary to fulfill the objectives of this study.

4.0 INEEL History and General Site Information

4.1 Site History ^(4, 5)

Note: Refer to Table 4.4A on page 16 for a tabular presentation.

The present-day INEEL site emerged during World War II, when the U.S. Navy set aside 270 square miles of land in southeast Idaho for use as a gunnery range. The United States Naval Ordnance Plant, located in Pocatello, Idaho, relined naval guns from warships. After relining, these guns were shipped to what is today the Central Facilities Area (CFA) at INEEL for test firing. The Army Air Corps of Pocatello, Idaho also used an area northwest of the Radioactive Waste Management Complex (RWMC) as a practice bombing range for the B24 *Liberator* aircraft. Military weapons testing occurred again during the Vietnam War when the RWMC was used for test firing the guns from the battleship *New Jersey*.

In 1949, the Atomic Energy Commission (AEC) obtained the Navy's gunnery range and named INEEL the National Reactor Testing Station. Later, land was added for the use of developing and testing nuclear reactors and related facilities. This provided an isolated location where prototype nuclear reactors could be designed, built, and tested. Since its establishment, 52 first of a kind reactors have been constructed at INEEL.

4.2 INEEL Reactors ^(4, 5)

Experimental Breeder Reactor I (EBR-I), the first reactor built at INEEL, began operation on December 20, 1951. During its operational lifetime, EBR-I made many innovative contributions to the field of nuclear science and technology. In 1952, it proved the concept that reactors designed to operate in high-energy neutron range are capable of creating more fuel than is consumed (breeding). It was also the first reactor in the world to generate usable electricity with plutonium as the major fuel component and demonstrate the feasibility of using liquid metal as a reactor coolant. EBR-I was decommissioned in 1964. It is now a national historic landmark.

The first boiling water reactor prototypes were also built and operated at INEEL in the 1950s. The Boiling Water Reactor Experiment III (BORAX), was the first to light an American town, Arco, Idaho, in 1955.

The Materials Test Reactor (MTR), the first reactor built specifically for testing reactor core and fuel materials, achieved startup on March 31, 1952. Experiments at this facility influenced the choice of fuel elements and core structural materials for every reactor constructed in the United States since the MTR start-up. The MTR was shut down on April 25, 1970, and was formally decommissioned in 1974.

INEEL also initiated the development of reactor prototypes for the U.S. Navy in the early 1950s. One such prototype, the S1W, was used for the first nuclear submarine, *the Nautilus*. The initial power run of this prototype was conducted in 1953. Two other prototypes include the A1W and the S5G. The A1W facility began operations in 1958 and was the first designed to have two reactors providing power to the propeller shaft of one ship. The S5G prototype was installed in an actual submarine hull and was capable of simulating the rolling motions of a ship at sea.

The Aircraft Nuclear Propulsion (ANP) program was conducted at Test Area North (TAN) in the 1950s. This program was designed to prove the feasibility of nuclear powered aircraft. During the course of this program, three Heat Transfer Reactor Experiments (HTRE-I, -II, -III) were built and tested. Results from these tests proved the feasibility of using heat from nuclear power to operate aircraft turbojet engines. Three additional low-power reactors were also operated in support of this program. However, the ANP program was terminated in 1961 by Presidential Executive Order.

In 1953, the Idaho Chemical Processing Plant (ICPP) began recovering and reprocessing unburned, enriched uranium from spent reactor fuel elements. The ICPP was INEEL's most important reactor support facility.

In 1955, the Special Power Excursion Test (SPERT) was established to meet the AEC's water cooled reactor safety testing program. Four SPERT reactors were designed, built, and operated in the 15 year period between initial startup of SPERT-I (June 11, 1955) and final shutdown of SPERT-IV in 1970.

Work at the Army Reactor Area (ARA) began in 1957. The purpose was to develop compact, portable, or mobile reactors to generate electricity in remote locations. One water-cooled reactor and two gas-cooled reactors were constructed. An incident at the Stationary Low Power Reactor No. 1 (SL-1) (Refer to page 10 for further information), located at the ARA-II facility, occurred in January of 1961. A steam explosion led to the first fatalities in U.S. history related to nuclear reactor operations. After nine years of operations, the program at ARA was terminated in 1965 due to cost effectiveness and inability to define its mission.

Also in 1957, the Engineering Test Reactor (ETR) was completed and operations began. At this time, the ETR was the largest and most technically advanced materials test reactor in the world. Upon its retirement in 1982, the ETR was the first reactor to be deactivated following shutdown.

Other reactor concepts were tested at INEEL between 1950 and 1970. The Organic Moderated Reactor Experiment was designed to test the use of liquid hydrocarbons as a coolant and moderator. Also, safety testing was conducted on a series of auxiliary power reactors designed for use in space. In 1978, the Loss of Fluid Test (LOFT) Facility, the only nuclear reactor in the world capable of repeatedly simulating loss-of-coolant incidents similar to those that might occur in commercial power reactors, conducted its first experiments.

Since the mid 1970s, one of the specific purposes of INEEL has been to advance science and technology associated with environmental characterization and restoration of areas contaminated by earlier operations. In 1974, the National Reactor Testing station was changed to the Idaho National Engineering Laboratory (INEL) to reflect the broader multi-program nature of the research and development work performed at the site. In January of 1997, the name was changed again to the Idaho National Engineering and Environmental Laboratory (INEEL) to signify the lab's two areas of expertise: systems engineering & the development and application of environmental technologies.

Five of the 52 reactors developed at INEEL are still operational. Emphasis has shifted away from reactor development and defense related work and is now being focused on hazardous and radioactive waste management, cleanup, and technology development, with the exception of the Naval Reactors Facility (NRF).

4.3 Criticality Accidents ⁽⁶⁾

Criticality accidents have occurred at INEEL throughout its operations. On July 22, 1954, destruction of the BORAX I Reactor released 135 megawatts per second (MW/sec) of fission energy. There were more than 200 safety experiments conducted on the BORAX-I Reactor simulating control rod accidents. For the last test, conditions were set up so that the reactor would be run to destruction. An explosion took place in the reactor which carried away the control mechanism and blew out the core. Radiation levels were 25 mr/hr (millirems per hour) half a mile away. Personnel were evacuated for about 30 minutes, and no injuries occurred. Destruction of the reactor was an intended part of the cost of the experiment.

On November 29, 1955, EBR-I was undergoing a series of emergency condition experiments. During one of these experiments, the scientist in charge told the operator to press the emergency reactor off button, which would have instantaneously removed sufficient reactivity. However, due to a misunderstanding, the operator withdrew the control rods at normal speeds, allowing the reactor to reach a higher power than anticipated. This resulted in a melting of the fuel elements. Shortly after the accident, radiation levels in the building increased. There were no personnel injuries, but there was minor contamination of the sodium potassium coolant.

On October 16, 1959, a nuclear incident occurred in a process equipment waste collection tank. An accidental transfer of about 200 liters of uranyl nitrate solution, containing about 34 kilograms of enriched uranium (91% U^{235}), from safe process storage tanks was made to a geometrically unsafe tank through a line formerly used for waste transfers. Limited inspections and tests revealed that no significant property damage or loss occurred other than the \$60,000 cost to recover the contaminated uranium solution resulting from the incident. Of the 21 individuals involved in the incident, seven received external exposures to radiation (1.17 rem to 8 rem), and two received external exposures directly to the skin (32 rem and 50 rem). No medical treatment was required.

In January of 1961, two criticality accidents occurred at INEEL. On January 3rd, a nuclear excursion occurred within the SL-1 reactor vessel, resulting in high radiation levels (500 - 1,000 rem/hr) within the reactor room, and extensive damage of the reactor core and room. When the accident occurred, a three man crew was on top of the reactor assembling the control rod drive mechanisms and housing. The nuclear excursion resulted in an explosion which killed two of the crew members instantly, and the third within two hours of the incident. Of the several hundred workers involved in recovery operations, 22 persons received radiation exposures (3 to 27 rem). Some gaseous fission products, including radioactive iodine, escaped into the atmosphere outside the building. Particulate fission material was largely confined to the reactor building.

On January 25th, a nuclear excursion of approximately 6×10^{17} fissions occurred in a first cycle product evaporator at a chemical processing plant. A solution of enriched uranyl nitrate accidentally surged from a geometrically safe section of the evaporator into the upper, critically unsafe, vapor disengagement section. Personnel were immediately evacuated from the facility. Analyses of personnel badges indicated a maximum exposure of 55 millirem gamma and 0 beta, and nuclear accident dosimeters indicated that there was negligible fast neutron flux associated with personnel exposures. The radioactivity released to the atmosphere as a result of the accident was about twice the normal background when it left the area. A \$6,000 loss resulted from cleanup of the incident.

4.4 Current Facility Overview (7, 8, 9, 10)

The INEEL currently occupies 890 square miles in a remote desert area in southern Idaho along the western edge of the Eastern Snake River Plain. The plain is characterized by a semi-arid environment and is home to a variety of wildlife and vegetation. The land consists of flat to gently rolling, high-desert terrain that lies about 5,000 feet above sea level. Isolated hills on INEEL land reach 6,572 feet; however, individual mountain peaks just north and west of the site's borders approach 11,000 feet. Vast sagebrush flats dominate most of the INEEL landscape.

The INEEL infrastructure under the DOE Idaho Operations Office (DOE-ID) comprises 510 owned laboratory, research and development, engineering, reactor, storage, maintenance, and office buildings; 18 leased laboratory, storage, and office buildings (primarily located in Idaho Falls); and over 1,000 support structures. Buildings and structures at INEEL are clustered within the primary facility areas, which are separated from each other by miles of undeveloped land. A full complement of utilities also exists at the INEEL site, including: 177 miles of paved INEEL roads and public highways, 56.5 miles of electrical transmission lines, and 14 miles of railroad lines. Refer to Appendix II for a map of the INEEL Site.

The site consists of 10 major operating areas, or Waste Area Groups (WAGs) at the site: 1) Test Area North (TAN); 2) Test Reactor Area (TRA); 3) Idaho Nuclear Technology and Engineering Center (INTEC); 4) Central Facilities Area (CFA); 5) Waste Reduction Operations Complex/Power Burst Facility (WROC/PBF); 6) Experimental Breeder Reactor I (EBR-I); 7) Radioactive Waste Management Complex (RWMC); 8) Naval Reactors Facility (NRF); 9) Argonne National Laboratory-West (ANL-W); and 10) Sitewide Area. There are also several facilities in the city of Idaho Falls, the nearest major community which is located 42 miles to the southeast. The following presents a brief history and current status of each WAG/operating area. Refer to Appendix II for a representation of INEEL Site Waste Area Groups.

4.4.1 WAG 1: Test Area North (TAN) ^(11, 12, 13, 14)

Test Area North was established in the 1950s by the U.S. Air Force and AEC Aircraft Nuclear Propulsion Program to support nuclear powered aircraft research. Upon termination of this program in 1961, the area's facilities were converted to support other DOE research projects including nuclear reactor safety research.

Currently, the primary objectives at TAN include manufacturing and support. It provides underwater storage for some spent nuclear fuel (SNF) and offers facilities for potential large projects at the site. TAN's water storage pool holds the Three Mile Island-2 spent fuel and core debris, as well as spent fuel from several other reactors. The area also supports nuclear inspection and storage operations, and the Specific Manufacturing Capability Facility, which manufactures tank armor for the U.S. Army's M1A2 Abrams battle tank. Industrial areas at TAN include: 1) the Contained Test Facility (CTF), 2) the Technical Support Facility (TSF), and 3) the Water Reactor Research Test Facility (WRRTF). A fourth area, the Initial Engine Test (IET) area, is inactive. The TAN Facility is also home to the world's largest Hot Shop for remote handling of radioactive materials.

4.4.2 WAG 2: Test Reactor Area (TRA) ^(15, 16, 17)

The Test Reactor Area was established in the early 1950s and has been used for studying the effects of radiation on materials, fuels, and equipment. The site has three major test reactors: the Materials Test Reactor (MTR) (1952-1970), the Engineering Test Reactor (ETR) (1957-1982), and the Advanced Test Reactor (ATR), which is currently in use. The MTR helped influence the choice of core structural material and fuel elements for U.S. power reactor designs. The ETR provided more testing space and flexibility compared to the MTR. It was used to evaluate fuels, coolant and moderator characteristics under environments similar to those in many types of power reactors. The MTR and ETR are now inactive. MTR is now used for offices, storage, and a test area in support of activities at the Idaho Chemical Processing Plant (ICPP or CPP).

The current mission of the ATR is to support the U.S. Navy in testing materials and nuclear fuels used by nuclear-powered submarines and surface vessels. The ATR is currently the area's largest program. It is used to test materials under reactor conditions and to produce radioisotopes for defense support, medicine, research, and industry. Isotopes produced include Iridium-192 and Cobalt-60. TRA's current mission also involves an operating Category B reactor (the Advanced Test Reactor Critical Facility, ATRC), Hot Cells, and related facilities to support testing for the naval nuclear propulsion program, commercial isotope production, domestic and foreign research and test programs. ⁽¹⁸⁾

4.4.3 WAG 3: Idaho Nuclear Technology and Engineering Center (INTEC); formerly Idaho Chemical Processing Plant (ICPP) ^(19, 20, 21, 22)

The Idaho Nuclear Technology and Engineering Center, formerly known as the Idaho Chemical processing Plant, was built in the 1950s to reprocess nuclear fuel from government reactors to recover highly-enriched uranium and return it to the government stockpile. Reprocessing ended in 1992.

Currently, INTEC receives and safely stores government SNF, processes (treats and converts) and stores radioactive waste (High Level Waste (HLW) / Transuranic Mixed Waste (TRU Mixed)), carries out nuclear technology development, provides analytical support to INEEL facilities, and conducts environmental restoration activities. INTEC stores the majority of SNF at INEEL utilizing a large underwater storage pool and dry storage facilities. Three existing facilities used to store the SNF are the CPP-666 underwater fuel storage, the CPP-749 dry storage vaults, and the dry storage portion of CPP-603. Another dry storage facility is under construction at INTEC to receive the Three Mile Island-2 spent fuel and core debris that is now in underwater storage at the TAN facility. Management of liquid radioactive waste remaining from the days of reprocessing SNF is also a major operation at INTEC.

4.4.4 WAG 4: Central Facilities Area (CFA) ^(23, 24, 25)

The original facilities at the Central Facilities Area (CFA) were built in the 1940s and 1950s to house Naval Gunnery Range personnel. Over the years, the facilities have been modified to fit the changing needs at INEEL and now provide space for craft labor, office & service personnel, and analytical laboratory needs.

Currently, CFA is the main service and support center for programs located at other facility areas. Programmatic support activities at CFA's 82 buildings include a modern transportation complex, maintenance, capital construction, environmental and radiological monitoring and calibration laboratories, fire protection, warehouses, a cafeteria, security headquarters and training center, a sewage treatment plant, and one of INEEL's three fire stations. A small amount of research and development work is also conducted. Work on radioactive and hazardous materials is restricted in and around the CFA.

4.4.5 WAG 5: Power Burst Facility/Auxiliary Reactor Area (PBF/ARA) ^(26, 27, 28)

Constructed in the 1950s, the Power Burst Facility (PBF) once housed the four Special Power Excursion Reactor Tests (SPERT) reactors. The reactors were operated to test reactor behavior during off-normal operating conditions and to conduct safety studies on light-water-moderated, enriched-fuel reactor systems. In 1970, the experiments ceased and the reactors were removed. The facility was placed in standby condition in 1985.

The Auxiliary Reactor Area (ARA) was also constructed in the 1950s and consisted of four reactors that were used for reactor behavior testing and reactor safety studies. The ARA has been inactive since 1989.

Currently, the PBF is focused on supporting waste management activities at INEEL. It is used for handling and treating low-level waste and mixed low-level waste generated at other INEEL facilities. The PBF operations are concentrated on reduction of waste volumes and stabilizing radioactive wastes prior to disposal. The complex operates an incinerator, compactor, waste size-reduction facility, and interim mixed waste storage facility. The LLW processed at this facility are disposed of at INEEL's low-level waste landfill.

4.4.6 WAG 6: Experimental Breeder Reactor-I (EBR-I)/Boiling Water Reactor Experiment Area (BORAX) ^(29, 30)

The Experimental Breeder Reactor-I and Boiling Water Reactor Experiment were originally constructed to house test reactors that have since been decommissioned. Built by the Argonne National Laboratory, EBR-I was intended to determine if scientists' theoretical calculations on fuel breeding could actually be achieved. The theory was proved in early 1953. This site facility was also the site of the first production of usable electricity from nuclear power (December 20, 1951).

EBR-I was used for research until 1963, deactivated and decommissioned, and was replaced by EBR-II in 1964. Other than monitoring, no operations take place in either area. The EBR-I is now a National Historic Landmark and is open to the public.

4.4.7 WAG 7: Radioactive Waste Management Complex (RWMC) ^(31, 32, 33, 34)

The Radioactive Waste Management Complex was established in 1952 to store and dispose of solid low-level radioactive waste generated by INEEL operations. In 1954, it began to receive waste with TRU elements from the Rocky Flats Plant. This waste was buried in pits and trenches until above-ground retrievable storage was started (1970). TRU waste was received at the RWMC until 1989, when out-of-state waste shipments to the RWMC were banned by the Idaho governor.

The RWMC is divided into two areas: the Transuranic Storage Area (TSA) and the Subsurface Disposal Area (SDA). The TSA holds retrievable TRU waste intended for disposal at the Waste Isolation Pilot Plant (WIPP). Currently, there are six RCRA-approved storage modules holding this waste. Additional TRU waste in barrels and boxes is stored on an asphalt pad under an earth berm. The TSA also has TRU waste container examination and venting facilities, as well as a TRUPACT-II (TRU waste container) loading facility.

The SDA has mixed TRU and low-level waste buried in 20 pits and 58 trenches. One Pit (9) has begun remediation. This one-acre pit had received TRU wastes primarily from the Rocky Flats Plant.

4.4.8 WAG 8: Naval Reactors Facility (NRF) ^(35, 36, 37)

The Naval Reactors Facility was established in the 1950s to support development of the Naval Nuclear Propulsion Program. The facility consists of three naval nuclear reactor prototype plants: the submarine thermal reactor prototype (constructed in 1951 and shut down in 1989); the large ship reactor prototype (constructed in 1958 and shut down in 1994); and the submarine reactor plant prototype (constructed in 1965 and shut down in 1995). These prototypes were used to train the more than 38,000 Navy students who manned and piloted the U.S. Navy's nuclear fleet. The training function at this facility was discontinued in May of 1995.

The Expended Core Facility was constructed in 1958 and is still operational. It is used to receive and examine naval nuclear fuel, examine core components and material test specimens irradiated in the ATR, and to ship fuel to INTEC for interim storage.

A dry cell handling facility was added in 1998 to prepare its spent fuel for dry storage. The Navy plans to begin moving fuel into dry storage by 2001.

4.4.9 WAG 9: Argonne National laboratory - West (ANL-W) ^(38, 39, 40)

Established in the 1950s, ANL-W has supported the development of advanced nuclear reactor technologies for nearly 45 years. It houses three major reactor facilities, the Transient Reactor Test (TREAT) Facility, the Experimental Breeder Reactor-II, and the Zero Power Physics Reactor, all of which support several missions, including defense work, fuels testing, and neutron radiography. The Transient Reactor Test Facility has been used mainly for safety tests for various fuel types, as well as non-reactor experiments, the Experimental Breeder Reactor-II is currently undergoing shutdown, and the Zero Power Physics Reactor was placed in standby in 1992.

There are 52 major buildings located at ANL-W, including the reactor buildings, laboratories, warehouses, technical and administrative support buildings, and craft shops. Currently, numerous technology developments are going on at ANL-W. Breakthroughs in the areas of type of fuel used in nuclear-generated power, simplified reprocessing, reduction of nuclear waste lifetime, and the design of increased safety systems within the power plant have all taken place at ANL-W.

4.4.10 WAG 10: Sitewide Area ⁽⁴¹⁾

The Sitewide Area is the whole of INEEL site lands excluding land within the boundaries of the site's primary facility areas. No major programs are located in the Sitewide Area. Only about 10 people are permanently assigned to the area. Although 59 facilities are located in the Sitewide Area, most of those facilities are old, abandoned reactors or reactor support buildings that are scheduled for, or in the process of, demolition. The remaining occupied/utilized facilities in the Sitewide Area include the INEEL Firing Range (a security force training center), the Experimental Breeder Reactor-I historical site, entrance and exit guardgate facilities, and small structures and utility buildings such as pumphouses and communications buildings.

Although the entire Sitewide Area is subject to environmental, ecological, and cultural resource management and preservation efforts, some specific land areas on the INEEL have been established and developed as designated research areas with specialized infrastructure to support specific environmental and ecological research efforts. These include the National Oceanic and Atmospheric Administration Test Grid and the Environmental Science and Research Foundation's Experimental Field Station. In addition, special use areas, including a significant locality near the Middle and East buttes, have been made accessible by the DOE Idaho Operations Office for use by Shoshone-Bannock tribal members. However, the Sitewide Area mainly comprises vast expanses of undeveloped lands. Infrastructure in the area consists mainly of communication, utility, and transportation systems that serve and connect the site's primary facility areas.

Table 4.4 A: Milestones Occurring at INEEL from 1949 to 1985⁽¹⁸⁾

Year	Date	Event
1949	May	National Reactor Testing Station established
	November	Construction began on Experimental Breeder Reactor I (EBR-I)
1951		Aircraft Nuclear Propulsion (ANP) Program
	December 20	Experimental Breeder Reactor I (EBR-I) produced electricity by nuclear fission
1952		Radioactive Waste Management Complex (RWMC) began
	May	Materials Test Reactor (MTR) achieved power operation
1953	February	Idaho Chemical Processing Plant (ICPP) began hot operations
	July	Experimental Breeder Reactor I (EBR-I) proved breeding concept
	March	Nuclear submarine <i>Nautilus</i> prototype operates
1954		Boiling Water Reactor Experiment I constructed
		Boiling Water Reactor Experiment II constructed
	February 11	Reactivity Measurement Facility startup
1955		Original Department of Energy (DOE) building on Second Street built
		Zero Powered Physics Reactor
	August	Materials Test Reactor (MTR) began operations
	June 11	Special Power Excursion Reactor Test I (SPERT-I) began operations
	July 17	Boiling Water Reactor Experiment III lit Arco, ID
1956		Boiling Water Reactor Experiment IV constructed
1957		Auxiliary Reactor Area I (ARA-I) established
1958	August	Materials Test Reactor (MTR) first used Plutonium as fuel
	October 4	Naval Reactor Facilities (NRF) A1W (A) Reactor demonstrated
	December 19	Special Power Excursion Reactor Test III (SPERT-III) began operations
1960	March 11	Special Power Excursion Reactor Test II (SPERT-II) began operations
1961	March 28	Aircraft Nuclear Propulsion (ANP) Program canceled by President Kennedy
	September 30	Startup of Experimental Breeder Reactor II (EBR-II)
	October	Special Power Excursion Reactor Test IV (SPERT-IV) began operations
1963	December	Waste Calcining Facility began operations
1964	August 13	Experimental Breeder Reactor II (EBR-II) achieves full power
	August	Experimental Breeder Reactor II (EBR-II) produced electrical power
1965		Loss of Fluid Test (LOFT) begins construction
	September 12	Naval Reactors Facility (NRF) S5G prototype operational
1966	August 26	Experimental Breeder Reactor I (EBR-I) declared National Historic Landmark
1968		INEL Supercomputing Center constructed
1969		Zero Powered Physics Reactor began operation
	December	First experiments inserted into Advanced test Reactor (ATR)
1972	September	Power Burst Facility (PBF) achieved criticality
1974		Naval Reactor Testing Station renamed Idaho National Engineering Laboratory
	September	First operation of semiscale reactor
1975		INEL designated National Environmental Research Park
	December	Loss of Fluid Test (LOFT) Facility began testing
1976		Technical Support Building constructed, University Place constructed
	March	Loss of Fluid Testing - Loss of cooling accident: non-nuclear simulation
1978		Technical Support Annex constructed
	December	Loss of Fluid Testing - Loss of cooling accident: nuclear simulation
1979		Willow Creek Building constructed
1982		New Waste Calcining Facility constructed
1984	April 17	INEL Research Center dedicated
1985		Stored Waste Examination Pilot Plant (SWEPP) began
		Waste Experimental Reduction Facility (WERF) began

4.5 Current Mission ⁽⁷⁾

The mission of the Environmental Management program at the Laboratory is to manage waste and clean up contamination produced by past activities. Environmental Management has been the Laboratory's landlord since FY 1994. The Nuclear Material and Facility Stabilization program coordinates and oversees the orderly transition of contaminated structures and facilities from other Departmental programs to the Environmental Management program; puts those facilities into a safe, low-risk maintenance mode; and provides overall landlord functions. The Environmental Restoration program addresses contaminated soil, ground water, structures, and other material at the site. The Waste Management Program manages spent nuclear fuel and treats, stores, and disposes of waste generated by fuel reprocessing, manufacturing, research, and remediation.

4.6 Future Use ^(7, 43)

Land and facility uses at INEEL are constrained by legal, environmental, and public concerns. In 1995, the Idaho Operations Office developed the Comprehensive Facility and Land Use Plan for the Idaho National Engineering Laboratory. The plan describes the integration of the site's mission with the economic, social, ecologic, and cultural factors. This comprehensive plan provides a guide to facility and land use decisions. It also describes INEEL's interaction with its neighbors and describes its effect on the surrounding region. The plan also contains projections of future land use, as well as facility and infrastructure changes.

The plan presents reasonable land use scenarios at INEEL for the next 25, 50, 75, and 100 years. The scenarios are developed with extensive stakeholder involvement and assume that the Laboratory's boundaries will not change in the next 100 years and that future industrial development will most likely be concentrated in the central portion of the site and within major facility areas. In summary, most of the developed areas of the site will remain industrial areas for the 100 year planning period. The designation for waste disposal areas will remain Controlled Access. The outer perimeter will continue to serve as a safety and security buffer and as a livestock grazing area buffer zone. It will be designated as Open Space Use. The following are brief descriptions of the planned scenarios:

25 Year Scenario: *Most of the activities occurring onsite involve the decontamination and decommissioning of underused facilities and the development of support-related uses in various facility areas. While this scenario does not preclude the possible development of new production or research facilities, it does not require the creation of a new development area or facility area. New facilities would be incorporated into areas within the current development areas.*

50 Year Scenario: *Existing major facilities would begin to reach the end of their useful life, requiring a decision-making process on the possibility of full adaptive reuse of these facilities, limited use, or restricted use within the facility areas. It should be stressed that the decontamination and decommissioning process and subsequent cleanup of other site contamination would require a longer time frame for completion. Therefore, the 50-year scenario identifies the beginning stages of this process. Further, it is projected that new, emerging technologies will continue to require the establishment of facilities for both DOE and non-DOE (i.e., private initiatives) research and development of nuclear and non-nuclear energy applications, such as research in fusion, medical isotopes, nuclear space propulsion, and advanced environmental restoration and waste management technologies. These facilities are projected to be located in areas with optimal location factors and minimal site constraints. New infrastructure (i.e., roads and rail lines) may be required to support the location of these facilities.*

75 Year Scenario: *INEEL will begin to develop a more consolidated, secured facility. The DOE will continue adaptive reuse of facilities adequately located for new DOE and/or non-DOE industrial uses. New infrastructure improvements will create a new access network to take full advantage of prime development areas.*

100 Year Scenario: *A general continuation of the development and management characteristics of the INEEL from the 75-year scenario. At the 100-year point, facilities created under the 50-year scenario will approach the end of their useful lives, thus beginning a new cycle of development and reuse. New technological advances in waste management will be used continually onsite to deal with possible environmental impacts.*

4.7 INEEL Stakeholders and Public Involvement ^(43, 44)

The Department of Energy Idaho Operations Office (DOE-ID) maintains relations with the community and stakeholders. The following is a list of local organizations involved in facility and land management decisions. Many of these groups participated in developing the comprehensive plan for the INEEL site.

- 1.) Tribal Governments (the Shoshone-Bannock Tribes)
- 2.) Citizen's Advisory Board (composed of individuals representing various public entities, including chambers of commerce, local Tribes, environmental groups, local government, organized labor, etc.)
- 3.) U.S. Bureau of Land Management
- 4.) U.S. Department of Energy
- 5.) U.S. Forest Service
- 6.) U.S. Park Service
- 7.) U.S. Environmental Protection Agency
- 8.) Idaho Department of Transportation
- 9.) Idaho Department of Fish and Game
- 10.) Idaho Department of Health and Welfare
- 11.) State of Idaho
- 12.) Local Governments (City of Idaho Falls, City of Blackfoot)
- 13.) INEEL Work Force
- 14.) Non-Union, Non-Management INEEL Employees (Lockheed Martin Idaho Technologies Company (LMITCO))

5.0 INEEL Site Regulatory Drivers

The DOE-Idaho Operations Office (DOE-ID) is responsible for the management and administration of the INEEL facility. Lockheed Martin Idaho Technologies Company (LMITCO), along with their teaming partners (Babcock & Wilcox Idaho, Inc., Duke Engineering & Services, and Waste Management Federal Services of Idaho, Inc.), is responsible for the overall operations at the site. Most of the operations at INEEL address hazardous and radioactive waste management, cleanup, and technology development. INEEL is committed to operating the site in accordance with all of the following agreements and acts (i.e. environmental laws, regulations, Executive Orders, and DOE-ID Orders):

5.1 DOE, State of Idaho, and Department of Navy Settlement Agreement ^(7, 45)

This court-ordered agreement, signed in October of 1995 by DOE, the Department of the Navy, and the State of Idaho, resolved legal disputes regarding the receipt of spent nuclear fuel (SNF) at INEEL, and will guide the management of SNF, transuranic waste, and radioactive waste at INEEL for the next 40 years. It imposes limits and milestones on the amounts and timing of SNF shipments into and out of the State of Idaho, and on the construction and operation of INEEL's treatment and storage facilities.

According to the agreement, DOE will be required to remove all spent nuclear fuel from the state by FY 2035, prepare all high-level waste for disposal by FY 2035, and to begin transuranic waste shipments to the Waste Isolation Pilot Plant (WIPP) by April 30, 1999 and complete them by FY 2018. Failure to meet these circumstances will result in the risk of substantial monetary penalties. All milestones to date have been met or exceeded.

5.2 Federal Facility Agreement and Consent Order (FFACO) ^(18, 45)

The Federal Facility Agreement and Consent Order (FFACO) for INEEL (1991) commits INEEL to milestones for environmental restoration of the site. The purpose of this agreement is to establish a procedural framework and schedule for developing, prioritizing, implementing, and monitoring appropriate response actions at INEEL. These actions must be in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act (HWMA). The FFACO expedites the cleanup process to the maximum extent possible consistent with protection of human health and the environment. There are more than 70 enforceable deadlines contained in the action plan. At the end of the research period for this document, all negotiated deadlines have been met by INEEL.

5.3 Site Treatment Plan Consent Order ⁽⁴⁵⁾

The Site Treatment Consent Order governs how the DOE will comply with the Federal Facilities Compliance Act (Refer to Section 5.7 on page 24), the federal law that addresses management of mixed low-level waste at INEEL. It also governs the treatment of incinerable mixed low-level waste from across the complex. The plan was approved by the State of Idaho in 1995, and provides the means to regulate mixed-waste at INEEL.

The provisions of the plan, which are required by the Federal Facility Compliance Act, establish the administrative framework for enforcement and implementation. Its purpose is to set a schedule for the development of waste treatment, and to define the state's role regarding potential shipment of out-of-state material to INEEL for processing. The plan affects only mixed waste, and it identifies the type and the amount of both site waste and offsite waste that are proposed for treatment at INEEL. The plan contains many milestones. Annual updates and reports have indicated that all milestones have been met or exceeded. ^(45: P. 5)

As a result of the Site Treatment Plan for mixed waste, INEEL is one of the larger DOE sites that will develop specialized treatment for mixed waste. Certain other smaller DOE sites have requested that their mixed waste be treated at INEEL.

5.4 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) ⁽⁴⁶⁾

The Comprehensive Environmental Response, Compensation & Liability Act (CERCLA), enacted in 1980 and amended in 1986 (42 U.S.C. 9601-9675), established a program that ensures sites contaminated by hazardous substances are cleaned up by the responsible parties or the government. CERCLA provides the specific procedures and processes to assess and remediate inactive waste sites where the release of hazardous substances has occurred.

INEEL was placed on the National Priorities List under CERCLA on November 29, 1989. Environmental restoration activities at INEEL are being conducted in accordance with the FFACO (December 1991) in consultation with EPA Region 10 and the State of Idaho. All cleanup milestones scheduled in the 1991 agreement were met during 1997. All but one of the 10 Waste Area Groups (WAG), WAG 2: TRA, have initiated a Comprehensive Remedial Investigative and Feasibility Study (RI/FS). The Comprehensive RI/FS for WAG2 (TRA) was completed by signing a Record of Decision in December of 1997. These are intended to be the last major investigations at each WAG.

5.5 Emergency Planning and Community Right-to-Know Act (EPCRA) ⁽⁴⁶⁾

The Emergency Planning and Community Right to Know Act requires that the public be provided with information about hazardous chemicals on INEEL grounds and in the community, and establishes emergency planning and notification procedures to protect the public from chemical releases. It also contains requirements for periodic reporting on hazardous chemicals stored and/or used at INEEL facilities. Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, requires all federal facilities to comply with the provisions of this act.

INEEL EPCRA Compliance:

311 Report: these reports are submitted quarterly to Local Emergency Planning Committees, the State Emergency Response commission, and to local fire departments by January 1st, April 1st, July 1st, and October 1st. These reports satisfy the RCRA 90-day notice requirement for new chemicals brought onsite.

312 Report: the Emergency and Hazardous Chemical Inventory (Tier II) Report identifies the types, quantities, and locations of hazardous and extremely hazardous chemicals stored at INEEL facilities that exceed CERCLA and Emergency Planning Act reporting thresholds. This report is transmitted to the planning and response agencies before March 1st of each year.

313 Report: the Toxic Chemical Release Inventory Report identifies quantities of toxic chemicals released to the environment by INEEL during the calendar year. This report is transmitted to the EPA and the State of Idaho by July 1st of each year. In 1997, a report was prepared for only one toxic chemical, nitric acid.

33/50 Report: the EPA 33/50 Pollution Prevention Program requires release reductions of 17 priority Toxic Chemical Release Inventory chemicals by 50% before the end on 1999. To reach this goal, DOE must achieve an overall 1.1 million kg (2.3 million lbs.) reduction in reported releases of toxic chemicals to the environment and transfers of toxic chemicals for treatment and disposal. DOE is focusing efforts on the specific chemicals and sites which contribute the largest amounts to the complex-wide total each year. Executive Order 12856 requires all federal agencies to comply with the program.

5.6 Resource Conservation and Recovery Act (RCRA) ⁽⁴⁶⁾

The Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6901-69920, 1976) establishes regulatory standards for generation, transportation, storage, treatment, and disposal of hazardous waste. The State of Idaho is authorized by the U.S. EPA to regulate hazardous waste and the hazardous component of mixed waste (wastes containing both radioactive and hazardous materials) at INEEL.

Notices of Violation (NOV)

Officials from the Idaho Department of Environmental Quality (DEQ) perform annual inspections of INEEL facilities. Pending the results of these inspections, Notices of Violation (NOV) are issued. On August 21, 1997, DOE received an NOV from a November 18, 1996 inspection which consisted of 135 violations and a fine of \$892,725. The violations covered four main areas: 1) releases of hazardous waste at TRA, 2) mismanagement of hazardous waste with the mercury retort, 3) waste determinations at the ARA, and 4) waste determination and management at INTEC.

Since the NOV, both DOE and LMITCO have conducted several audits at INEEL, which have resulted in a list of additional non-compliant issues. This list was given to the state. DOE and LMITCO are negotiating a voluntary consent order to address the additional non-compliance issues.

RCRA Reports

As required by the State of Idaho, DOE-ID annually submits the Idaho Hazardous Waste Generator Annual Report. The report contains information on waste generation, treatment, recycling, and disposal activities at INEEL facilities for the year.

DOE-ID also submits the INEEL Affirmative Procurement Report to the EPA by December 1st of each year, as required by Section 6002 of RCRA and Executive Order 12780. This report provides information on INEEL's procurement of products containing recovered, rather than virgin materials.

The INEEL RCRA permit for the Hazardous Waste Storage Facility at CFA and some areas of ANL-W require submittal of an annual certification to the DEQ that the INEEL has a waste minimization program in place to reduce the volume and toxicity of hazardous waste. The certification is submitted on July 1st of each year.

The Annual Reports on Treatability Studies are also submitted to the DEQ. These annual reports describe the types of studies performed on both hazardous waste and mixed waste, and the quantities of waste used in the studies for the previous calendar year. They also provide a brief description of studies planned for the current calendar year.

5.7 Federal Facilities Compliance Act ⁽⁴⁶⁾

The Federal Facilities Compliance Act amends RCRA and requires the preparation of site treatment plans for the treatment of mixed wastes (contain both hazardous and radioactive components) at DOE facilities that store or generate mixed wastes. INEEL's Proposed Site Treatment Plan formed the basis for consent order negotiations for mixed waste treatment between DOE-ID and the state of Idaho.

5.8 Clean Air Act (CAA) ⁽⁴⁶⁾

The Clean Air Act (CAA) sets standards for the emission of hazardous air pollutants and for surrounding air quality. This act protects public health and welfare by safeguarding air quality, bringing polluted air into compliance, and protecting clean air from degradation. While the EPA is the federal regulatory agency of authority, states may administer and enforce provisions of the act by obtaining EPA approval of a State Implementation Plan. The State of Idaho has been delegated such authority.

The Idaho air quality program is administered through the permitting process. Potential sources of air pollutants are evaluated against regulatory criteria to determine if the source is specifically exempt from permitting requirements, and if the sources's emissions are significant or insignificant.

Title V Operation Permit: Title V of the 1990 CAA Amendments requires the EPA to develop a federally enforceable operating permit program for air pollution sources to be administered by the state and/or local air pollution agencies. The State of Idaho has established regulations, and the EPA has given interim approval of the Idaho Title V Operating permit program. INEEL's Title V Operating Permit Application was submitted and declared administratively complete in 1995. The regulatory technical review of the application was not anticipated to begin until the summer of 1999, with a permit to be issued in 2000. An emission inventory of sources of air pollutants has been and will continue to be conducted with the inventory submitted to the regulatory agency annually.

Efforts are ongoing at INEEL to evaluate and update release points and ensure that such sources are adequately described in existing permits and in the Title V application. Also, in 1997, a database was developed which identifies all applicable air quality requirements. The database, which is currently undergoing review, will support the Title V Operating Permit, and will help to identify requirements and to develop strategies for ensuring compliance.

5.9 National Emission Standards for Hazardous Air Pollutants ⁽⁴⁶⁾

Every year in June, DOE-ID submits the INEEL National Emission Standards for Hazardous Air Pollutants - Radionuclides report to the EPA, DOE-Headquarters, and State of Idaho officials. Using the CAP-88 software, the hypothetical maximum individual effective dose equivalent to a member of the public resulting from INEEL airborne radionuclide emissions (monitored, unmonitored, and diffuse sources) is determined. From the June 1998 submission, the dose reading from 1997 INEEL airborne radionuclide emissions was 0.03 mrem/yr. This dose was 0.3% of the regulatory standard of 10 mrem/yr.

5.10 Clean Water Act (CWA) ⁽⁴⁶⁾

The Clean Water Act (CWA), passed in 1972, establishes goals to control pollutants discharged to surface waters of the United States. One of the main elements of CWA is the effluent limitations set by the EPA for specific industry categories and water quality standards set by states. The CWA also utilizes the National Pollutant Discharge Elimination System (NPDES) permit program, which requires permits for discharges from a point source into surface waters. In 1993, DOE was issued NPDES storm water general permits for the discharge of storm water from industrial and construction activities at INEEL. Another application is on file with EPA Region 10 for minor discharges from INTEC production wells to the Big Lost River. INTEC is required to comply with Idaho Water Quality Standards for these discharges.

Only TAN, INTEC, and RWMC are required to have Spill Prevention, Control, and Countermeasure Plans. In 1997, all INEEL facilities were evaluated in accordance with 40 CFR 112. It was determined that all other facilities remained exempt. The plans are reviewed and updated as necessary.

5.11 Safe Drinking Water Act (SDWA) ⁽⁴⁶⁾

The Safe Drinking Water Act (SDWA), which was reauthorized on August 6, 1996, establishes primary standards for drinking water delivered by systems that supply drinking water to 15 or more connections or 25 individuals for at least 60 days per year. INEEL's drinking water supplies meet those criteria and are classified as either nontransient noncommunity or transient noncommunity systems, because persons who use the water do so four or five days per week, but do not live at the Site.

INEEL operates 12 active public water systems. All facilities perform sampling of drinking water as required by the EPA and the State of Idaho. This sampling involves monthly and/or quarterly testing for coliform bacteria. Bacteriological contamination was found in the drinking water supplies at TRA and PBF during 1996. Because of this, permanent disinfectant systems were completed for those facilities in the spring of 1997. All bacteriological monitoring conducted at INEEL in 1997 tested negative for coliform bacteria.

5.12 Toxic Substances Control Act (TSCA) ⁽⁴⁶⁾

The Toxic Substances Control Act (TSCA) requires testing and regulation of chemical substances that enter the environment. The Act, which is administered by the EPA, supplements sections of the CAA, CWA, and the Occupational Safety and Health Act. At INEEL, compliance with the act is primarily focused on the management of polychlorinated biphenyls (PCBs).

DOE-ID continues to store radioactively contaminated PCBs at INEEL. On May 8, 1996, as a result of negotiations between DOE and EPA, a complex-wide agreement for storage longer than one year was reached. Currently, DOE-ID and EPA Region 10 are in the process of developing an agreement for issues other than one-year storage of these materials. The issues being discussed include characterization, inspection, labeling, storage, and treatment. Several of the issues are related to the management of CERCLA waste.

5.13 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) ⁽⁴⁶⁾

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the registration and use of pesticides, including fungicides, herbicides, insecticides and rodenticides. INEEL complies with the act's requirements pertaining to the storage and application of such pesticides. No activities or issues, with respect to this statute, occurred at INEEL during 1997.

5.14 Tribal Working Agreement ⁽⁴⁵⁾

DOE-ID is focusing on expanding and strengthening its relationship with the Shoshone-Bannock Tribes of Fort Hall, Idaho. They have developed an agreement in principle with the tribes that addresses DOE Indian Policy objectives, including cooperation, participation, and communication between DOE and the Tribes. DOE-ID also funds programs and projects through a Cooperative Agreement (sponsored by DOE Headquarters-EM organization), intended to enhance tribal awareness, capabilities, and participation in INEEL activities. The core program addresses Environmental Management activities, including the National Environmental Policy Act (NEPA), transportation, environmental monitoring & training, cultural resources management, and emergency response & management. In addition, DOE funded the construction of an Emergency Operations Center (EOC) and a Community Monitoring Station (CMS) at Fort Hall. The CMS provides environmental data to the public and tribal officials for the purposes of outreach and environmental and emergency management. This system allows all INEEL environmental emissions data generated by the State or National Oceanic and Atmospheric Administration (NOAA) monitoring networks to be accessible to the tribes. An educational program is being fostered that will be included in the Fort Hall schools.

5.15 National Historic Preservation Act ⁽⁴⁶⁾

The National Historic Preservation Act requires that when any federal undertaking will have an adverse effect on historic property, the associated federal agency must enter into an agreement with the state Historical Preservation Officer for the purpose of mitigating those adverse effects. Section 106 of this act mandates the preservation of historic properties on lands managed by DOE.

A comprehensive draft of the Historic Context of INEEL was prepared in 1997, and is currently being reviewed by the State Historical Preservation Officer. The draft contains a historic evaluation of all properties built on INEEL grounds under the authority of DOE-ID, and provides a background that can be used to assess their historical significance. It will be used to guide a more comprehensive approach to managing the preservation and documentation of buildings scheduled to be modified or dismantled.

Draft Tribal Consultation Procedures were also developed in conjunction with the Tribes. These procedures provide clarity and guidance to ensure communication between the Tribes, DOE, and LMITCO regarding cultural resource management at INEEL.

5.16 Native American Grave Protection and Repatriation Act ⁽⁴⁶⁾

Because INEEL is located on the indigenous territory of the Shoshone people, the Shoshone-Bannock Tribes are major stakeholders in INEEL activities. Concerns exist as to how the remains of their ancestors and culture are treated by DOE-ID and its contractors. The Native American Grave Protection and Repatriation Act provides for the protection of Native American remains and the repatriation of human remains and associated burial objects. Repatriation refers to the formal return of human remains and cultural objects to the tribes with whom they are culturally affiliated.

The State Historic Preservation Office and DOE-ID have been working together to develop procedures based on the repatriation efforts for human remains found on INEEL grounds in 1995. These draft procedures were formulated to assist in current or any future repatriations on INEEL grounds. Human remains were again discovered on INEEL's Waste Experimental Reduction Facility during the summer of 1996. However, cultural affiliation could not be determined. DOE-ID and the Tribes are working together to determine how to proceed.

5.17 National Environmental Policy Act (NEPA) ⁽⁴⁶⁾

The National Environmental Policy Act (NEPA) establishes environmental policy to prevent or eliminate damage to the environment and requires that major federal projects with significant impacts be carefully reviewed and reported to the public in Environmental Impact Statements (EIS). Along with DOE's Council on Environmental Quality Regulations (40 CFR 1500), the act requires each federal agency to do the following regarding any proposed actions: 1) consider every significant aspect of the environmental impacts, 2) inform the public that the agency considered environmental concerns in its decision-making process, and 3) inform the agency decision maker of the environmental impacts and public concern associated with a proposed action. DOE's NEPA implementing procedures are found in 10 CFR 1021 as amended.

DOE Order 451.1 assigns authorities and responsibilities for the NEPA process within DOE. DOE-ID specific processes are set forth in its NEPA Internal Scoping Procedures, Quality Program Plan, and Public Participation Plan. The process is implemented by the DOE-ID NEPA Compliance Officer and NEPA Planning Board.

5.18 Endangered Species Act ⁽⁴⁶⁾

The Environmental Science and Research Foundation conducts ecological research, field surveys, and NEPA evaluations regarding ecological resources for DOE-ID. Particular emphasis is given to threatened and endangered species and species of special concern (as identified by the U.S. Fish and Wildlife Service).

Research and monitoring of this type has continued on several species of special biological, economic, and social concern: Townsend's big-eared bat, pygmy rabbit, burrowing owl, sage grouse, elk, and pronghorn antelope. Also, in 1997, two bald eagles, an endangered species, were sighted on INEEL grounds during the mid-winter season. Wolves, another endangered species, have been sporadically sighted on INEEL grounds since 1993. However, none were reported in 1997. Nor were there reports of the plant Ute's ladies tresses. It is doubtful that a suitable habitat (wet meadows) exists long enough each year on INEEL grounds to support this threatened species.

5.19 Environmental Occurrences

As required by law (DOE Order 232.1A), onsite/offsite environmental occurrences (spills, leaks, etc.) of radioactive and nonradioactive effluent materials at INEEL are reported to DOE and other federal and state agencies. All emergency, unusual, off-normal occurrence reports, including event descriptions and corrective actions, are available for review in the DOE-ID Reading Room located on the campus of Idaho State University, at Idaho Falls, Idaho. They are also available through the DOE Occurrence Reporting and Processing System (ORPS) via the Internet [<http://tis.ch.doe.gov/oeaf/orps.html>]. However, special access is required for ORPS use. Several small spills occurred at the INEEL during 1996 that were not reportable under environmental regulations. These included small releases of diesel fuel, sulfuric acid, nitric acid and oil. Significant INEEL ORPS reports are discussed in Section 8.5 on pages 75 and 76.

5.20 Environmental Oversight & Monitoring Agreement ⁽⁴⁶⁾

The Environmental Oversight & Monitoring Agreement between DOE-ID, DOE-Naval Reactors Idaho Branch Office, and the State of Idaho maintains the state's program of independent oversight and monitoring, which was originally established under the agreement first creating the INEEL Oversight Program. The main objectives of the second five-year agreement are: 1) to assess potential impacts of present and future activities in Idaho, 2) to assure citizens of Idaho that all present and future activities are or will be protective of the health and safety of Idahoans and the environment, and 3) to communicate the findings to the citizens in a manner that provides them the opportunity to evaluate potential impacts of the present and future DOE activities at INEEL.

The INEEL Monitoring and Surveillance Committee (MSC), created in March 1997, holds monthly meetings to coordinate monitoring activities among the several groups involved in INEEL onsite and offsite environmental monitoring. The MSC serves as a forum to review monitoring, analytical, and quality assurance methodologies. The committee brings together representatives from DOE-ID, LMITCO, ANL-W, the Shoshone-Bannock Tribes, and DEQ, among other organizations and interested parties.

6.0 INEEL Waste Stream and Remediation Worker Task Definitions / Task-Based Classification Approach

6.1 Overview

Classification of remediation workers at the Idaho National Engineering and Environmental Laboratory (INEEL) is based on worker function and the types of waste streams handled during a particular remediation activity. For purposes of this study, an approach for categorizing these workers was developed in order to define the remediation worker population at the site and categorize INEEL remediation worker activities and technologies.

Remediation workers at the INEEL site are frequently moved from project to project and area to area. Due to the variety of activities and projects assigned to each INEEL employee and the tendency to work with different waste types, categorization of remediation workers can only be achieved by task.

Table 6.1 A on page 31 provides definitions of waste types at INEEL. INEEL waste treatment / storage / and final disposition (T/S/D) paths are discussed in Section 9.0 on pages 80 through 99.

Remediation workers at INEEL may perform tasks involved with one or more of the following wastes presented in Table 6.2 A: Classification Basis for INEEL Remediation Worker Tasks on page 36.

Table 6.1 A: INEEL Waste Type, Associated Acronym, and Description (47, 48)

Waste Type and Associated Acronym		Waste Description
Hazardous Waste	HW	...is defined as a solid waste, or as a liquid or gaseous waste in a container, that exhibits one or more characteristics of corrosivity, ignitability, reactivity or toxicity, or is listed in Environmental Protection Agency (EPA) regulations as a hazardous waste. Waste defined as hazardous is not radioactive. Hazardous waste is regulated by the Resource Conservation and Recovery Act (RCRA) and Section 39-4411 (4) of the Idaho Hazardous Waste Management Act (HWMA).
Industrial and Commercial Waste	--	...is waste that is generated by business establishments such as offices and manufacturing. It can contain substances such as asbestos (subject to the Toxic Substances Control Act (TSCA)), but not hazardous or radioactive components (*See Page 34). Historically, industrial and commercial waste was disposed of at the INEEL in Central Facility Area (CFA) landfills. Currently, the INEEL generates uncompacted, solid, industrial and commercial waste for disposal or recycling. Sanitary waste at INEEL is classified as Industrial and Commercial Waste.
Low-Level (or Low-Level Radioactive) Waste	LLW (or LLRW)	...is radioactive material that is not classified as high-level waste, transuranic waste, spent nuclear fuel or natural uranium and thorium byproduct material. LLW does not contain HW constituents. Much of the low-level waste at the INEEL consists of contaminated rags, wood, tools, soils and personal protective equipment (PPE).
Low-Level Mixed Waste	LLMW	...is low level waste determined to contain both a hazardous component subject to RCRA and a radioactive component subject to the Atomic Energy Act. Low-level waste containing polychlorinated biphenyls (PCBs), asbestos, or other regulated toxic components will be managed under the TSCA. Hazardous components may include lead and other heavy metals, solvents, paints, oils, other hazardous organic materials, or components that exhibit RCRA characteristics of toxicity, ignitability, corrosivity, or reactivity.
TRU (Transuranic) and TRU Mixed Waste	TRU / TRU Mixed	...is waste containing radioactive isotopes with atomic numbers greater than 92 and half-lives longer than 20 years at concentrations exceeding 100 nanocuries of alpha-emitting radionuclides per gram. Common constituents of TRU waste are the elements plutonium and americium. TRU waste can remain dangerously radioactive for hundreds of thousands of years. Unlike high-level waste (HLW), which is generated from only a few specific processes and has a narrow range of characteristics, TRU waste exists in many different forms and can contain an array of hazardous chemicals (TRU Mixed waste).
Contaminated Media	-	...is LLMW and LLW (LLRW) contaminated soil, debris, and groundwater. Contaminated media is managed by the Environmental Restoration Program at the INEEL site. It also includes HW debris, Asbestos, TRU debris, and contaminated groundwater.
High Level Waste	HLW	...is radioactive, containing long-lived radionuclides and hazardous substances, metals and organic solvents. HLW at the INEEL resulted from the chemical reprocessing of spent nuclear fuel to extract uranium. It contains a combination of fission products, uranium and transuranic elements in concentrations that require permanent isolation. All HLW is managed as mixed waste, but is RCRA exempt .
Spent Nuclear Fuel	SNF	...is fuel that has been irradiated in a nuclear reactor to the point that it no longer efficiently contributes to the nuclear chain reaction. It contains a broad array of radionuclides (such as uranium, plutonium, or thorium radionuclides) with varying half-lives, some of which are very long. SNF is extremely radioactive and thermally hot. The Department of Energy (DOE) will not classify SNF as waste until the material is disposed of in a permanent geologic repository.

6.2 Remediation Worker Task Definitions

The following remediation worker task definitions were developed using a combination of process knowledge, information gleaned from INEEL publicly available documents, and INEEL site contacts. These definitions will vary between Department of Energy (DOE) sites due to site specific functions and missions.

There are four types of remediation worker tasks performed at the INEEL site. An individual remediation worker may perform one or more of the following tasks. They include:

Hazardous Waste Tasks (HW Tasks)

Hazardous waste (HW) tasks include sampling, surveying, containerization, treatment, transportation, storage, and disposal of **Hazardous Waste (HW)** (i.e. regulated chemical waste or chemically contaminated wood, metal, concrete, asphalt, debris, process residues, discarded product, contact waste, etc.), **Industrial and Commercial Waste** (* See Page 34), **Low-level Mixed Waste (LLMW)**, and **Transuranic Mixed Waste (TRU Mixed)** associated with solid waste management units (SWMUs), hazardous material units (HMUs), unplanned release sites (UPRs) or any other facility that requires HW, LLMW, or TRU Mixed waste remediation. HW tasks are also involved in removal, excavation, packaging, and/or transport of mixed waste portions (i.e. LLMW, TRU Mixed) of **Contaminated Media** (i.e. mixed waste contaminated soil and/or groundwater).

HW tasks are regulated by either the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) depending on whether the waste is located at an inactive waste site (CERCLA) or an active waste site (RCRA). Hazardous waste tasks can also include the duties of an Industrial Hygiene Technician (IHT) who surveys, samples, or containerizes chemical non-radiological substances to determine employee exposure potential. Laboratory workers who sample, survey, transport, treat (bench-scale), and dispose of non-radiological hazardous waste or mixed waste are also classified as HW task workers.

Deactivation, Decontamination, and Decommissioning Tasks (De Tasks)

Deactivation tasks involve placing a facility in a safe and stable condition to minimize the long-term cost of a surveillance and maintenance (S&M) program that is protective of workers, the public, and the environment until facility decommissioning is complete. Tasks include draining and/or de-energizing non-essential systems (including those related to **Spent Nuclear Fuel (SNF)**), removal of stored radioactive (**Low Level Waste (LLW)** and **Transuranic Waste (TRU)**), mixed (**LLMW and TRU Mixed Waste**), and **HW** materials, and related actions. As a bridge between operations and decommissioning, based on facility-specific conditions and final disposition plans, deactivation can accomplish operations such as final process runs and decontamination activities aimed at placing the facility in a safe and stable condition. (Refer to Section 10.4 on pages 131 through 138 for a detailed description of the INEEL Deactivation, Decontamination and Dismantlement Program).

Decommissioning takes place after deactivation and includes the S&M, decontamination, and/or small-scale dismantlement of process lines, tanks, and equipment within the facility or structure. These De tasks are conducted at the end life of the facility to retire it from service with adequate regard for the health and safety of the workers, the public, and protection of the environment. The ultimate goal of decommissioning is the unrestricted release or restricted use of the site. Asbestos abatement (i.e. removal prior to packaging and transport) is also conducted by workers performing De tasks. De tasks are usually CERCLA driven.

Demolition and Large Scale Dismantlement Tasks (Di Tasks)

Dismantlement tasks involve the disassembly, demolition and removal of any structure, system, or component, and the satisfactory interim or long-term disposal of the residue from all portions of the facility. Dismantlement tasks also involve final large-scale (superstructure) dismantlement, disassembly and/or demolition of the facility subsequent to facility deactivation. **Low-level Waste (LLW)** and **Contaminated Media** (radiological components only) are the primary waste stream involved with Di Tasks.

Unlike hazardous waste, deactivation and cleanup tasks, which are performed by major and sub-tiered contractors at the site, dismantlement tasks are usually performed by workers who are pulled from and are dedicated exclusively to dismantlement tasks. Di tasks are usually CERCLA driven.

Cleanup Worker Tasks (CW Tasks)

Cleanup worker tasks (CW tasks) involve systems operation and maintenance including treatment, transportation, storage, and disposal of **LLW, High Level Waste (HLW), SNF, TRU Waste, *Industrial or Commercial Waste, and Contaminated Media** (radiological components only) generated or handled during day-to-day remediation activities at the INEEL site. Workers involved with CW tasks will also survey, monitor, and analyze **LLW, HLW, TRU, SNF, Contaminated Media and *Industrial and Commercial Waste**. Laboratory workers as well as Radiological Control Technicians (RCTs) are considered to perform CW tasks. Like HW tasks CW tasks are either RCRA or CERCLA driven but are more likely to handle RCRA-exempt materials such as HLW.

***Industrial or Commercial waste is considered non-radioactive and non-hazardous by the INEEL site. For this report, workers involved with Industrial and Commercial waste streams may have the potential of working with hazardous or radioactive components based upon location or related activities. Tasks involved with Industrial and Commercial waste containing asbestos are classified as either HW or De tasks depending upon the activity.**

Examples of Tasks performed by Remediation Workers

Under a removal action (RA) or closure action, remediation workers performing HW tasks will remediate any hazardous waste site within an area (soils and groundwater) prior to facility deactivation (if applicable). RAs, authorized by *CERCLA Section 104d (2)*, are designed to address immediate threats to human health and the environment associated with abandoned or inactive sites. A removal action may be conducted during any point in the CERCLA response process. Typical removal actions include preventing migration of hazardous substances through excavation or placing barriers and removing barrels, drums, tanks, or other contaminated materials from facilities or past operations disposal areas.

Upon completion and disposition of the removed hazardous waste, remediation workers performing De Tasks will enter the building to be deactivated and remove any salvageable equipment, loose radiological gross contamination, or 'holdup material' (material left in process lines, machinery, equipment etc.). At this point, the facility may be placed in a 'safe' mode requiring surveillance, maintenance and monitoring or the internal structure of the building will be decommissioned and made ready for large-scale dismantlement (if applicable). A contract is then let to a dismantlement company for the final phase of the process. Remediation workers performing Di tasks will use brute force activities with heavy equipment (i.e. cranes) to completely demolish the structure.

Remediation workers performing CW tasks will provide maintenance and support to areas associated with the treatment, storage, and disposal of LLW, HLW, TRU, SNF, Industrial or Commercial waste, and Contaminated Media. They will also transport, treat and dispose of those wastes (usually higher in contamination) not handled by the worker performing HW or De Tasks. CW task workers could be in a laboratory performing bench scale treatment/technology research or working to retrieve or characterize HLW slurry or sludge from INEEL tank farms. Workers performing CW tasks can experience the greatest radiological exposure potential at the site.

Classification of 'Below' and 'Above' Grade Remediation Worker Tasks

In terms of 'below-grade' (below ground level) (i.e. trenches, burial grounds, cribs, french drains, gravel pits, etc.) remediation, tasks are either classified as HW or CW depending upon the waste types removed from the area. De and Di tasks are usually performed 'above-grade' or above ground within or on structures or facilities. The exception to this includes the decontamination or dismantlement of 'below-grade' pipes or tanks.

The following table summarizes the basis for remediation worker task classification and also presents example remediation worker tasks and associated waste streams at the INEEL site.

Table 6.2 A: Classification Basis for INEEL Remediation Worker Tasks

Remediation Worker Task	Associated Wastes	Example of Task Activities
Hazardous Waste Task (HW Task)	LLW, TRU Mixed, HW, Industrial or Commercial waste, and Contaminated Media	Sampling, surveying, containerization, excavation, treatment, transportation, storage, and disposal of hazardous and mixed waste. Task can be 'below-grade'.
Deactivation, Decommissioning, Decontamination, Small-Scale Dismantlement Task (De Task)	LLMW, LLW, TRU Mixed, TRU, HW, and SNF	Deactivation, Decommissioning, Decontamination, Small-scale Dismantlement of facilities. Task is usually 'above-grade'. The exception includes De tasks with 'below-grade' piping or tanks.
Dismantlement, Demolishing Task (Di Task)	LLW and Contaminated Media	Demolishing, Large-scale Dismantlement of facilities. Involved with radiological waste only. Task is usually 'above-grade'. The exception includes Di tasks with 'below-grade' piping or tanks.
Clean-up Worker Task (CW Task)	LLW, TRU, HLW, SNF, Contaminated Media, and Industrial and Commercial waste	Systems operations and maintenance. CW workers will identify, weigh, sample, survey, containerize, store, and prepare radiological waste. Treatment, transportation, storage, and disposal of HLW, TRU, LLW, SNF, SNM, and Contaminated Equipment and Media. Task can be 'below-grade'.

7.0 INEEL Site Past, Present and Proposed Remediation Worker Demographics, Site Health and Safety Management, Remediation Worker Training and Demographic Data Systems

7.1 Overview of INEEL Site Personnel

Current staffing for the entire Idaho National Engineering and Environmental Laboratory (INEEL) site represents a site-wide mix of federal and tiered contractor personnel. ^(49: P. 52) The Department of Energy Idaho Operations Office (DOE- ID) manages prime contractor activities at the site. The prime management & operating (M&O) contractor at INEEL is **Lockheed Martin Idaho Technologies Company (LMITCO)**. LMITCO and it's 'teaming partners' are responsible for the overall operations.

LMITCO teaming partners include: 1) **Babcock & Wilcox Idaho, Inc. (B&W)**, 2) **Waste Management Federal Services of Idaho, Inc. (WMFS)**, and 3) **Duke Engineering & Services (DE&S)**. All lower-tiered sub-contractors at the site fall under LMITCO and the teaming partners with the exception of British Nuclear Fuels Limited (BNFL, a DOE-ID privatization contractor), Westinghouse Electric Corporation (the Naval Reactor Facility (NRF) sub-contractor managed by the DOE Pittsburgh Naval Reactors Office*), and Argonne National Laboratory-West (ANL-W, managed by the DOE Chicago Operations Office (DOE-CH) and operated by the University of Chicago). Roles and responsibilities of each company will be described later in this section. ^(18, 45, 50)

The following tables present organizational charts showing contractor involvement post 1989. Table 7.1 A on page 38 presents major operating contractors from 1989 to October 1994 for the Idaho National Engineering Laboratory (INEL) and Table 7.1 B on page 39 presents the operating contractor organization from October 1994 to June 1999.

* The Naval Reactors Facility (NRF) workforce is not included in the scope of this study. Refer to the preface of this report for a detailed explanation.

Table 7.1A: Idaho National Engineering Laboratory (INEL) Site Contractor Organizational Chart from 1989 to October 1994 (18, 42, 45, 50)

<u>United States Department of Energy Idaho Operations Office</u>			
Provided oversight and management to three major operating contractors at the Idaho National Engineering Laboratory (INEL):			
EG&G Idaho, Inc.	Westinghouse Idaho Nuclear Company (WINCO)		Rockwell-INEL
<u>Other organizations at the INEL:</u>			
Westinghouse Electric Corporation (WEC)	Argonne National Laboratory-West (ANL-W)	MK-Ferguson of Idaho (MK-FIC)	Protection Technology Idaho, Inc. (PTI)
<u>Functions and Responsibilities:</u>			
Operated the Naval Reactor Facility (NRF) for DOE Pittsburgh Naval Reactors Office	Operated various reactors and maintained research facilities for DOE Chicago Operations Office.	Provided construction management services for DOE-ID.	Provided INEL security services.

Table 7.1B: Idaho National Engineering & Environmental Laboratory (INEEL) Site Contractor Organizational Chart from October 1994 to June 1999^(18, 45, 50)

Chart from October 1994 to June 1995

<u>United States Department of Energy Idaho Operations Office</u> Provides oversight to the management and operating (M&O) contractor at the Idaho National Engineering and Environmental Laboratory (INEEL):			
Lockheed Martin Idaho Technologies Company (LMITCO) <i>Teaming Partners include:</i>			
Babcock & Wilcox Idaho, Inc.	Duke Engineering & Services (DE&S)	Waste Management Federal Services of Idaho, Inc. (Formerly Rust International, Inc.)	
Functions and Responsibilities:			
Responsible for INTEC operations (HLW and SNF Management), Specific Manufacturing Capability, Energy Research, and Technology Development.	Responsible for Nuclear Operations, and Environmental Safety and Health.	Responsible for Environmental Restoration, Waste Management, Construction Management (other than Remediation Design/Action (RD/RA))	
<u>LMITCO Subcontractors:</u>			
Coleman Research Corp.	Parsons Infrastructure & Technology Group, Inc.	Thermo Technology Ventures	Numatec, Inc.
Functions and Responsibilities:			
INEEL Training Institute, Independent Assessment, Quality Assurance, Information Resources Management	Remediation Design/Action (RD/RA)	Leadership in Technology Commercialization	Waste Management Practices
<u>Other organizations at the INEL:</u>			
Westinghouse Electric Corporation (WEC)	Argonne National Laboratory-West (ANL-W)	MK-Ferguson of Idaho (MK-FIC) (Until 1995)	
Functions and Responsibilities:			
Operates the Naval Reactor Facility (NRF) for DOE Pittsburgh Naval Reactors Office	Operates various reactors and maintains research facilities for DOE-CH	Provides construction management services for DOE-ID	
<u>DOE Privatization Contractor for Advanced Mixed Waste Treatment Project (AMWTP):</u>			
BNFL, Inc. (Contract Awarded in 1996)			
Morrison Knudsen Corporation (MK)	GTS Duratek	Science Applications International Corporation (SAIC)	Rocky Mountain Remediation Services, L.L.C. (RMRS)
Functions and Responsibilities:			
Engineering and Construction	Vitrification Technology	Environmental, Safety, and Health Planning	Environmental, Waste, and Project Management

Note: Lockheed Martin Idaho Technologies Security Services are included within the prime M&O.

As of April 1998, there were approximately 6000 LMITCO and associated teaming partner employees (including subcontractors) and approximately 380 federal (DOE-ID) employees.⁽⁴⁵⁾ As of December 1998, there were *six DOE-CH employees and approximately 820 personnel at ANL-W.*⁽⁵⁰⁾ The overall number of Westinghouse Electric Corporation contractors working at the Naval Reactors Facility is not provided in this document.

7.2 Historical (1989-1998) Overview of Remediation Worker Population at INEEL

Remediation workers performing Clean-up (CW) and Hazardous Waste (HW) tasks (Refer to Section 6.0 on page 31 for task definitions) have been at the INEEL site since 1989. Decontamination / Decommissioning (De), and Dismantlement (Di) tasks activities have occurred at the site since late 1977. (Refer to Section 10.4 on pages 131 through 138 for a detailed explanation of D&D activities at INEEL).

INEEL remediation workers are primarily represented by the Oil, Chemical, and Atomic Workers (OCAW) local union, the site's largest union representing approximately 800 members in the occupations of operators, technicians, and crafts.⁽⁵¹⁾ Other groups, such as the Building Trades Consortium, also comprise the INEEL remediation worker population and will be discussed in detail later in this section.

Prior to 1989, OCAW members worked with INEEL site prime production contractors (i.e. AEC, EG&G, WINCO, and other contractors listed in Table 7.1 A on page 38) and performed tasks relating to site operations. Today, most remediation workers are former site production workers, however, young un-skilled laborers have entered the workforce over the last 10 years.

Prior to 1989 and through October 1994, EG&G Idaho, Inc. / WINCO and ANL-W held labor agreements with OCAW.^(52,53) In October 1994, LMITCO took over the EG&G/WINCO labor agreement along with securing the INEEL site M&O contract. Future INEEL M&O contractors will continue to recognize site unions as *exclusive collective bargaining agents with respect to wages, hours, and working conditions.*^(53: P.1) Detailed information about the OCAW labor agreement and other site union agreements are presented later in this section.

Exhibit 12.1 on pages 172 and 173 presents numbers of hourly paid remediation employees from 1989 through January 1999 as reported by the OCAW seniority roster. According to site contacts, the seniority roster is the best representative report presenting all union members since 1989.^(51, 54) Some job classifications such as x-ray technologist and production cook were excluded from this table due to the nature of the position. Remediation worker population inclusion and exclusion decision logic is presented in Section 7.3.1 on page 45.

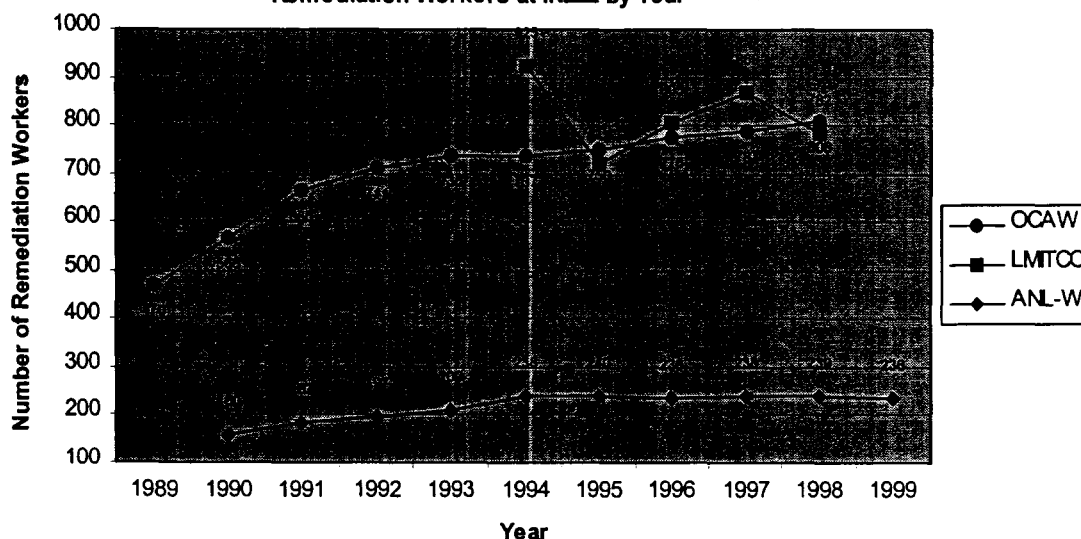
LMITCO and ANL-W union and non-union remediation workers are presented in Exhibit 12.2: Total Number of LMITCO Remediation Workers at INEEL from 1994 through 1998 and Exhibit 12.3: Total Number of ANL-W Remediation Workers at INEEL from 1990 through 1999 on pages 174 through 176. Non-union remediation workers are defined as non-exempt (i.e. eligible for overtime) technicians (i.e. industrial hygiene, health physics, or engineering technicians) or those working in the laboratory.

Listings of desired remediation worker job classifications were given to LMITCO and ANL-W site contacts in order to generate Exhibits 12.2 and 12.3. Exhibit 12.4: LMITCO and ANL-W Non-Exempt Technician Discipline Descriptions on pages 177 through 185 presents a list of non-union non-exempt remediation worker positions and a detailed description of each position. Exhibit 12.5: LMITCO Parent Job Family Structures on pages 186 and 187 presents descriptions of non-exempt work groups. The job family structure was instituted in early 1999 for LMITCO only. Union job descriptions (i.e. craft positions) were not made available for this report.

Figure 7.2 A, located below, graphically shows changes in the total remediation worker population for OCAW, LMITCO and ANL-W remediation workers from 1989 to 1999.

Remediation worker population head counts were not obtainable prior to 1994 for the prime M&O contractor at the site. It was mentioned by a site contact that EG&G maintained the site Human Resources Information System (HRIS) database for its own employee's (this database is discussed in detail on pages 61 and 62) and sold Human Resources (HR) tracking services to other, but not all, INEEL site contractors. In order to properly obtain all head counts during this time period, investigations of each contractor would need to be conducted. This is difficult due to the dissolution of companies such as Rockwell-INEL and the identification of lowered-tiered sub contractors not presented in this document. ⁽⁵⁵⁾

Figure 7.2 A: Changes in the Total Number of OCAW, LMITCO, & ANL-W Remediation Workers at INEEL by Year ^(56, 57, 58)



7.3 Current Remediation Worker Population at the INEEL Site Defined

For the purpose of this Exposure Assessment Feasibility Study (EAFS), INEEL remediation workers are defined as OCAW represented employees working for LMITCO and ANL-W. The population also consists of union members within the Building Trades Consortium and non-union laboratory technician workers employed by LMITCO and ANL-W performing bench scale remediation treatment technologies, including packaging, storage and disposal of contaminated materials. For a description of remediation worker population inclusion and exclusion decision logic, refer to Section 7.3.1 on page 45.

Contacts and demographic descriptions of prime, subcontractor, and union remediation workers at INEEL are presented in Table 13.1 pages 288 through 291. Table 13.1 combines contractor and labor union information. Note that the total remediation worker population at INEEL is approximately 2000 employees. Remediation workers comprise approximately 28% of the 7206 employees at the INEEL site. These numbers excluded employees at the NRF. The total number of remediation workers at INEEL does not include lower-tiered subcontractors that are contracted for specific short-term projects such as small demolition or construction projects. In December 1998, the LMITCO radiological dosimetry system (described on page 63) reported approximately 850 vendors and contractor companies making deliveries or working within site boundaries.⁽⁵⁹⁾ It was not known how many contract companies were specifically performing remediation work.

During the summer months at INEEL, the remediation worker population increases due to increased outdoor remediation projects including activities such as construction and demolition. It was stated by a site contact that the routine number of laborers within the Building Trades Consortium (year round) is 100 and increases up to 1000 employees during the summer months. Note that the total number of remediation workers mentioned in the above paragraph includes union members that may be asked to work at INEEL during the summer months.⁽⁵⁴⁾

Table 7.3 A on pages 43 and 44 presents contact information and numbers of laborers within each craft in the Building Trades Consortium as of June 1999. The total number of unionized remediation workers at INEEL is approximately 1,729. (This number includes the OCAW and all Building Trades Consortium members regardless of whether they are performing routine year round work at the site.)

Table 7.3A: INEEL Building Trades Consortium Contacts and Number of Members as of June 1999

Local Union	Contact, Address, and Telephone/Fax	Number of Employees (Current 3 month Average)
Asbestos Workers Local # 69	Jerry Turner, Business Agent 2261 S. Redwood Rd., Suite B Salt Lake City, Utah 84119 (801) 972-3945 Fax (801) 972-8481	6 ⁽⁶⁰⁾
Boilermakers & Welders Local # 182	Brad John, Business Manager Terry Crader, Business Agent 4707 South 300 West, Murray, Utah 84107 (801) 821-9988 Fax (801) 281-9990	20 ⁽⁶¹⁾
Carpenters Local # 808	Steve Crumley, Business Agent Peggy Hill, Office Manager P. O. Box 51160, Idaho Falls, Idaho 83405 (208) 524-2409 Fax (208) 524-2432	341 ⁽⁶²⁾
International Brotherhood of Electrical Workers (I.B.E.W.) Local # 449	Bob Bodell, Business Manager and Building Trades Consortium President Steve Walters, Business Associate LeDawn Espinosa, Office Coordinator. P. O. Box 4949, Pocatello, Idaho 83205 (208) 232-5263 Fax (208) 232-7883	137 ⁽⁶³⁾ (45 in maintenance, 92 in construction)
International Union of Operating Engineers (IUOE) Local # 370	Brian Hogan, Business Representative Darlene Schomaker, Secretary/Dispatcher P. O. Box 370, Pocatello, Idaho 83204 (208) 232-8492 Fax (208) 232-8493	38 ⁽⁶⁴⁾
Laborers Local # 155	Chuck Vogel, Business Manager Pam Bare, Office Manager 465 W. 17th St., Idaho Falls, Idaho 83402 (208) 529-0191 Fax (208) 528-6466	110 ⁽⁶⁵⁾
Iron Workers Local # 732	Willis Norton, Business Manager P.O. Box 1120, Pocatello, Idaho 83204 (208) 232-4873 Fax (208) 234-7543	175 ⁽⁶⁶⁾
Painters & Glaziers Local # 764	Dan Obray, Business Manager P. O. Box 1120, Pocatello, Idaho 83204 (208) 232-5957 Fax (208) 478-1746	10 ⁽⁶⁷⁾

Table 7.3A: INEEL Building Trades Consortium Contacts and Number of Members as of June 1999

Local Union	Contact, Address, and Telephone/Fax	Number of Employees (Current 3 month Average)
Plasterers & Cement Masons Local # 629	Bob McKnight, Business Agent/Secretary 907 McKinley, Pocatello, Idaho 83201 (208) 237-4064	38 ⁽⁶⁸⁾
Plumbers & Steam Fitters Local # 648	Rod Fuger, Business Manager P.O. Box 1120, Pocatello, Idaho 83204 (208) 232-6806. Fax (208) 232-6884	40 ⁽⁶⁹⁾
Roofers Local # 200	Brett Purkett, Business Manager Shirley Purkett, Secretary Co-owners of Pocatello Roofing 915 Berryman Road, Pocatello, Idaho 83201 (208) 237-7021	20 ⁽⁷⁰⁾
Sheet Metal Workers Local # 60	Brent Moore, Business Manager Irene Carlson, Secretary/Bookkeeper P. O. Box 1120, Pocatello, Idaho 83204 (208) 233-5214. Fax (208) 232-4132	4 ⁽⁷¹⁾
Sprinklers & Fitters Local # 669	Dan Koch, Business Agent P. O. Box 279, Laurel, Montana 59044 (406) 628-7744 Fax (406) 628-6644	4 ⁽⁷²⁾ (Employed by 3-D Fire Protection Company)
International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers, Local 983	Mike Oar, Operations /Business Manager P. O. Box 1165, Idaho Falls, Idaho 83405 (208) 526-2606	19 ⁽⁷³⁾
Total Building Trades Consortium Union Members		962

7.3.1 Decision Logic in Defining the Remediation Worker Population at the INEEL Site

The following groups of INEEL workers are included in the remediation worker population for this EAFS:

1) The Oil, Chemical, and Atomic Workers International Union AFL-CIO OCAW Local 2-652 LMITCO and ANL-W Units

...except workers that do not perform remediation tasks as defined in Section 6.0. Classifications excluded from remediation work are chef, first cook, production cook, grid cook, mail labeler, mail clerk, photographer, microfilmer, printer, telephone operator, occupational health nurse, x-ray tech, and LPN exam tech.

2) The Building Trades Consortium INEEL site members

3) Non-union technician and laboratory workers employed by LMITCO and ANL-W

...these workers are also classified as non-exempt non-bargaining unit employees. Job descriptions for these workers are provided in Exhibits 12.4 and 12.5 on pages 177 through 187.

4) International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers Union, Local No. 983 Unit

The following groups of INEEL workers are excluded from the remediation worker population for this EAFS:

1) United Plant Guard Workers America and Amalgamated Plant Guards International Union, Local 3 (UPGWA) Unit

2) Amalgamated Transit Union, Local 1517, AFL-CIO Unit

3) Oil, Chemical and Atomic Workers International Union, Local 2-652 (Firefighters) Unit

... even though firefighters at INEEL are a part of the OCAW Local Unit, they are considered excluded from the remediation worker population due to infrequent (emergency response only) exposure to chemical and radiological hazards.

4) All DOE-ID and DOE-CH employees, any LMITCO or ANL-W exempt professional or management positions

5) All Westinghouse Electric Corporation employees working at the Naval Reactor Facility under the DOE Pittsburgh Naval Reactors Office

7.4 INEEL Labor Agreements

As mentioned previously, LMITCO and ANL-W hold labor agreements with OCAW. These labor agreements govern duties relating to environmental restoration, D&D work, upkeep and maintenance of facilities, transportation, storage and disposal of hazardous or radioactive wastes, emergency management, monitoring, and data/clerical operations at the INEEL site.

7.4.1 1998 LMITCO / OCAW Labor Agreement ^(53: P.1)

The following union information was selected from the July 13, 1998 collective bargaining agreement between LMITCO and OCAW Local No. 2-652. The bargaining agreement defines a set of employment terms and conditions agreeable between the OCAW, LMITCO and its teaming partners and subcontractors, and DOE-ID. The LMITCO/OCAW working agreement recognizes the following remediation worker groups: 1) operations and maintenance employees at associated buildings in Idaho Falls and at any onsite facility within LMITCO's responsibility and jurisdiction, 2) experimental machine shop employees at Test Reactor Area (TRA), 3) Radiation Control Technicians (RCTs) and/or Health Physics Technicians (HPTs) employed by LMITCO at its Idaho Chemical Processing Plant (ICPP) and as certified by the National Labor Relations Board (NLRB), 4) Decontamination Technicians at ICPP, 5) Clothing Issue Technicians at ICPP, 6) Vehicle Repair Specialists and Helpers. The agreement excludes confidential, administrative, professional office clerical employees, security guards, and supervisors.

LMITCO Management Rights:

The Union (OCAW) recognizes that managerial functions inherent in the conduct of business by an employer are retained by the Company (LMITCO). The management of the company and direction of its employees, except to the extent modified or deleted by this Agreement remain vested in the company. Such rights of management include but are not limited to the following: 1) the introducing of new or improved production means, methods, processes or equipment, 2) verifying work has been performed correctly, 3) determining the size and the composition of the work force, 4) the establishment of work rules, 5) discipline of employees for cause, and 6) the hiring, reducing or increasing of the work force. ^(53: P.11)

LMITCO Hours of Work and Shifts: (53: Pg. 16-19)

Each employee will have an established work schedule that complies with this Article. Changes to the established schedules will be discussed with affected employees, and the Union will be given the opportunity to provide alternatives.

Work Week:

The work week for all employees starts at 12:01 a.m. on Monday and ends seven days later.

Work Day:

The work day starts at 12:01 am and ends twenty-four hours later.

Work Schedules for Day Workers:

The standard work schedule will be one of the following: 1) 5X8 (five days at 8 hours a day) or 2) 4X10 (four days at 10 hours a day).

Alternate Work Schedules:

Schedules may be modified in order to meet the business needs of a competitive marketplace and adapt to the needs of an increasingly diverse work force.

Work Schedules for Shift Workers:

An employee may be assigned to any of the following shift schedules to support Site operational activities: 1) Rotating Shifts (day, evening, night / 8 or 12 hour days), 2) Fixed Shift (steady shift other than day shift), and 3) Alternating Shift (alternates between two shifts).

Employees (except temporary hires, part-time or probationary employees) are eligible for overtime rates. Overtime is voluntarily requested by the employee and assigned as needed by LMITCO. Qualified employees are also eligible to participate in the following INEEL benefit programs: personal leave, medical plan, dental insurance plan, vision insurance, health care flexible spending account, dependant day care flexible spending account, employee life insurance, spouse / dependent life insurance, accidental death and dismemberment insurance, short-term / long-term disability insurance, workers compensation, long-term care insurance, service awards, leaves of absence, retirement plan, investment plan, holidays, and severance pay.

Employees within OCAW are also affected by 'seniority'. Seniority is a measure of an employee's length of service with respect to promotions, demotions, layoffs, bidding, shift assignments, and reemployment. The seniority roster, published by LMITCO every 6 months, lists all current employee standings. The January 1999 seniority roster was used to determine the information provided in Exhibits 12.1 and 12.6: Total Number of OCAW Remediation Workers at INEEL by Facility Area in 1998. It should be noted that employees leaving the union over time are not tracked in this table. Readily available records providing the exact number of employees per year by job classification and area were not available for this study. ^(51, 74)

LMITCO/OCAW Health and Safety Agreement:

The Company and the Union recognize the importance of maintaining a safe working environment, providing applicable health and accident prevention, and the general elimination of hazards to health and safety in the work place. Recognizing that safety is a joint responsibility, both parties acknowledge the Union Health and Safety Representative and commit to comply with the provisions of the INEEL Worker's Bill of Rights. ^(53: P.79)

7.4.2 Argonne National Laboratory-West (ANL-W) / OCAW Labor Agreement ⁽⁵²⁾

In June 1998, ANL-W (the Laboratory) renewed its labor agreement with OCAW Local 2-652. The Laboratory recognizes the Union as the exclusive bargaining agent with respect to pay, hours of work, working conditions, and other conditions of employment for the following Argonne employees in Local 2-652 certified by the NLRB:

1) All maintenance employees in the Plant Services Section of Argonne's facility at the INEEL, excluding all technicians, supervisors, guards, clerical and professional employees. (RCTs and IHTs are non bargaining unit.)

2) All material handling employees in the Supply Section of Argonne's facility at the INEEL, excluding all clerical employees, technical employees, professional employees, guards, and supervisors.

The agreement is similar in intent and scope as compared to the LMITCO / OCAW working agreement.

7.4.3 INEEL Site Stabilization Agreement^(75, P. ii)

The INEEL Site Stabilization Agreement between INEEL, site subcontracting construction companies such as Morrison-Knudsen Co., Inc. and Catalytic, Inc., the Building and Construction Trades Department of AFL-CIO, International Unions affiliated with the Building Trades Consortium, and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, Helpers of America became effective in 1984. The agreement states that all contractors and subcontractors performing construction work at INEEL are subject to the Davis-Bacon Act and to the provisions stated in the agreement. The agreement is similar in scope as other labor agreements at the INEEL site.

7.5 Remediation Worker Population Turnover Rates

The LMITCO turnover rate for FY 1999 was reported as approximately 5.1 percent. This includes teaming partners and major subcontractors.⁽¹⁰¹⁸⁾ Turn over rates from 1989 to 1998 for the M&O contractor were not available for this report. The ANL-W remediation worker population was described by site contacts as stagnant.⁽⁷⁷⁾

7.6 Future INEEL Worker Population

Future Full Time Equivalent (FTE) requirements at INEEL have changed from defense production to environmental management and restoration. Critical skills and core compensation are needed to meet long-term site objectives. Programs will be implemented to analyze/manage the skill mix of the work force. Core competency and critical skills have been identified, with a focus on operations and maintenance, engineering, research and development, scientific program support, and radiological/industrial hygiene requirements. Programs are designed to maintain required core competency through timely personnel transfers, retraining, subcontracting, and judicious limited hiring. In the future, the employment trend at INEEL may shift to subcontracts, with significant declines in employment beyond FY 2040, or if there are no more missions.^(49: P.53)

In May 1999, OCAW (INEEL's primary local union council) was replaced by the Paper Allied Industrial Chemical and Energy Workers International union (PACE). All workers formerly with OCAW rolled into the new union organization.⁽⁷⁶⁾ In October 1999, LMITCO will be replaced by Bechtel B&W Idaho, Ltd. Liability Company (BBWI) as the M&O site contractor. Contracting companies are expected to change approximately every five years based on recompetition of the INEEL M&O contract.

7.7 INEEL Health and Safety

7.7.1 Integrated Safety Management

DOE-ID and its contractors are currently working to *systematically integrate safety considerations into management and work practices at all levels to accomplish missions while protecting the public, the worker, and the environment.* ⁽⁷⁸⁾ The INEEL Integrated Safety Management System (ISMS) is the comprehensive process in which the above objective is sought. Full implementation is expected by August of 2000. ⁽⁷⁹⁾

Since 1997, Integrated Safety Management (ISM) has been *institutionalized through DOE directives and contracts to establish Department-wide safety management objectives, guiding principles, and functions. The system encompasses all levels of activities and documentation related to safety management throughout the DOE complex. The objective of this policy is achieved by other means for INEEL's Naval Reactors Facility under the Naval Nuclear Propulsion Program.* The following policies and directives drive ISM at INEEL:

- 1) Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 95-2, "Integrated Safety Management"
- 2) DOE Policy 450.4, "Safety Management System Policy"
- 3) 48 CFR (Department of Energy Acquisition Regulations (DEAR)) 970.5204-2, "Integration of Environment, Safety, and Health into Work Planning and Execution"
- 4) 48 CFR (DEAR) 970.5204-78, "Laws, Regulations, and DOE Directives"
- 5) PDD-1004, "INEEL Integrated Safety Management System" ^(80, 81)

Guiding principles for the INEEL ISMS include the following:

1) Line management responsibility for safety: Line management is directly responsible for the protection of the public, the workers, and the environment. As a complement to line management, the DOE's Office of Environment, Safety and Health provides safety policy, enforcement, and independent oversight function.

2) Clear roles and responsibilities: Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the DOE and its contractors.

3) Competence commensurate with responsibilities: Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.

4) Balanced priorities: Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.

5) Identification of safety standards and requirements: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.

6) Hazard controls tailored to the work being performed: Administrative and engineering controls to prevent and mitigate associated hazards shall be tailored to the work being performed.

7) Operations authorization: The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.

(2132, 2146) 8) Worker Involvement. (Promoted through the DOE Voluntary Protection Program (VPP)).

7.7.2 INEEL Voluntary Protection Program ^(82, 83)

The VPP was established by DOE in December 1993 to recognize superior performance in the field of safety and health by contractor management and their employees. *As evident in its name, the VPP is voluntary. Each company that wishes to present its safety program and incident rates completes an application and submits it to the DOE. The DOE then looks at the elements of the program and evaluates them to determine whether they are above and beyond compliance.*⁽⁸³⁾ The goal of the VPP is to create and maintain a work place free of injuries and illnesses using employee involvement and management leadership. Key elements of the program include: 1) management commitment, 2) employee involvement, 3) work site analysis, 4) hazard prevention and control, and 5) safety and health training. Recognition programs within the VPP include STAR and MERIT. Both rewards are given based upon the specific safety and health performance of a group or an employee. VPP aligns with Total Quality Management (TQM) principles and expects employees to act as leaders and report health and safety concerns (such as near misses, incidents, occupational injuries/illnesses occurrences) to line management or to onsite INEEL health and safety professionals.

7.7.3 Involvement of Safety and Health Professionals ⁽⁸³⁾

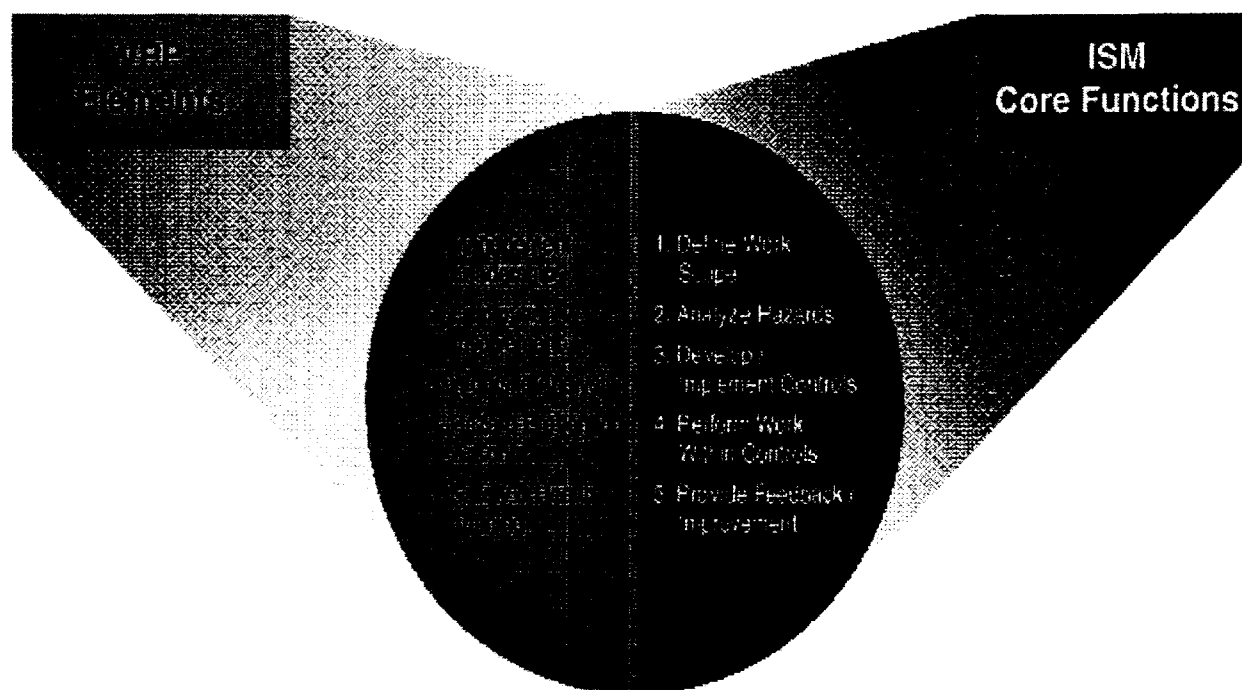
INEEL Safety and Health professionals serve as a critical resource for line management and individual employees. Safety hazards and concerns are reviewed quickly, prioritized, communicated, and incorporated into the budgeting process. Worksite analysis mechanisms are conducted by safety and health personnel in order to achieve, maintain, and monitor compliance with DOE/OSHA requirements. Mechanisms include 1) inspections, 2) appraisals, 3) self-assessments, 4) hazard evaluations, and 5) lessons learned.

Evaluations are conducted for all INEEL facilities, processes, and work sites. These evaluations anticipate, recognize, evaluate, and document all potentially hazardous conditions. Results of baseline evaluations are used to determine inspection and monitoring frequency and necessary safety controls. New facilities and major modifications (clean-up and D&D) are required to have a review process that may involve: 1) safety reviews (including exposure assessments, industrial hygiene, personnel monitoring, radiological control, operational surveillance), 2) design reviews, 3) safety analysis reports (SARs), 4) technical safety requirements, 5) readiness reviews, 6) procurement reviews, 7) job safety analysis, and/or 8) a health and safety plan (HASP).

The HASP is the primary implementing safety document at the worker level to ensure that hazards are identified, evaluated, controlled, and communicated. It provides the unifying structure for conducting work safely at a hazardous waste operations site. It integrates the treatment of all site- and task-related hazards and controls to form a complete picture of hazards and controls at the site and task level. ⁽⁸⁴⁾ INEEL HASPs proved to be an excellent source document for the investigators involved in the preparation of this report. HASPs can also provide additional documentation for further and more detailed study of the remediation worker population. HASPs and other INEEL reports such as initial site assessments and SARs were frequently used in Section 10.0 and the INEEL activities database that accompanies this report. The database is described in greater detail in Appendix I that accompanies this report.

LMITCO works to combine site ISM and VPP principles. The figure on page 53 presents the elements and functions of each program.

Figure 7.7 A: Pictorial Presentation of Voluntary Protection Program Elements and Integrated Safety Management Core Functions Combined at INEEL ⁽⁸⁵⁾



7.7.4 INEEL Occupational Medicine and Industrial Hygiene Programs

The LMITCO Industrial Hygiene (IH) and Occupational Medical Programs (OMP) are both managed by the Site Medical Director. The Occupational Medical Program covers the entire site (including ANL-W and NRF) while LMITCO's IH program is exclusive to LMITCO managed areas. The Occupational Medical Surveillance System (OMSS) is the information system associated with the INEEL Occupational Medicine Program. Information regarding this system is located in Section 8.1.3 on page 67. Industrial hygiene data systems are explained on page 68.

7.7.4.1 INEEL Occupational Medicine

Employees who are injured on the job or experience an on-the-job illness must take certain steps to ensure they receive proper medical treatment and are covered under the Idaho Worker's Compensation Law. If a work-related injury or illness occurs, the employee should go to the nearest area dispensary nurse or the Central Facility Area (CFA) Medical Facility. Employees working in an Idaho Falls facility (near town), should go to the Willow Creek Building (WCB) Medical Facility. In an emergency situation, employees will be stabilized then transported by emergency vehicle to a nearby hospital in Idaho Falls. ⁽⁸⁶⁾

Employees are to notify their immediate manager of 1) work restrictions imposed by the defined medical program resulting from any medical / physical condition, or 2) of any medication being taken which may impact the safety of themselves, their coworkers, or the public. The manager must ensure proper work accommodation or referral to appropriate medical care facilities. This policy applies to all individuals, including subcontractor personnel. Management will, in addition, refer employees to the defined medical providers for health evaluation when 1) the manager identifies a behavior or condition he / she in good faith believes to be health related which could impact safety, 2) an employee requests a medical evaluation due to potential impact on work assignments and / or safety and health. Managers, supervisors, or employees who identify behavior or conditions creating an imminent hazard to health and safety shall take whatever steps are reasonably necessary to correct the conditions, including stopping of the work. ⁽⁸⁶⁾

The following DOE policies and National Standards are applicable to the OMP at INEEL:

- 1) DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees"
- 2) DOE Order 151.1, "Comprehensive Emergency Management Systems"
- 3) DOE Policy 450.4, "Safety Management System"
- 4) DOE Policy 450.1, "Environment, Safety and Health Policy for the DOE Complex"
- 5) DOE Policy 450.3, "Authorizing Use of Necessary and Sufficient Process for Standards-Based Environment, Safety and Health Management"
- 6) Section 3162 of the FY 1993 Defense Authorization Act {42 US Sec.7274i}, Program to Monitor DOE Workers Exposed to Hazardous and Radioactive Substances"

In January 1999, the Office of Environment, Safety and Health reported in an interim report entitled 'The Effectiveness of DOE Occupational Medical Programs' that *DOE occupational medical programs are not sufficiently comprehensive and are not achieving all applicable DOE objectives.* It stated that the majority of DOE OMPs were effectively implementing most of the routine clinical service function, but other core functions, such as medical surveillance, were not receiving sufficient attention. ⁽⁸⁷⁾ INEEL specific performance was not mentioned.

7.7.4.2: LMITCO Industrial Hygiene

The LMITCO IH Program is jointly managed by the INEEL Site Medical Director and the assigned industrial hygiene managers for TAN, TRA, RWMC, INTEC, PBF/ARA and CFA. Area managers provide reports and documentation to the head LMITCO Medical Director for tracking. (Refer to Section 8.1.4 on page 68 for a description of IH exposure record tracking.) LMITCO, as the prime site M&O contractor, has the responsibility to provide workers the proper information and training for potential health hazards, control measures, and protection to reduce risks. LMITCO informs workers of health hazards and results from monitoring. LMITCO is also required to evaluate the effectiveness of proposed environmental control equipment and any engineered modifications.

As reported by a site contact, the top major chemicals of concern to industrial hygienists at LMITCO areas include lead, asbestos, cadmium, and beryllium. Hearing conservation is also a concern. ⁽⁸⁸⁾

The LMITCO Hazard Prevention and Control Manual is a compilation of program requirement documents, each addressing a particular safety and health topic, that provide LMITCO interpretation of the related safety and health source requirements. The manual provides the baseline from which to implement specific safety and health programs. Table 7.7 B on page 56 presents a list of documents provided within the manual. These documents illustrate the components of the industrial hygiene and occupational (industrial) safety LMITCO program.

Table 7.7 B: Components of the LMITCO Hazard Prevention and Control Manual

Document #	Document Name
PRD-1001	Subcontractor Requirements Program Description
PRD-1002	Safeguards and Security Requirements
PRD-1003	General Requirements
PRD-1004	Stop Work Action
PRD-1006	Safety Surveillance
PRD-1007	Work Coordination and Hazard Control
PRD-2001	Personal Protective Equipment
PRD-2002	Fall Protection
PRD-2003	Ladders
PRD-2004	Scaffolding
PRD-2005	Walking and Working Surfaces
PRD-2006	Aerial Lifts and Elevating Work Platforms
PRD-2007	Hoisting and Rigging
PRD-2008	Structural Steel Erection
PRD-2009	Compressed Gases
PRD-2010	Welding, Cutting, and Other Hot Work
PRD-2011	Electrical Safety
PRD-2012	Lockout and Tagout
PRD-2013	Concrete and Masonry
PRD-2014	Excavations and Surface Penetrations
PRD-2015	Hand and Portable Power Tools
PRD-2016	Material Handling, Storage, and Disposal
PRD-2019	Motor Vehicle Safety
PRD-2020	Heavy Industrial Vehicles
PRD-2021	Powered Industrial Trucks
PRD-2022	Safety Signs, Color Codes, and Barriers
PRD-2023	Temporary Facilities
PRD-2024	Demolition
PRD-2025	Explosives Safety
PRD-2101	Hazard Communication
PRD-2102	Disease Control
PRD-2105	Lead
PRD-2107	Heat and Cold Stress
PRD-2108	Hearing Conservation
PRD-2109	Respiratory Protection
PRD-2110	Confined Spaces
PRD-2201	Flammable and Combustible Liquid Storage
PRD-2202	Fire Protection
PRD-3001	Radiological Control
PRD-4001	Waste Management
PRD-4002	Chemical and Materials Handling
PRD-4003	Water

Table 7.7 B (continued): Components of the LMITCO Hazard Prevention and Control Manual

Document #	Document Name
PRD-5001	Training and Indoctrination
PRD-5002	Construction Interface
PRD-5003	Vendor Data Control
PRD-5004	Procurement Document Control
PRD-5005	Procedure Development
PRD-5006	Subcontractor Quality Plan
PRD-5007	Document Control
PRD-5008	Control of Purchased Items
PRD-5009	Material Traceability
PRD-5010	Weld Record Packages
PRD-5012	Survey Equipment Calibration and Control
PRD-5014	Test Control
PRD-5015	Control of Measuring and Testing Equipment
PRD-5016	Material and Equipment Storage, Handling, and Maintenance
PRD-5017	Inspection and Test Status
PRD-5018	Control of Non-Conforming Items

7.7.5 LMITCO Radiological Safety / Health Physics Program

The LMITCO Radiological Control Program is conducted through the interpretation and direction of the following nuclear safety regulations; DOE Functions, Responsibilities, and Authorities Manuals; and other DOE policies:

- 1) DOE Notice 441.1 "Radiological Protection for DOE Activities"
- 2) DOE Policy 441.1 "Radiological Health and Safety Policy Statement"
- 3) DOE Order 231.1 "Environment, Safety and Health Reporting Requirements"
- 4) DOE Manual 231.1 "Environment, Safety and Health Reporting Manual"
- 5) 10 CFR 835 (1998 Amendment) "Occupational Radiation Protection"

Includes the following Implementation Guides:

- a) Radiation Protection Program
- b) Radiation Safety Training
- c) External Dosimetry Program
- d) Occupational ALARA Program
- e) Internal Dosimetry Program
- f) Air Monitoring
- g) Radiation-Generating Devices
- h) Sealed Radioactive Source Accountability and Control
- i) Posting and Labeling for Radiological Control
- j) Occupational Radiation Protection Record-Keeping & Reporting
- k) Evaluation and Control of Fetal Exposure
- l) Portable Monitoring Instrument Calibration Radioactive Contamination Control

- 6) Draft (for comment) SAFT-0072 Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities
- 7) Guide of Good Practices for Occupational Radiological Protection in Plutonium Facilities
- 8) DOE Radiological Control Manual, Rev. 1, April 1994 (Site specific: INEEL Radiological Control Manual)
- 9) Training Standards
- 10) Internal Dosimetry Technical Standard, DOE-STD-1121-98, December 1999
- 11) Radiological Control Standard, DOE-STD-1098-99, July 1999

In an independent oversight assessment of the INEEL Radiation Protection Program conducted in May 1999 by the DOE Office of Oversight, the following positive attributes were found: ⁽⁸⁹⁾

- 1) INEEL uses remote equipment such as a gamma camera to reduce personnel exposure and identify areas needing decontamination or additional shielding
- 2) INEEL has improved worker mockup training areas
- 3) INEEL has implemented a radiological performance index to determine an overall level of radiological control performance at INEEL facilities
- 4) Both the external dosimetry and bioassay analysis programs at INEEL are accredited by the Department of Energy Laboratory Accreditation Program (DOELAP)
- 5) The whole body counting (WBC) facility (also DOELAP accredited) and staff are well equipped to perform in vivo whole body, lung and organ counting.
- 6) The Radiological Control Information Management System (RCIMS) provides a computerized system to improve radiological access control. (This system is described in Section 8.1.1 on pages 63 to 65).
- 7) LMITCO has established a training course specifically for ALARA committee members.
- 8) Flowdown of radiation protection requirements to subcontractors is ensured through DOE-ID review of subcontractor ES&H clauses. DOE-ID has demonstrated active involvement in promoting improvements to the INEEL radiation protection program.

Issues concerning the INEEL Radiation Protection program include the following:

- 1) DOE-ID does not have a formally defined and comprehensive program for oversight of the LMITCO radiation protection program.
- 2) INEEL does not have an effective system for ensuring that transient radiological workers are included in appropriate bioassay programs. The Office of Oversight identified a small group of construction workers who required bioassay monitoring by site procedures, but who were not in a bioassay program.
- 3) Management and implementation of the extremity exposure monitoring program requires improvement. There are indications that extremity dosimeters may not have been assigned to and worn correctly by some workers. Extremity dose results provided to line managers are not adequate to manage worker exposure.
- 4) Cask dismantlement activities at the TAN Hot Shop were conducted without required engineering controls (local ventilation), resulting in significantly reduced visibility and increased potential for worker lead exposure.

- 5) Deficiencies were identified in Radiological Work Permits (RWPs). The scope of RWPs was not always clearly defined. Appropriate radiological controls were not always defined. There were inconsistencies between RWPs and ALARA reviews. Post-job reviews were not always completed. Work task descriptions for some RWPs at INTEC were extremely general and vague.
- 6) Formal qualification requirements, consistent with DOE Order 5480.20A requirements and the INEEL Radiological Control Manual, are not established for all radiation protection professional and management positions.
- 7) Site internal assessments and surveillance, and interviews conducted during the Office of Oversight surveillance, indicate that many personnel do not understand and comply with all site radiation protection procedures.

7.7.6 Health and Safety at Argonne National Laboratory-West (ANL-W)

ANL-W has their own health and safety program separate from LMITCO. ANL-W's Health and Safety Organization Manager oversees fire protection, industrial hygiene, industrial safety, and health physics. For emergency and service support in cases of instrumentation and dosimetry, ANL-W works with LMITCO under a Memorandum of Understanding (MOU).

In May 1997, the University of Chicago and DOE-CH formally entered into a partnership agreement that initiated the development of an ISMS consistent with DOE Policy 450.4 "Safety Management System Policy". DOE validation and verification of the ISMS at ANL-W is expected during mid to late FY 1999. ⁽⁵⁰⁾ Guiding principles of ISM were previously described in Section 7.7 on pages 50 and 51.

Similar to LMITCO, ANL-W interprets and follows the rules, manuals and orders described in Sections 7.7.4 and 7.7.5 on pages 54 through 59. During ANL-W work planning processes, emergency, health physics, industrial hygiene and safety organizations are consulted prior to activity execution. ⁽⁹⁰⁾ Controls for the work activity are categorized as engineered, procedural, and radiological. Radiological controls are implemented through a RWP, the primary ANL-W radiological document associated with the work activity. RWPs specify protective clothing requirements and contaminants of concern.

As reported by a site contact, the top five industrial hygiene concerns at ANL-W include asbestos, lead, noise, ergonomics, and beryllium. ⁽⁹⁰⁾

The ANL-W Emergency Command Center (ECC) alerts the site-wide INEEL Emergency Operations Center (EOC) operated by LMITCO in cases of radiological release or exposure. The LMITCO OMP is extended to ANL-W employees in cases of work related injury or exposure.

During an independent DOE Office of Oversight review of an ANL-W radiation contamination incident, several opportunities for improvement were identified in emergency management, radiological controls, and ISM. The following was suggested for emergency management: *1) emergency management response needs to be strengthened by conducting an annual exercise with full participation from INEEL, 2) revise the Emergency Plan Implementing Procedures to ensure that they adequately address roles and responsibilities, and 3) revise INEEL EOC (LMITCO) activation procedures to require an ANL-W representative in the EOC for ANL-W events before declaring it operational.*

The following was suggested for radiological control: *1) strengthen the radiological control program by considering the extent of contamination that could be involved in a maintenance activity, 2) increase conservatism in the use of personal protective equipment (PPE) by considering: a) using full anti-contamination clothing, b) using portable air-monitoring equipment, c) properly defining radiological boundaries, d) sealing off potential pathways that could exacerbate a contamination release, e) requiring the use of extremity dosimetry when repairing seal tubes, and processing the dosimetry promptly, and 3) improve the work planning processes to include consideration of potential contaminations and hazards associated with its release.*

Finally, the following was recommended for improving ISM at ANL-W: *1) improve the work planning process to include a complete hazard analysis for work activities, 2) improve worker feedback mechanisms to ensure that procedures are usable and can be followed appropriately to conduct work safely, 3) conduct routine management oversight of critical work activities to ensure that they are conducted within controls, and 4) strengthen the event review process to evaluate affected programs and develop improved corrective actions to address identified programmatic deficiencies.*

7. 8: INEEL Safety and Health Requirements Database

In the previous health and safety sections, many regulations and policies were mentioned in text. *Numerous requirements have been promulgated to protect workers, equipment, facilities and the environment. When work is performed, the specific requirements affecting the work must be identified and incorporated into the work-plan.*

INEEL has developed a system that consists of a relational database of approximately 9,400 requirements from OSHA and NEPA and other regulatory sources. It allows those to identify those requirements that will impact their work and facilitates the consolidation of potentially overlapping requirements. It also allows requirements to be tracked from their source documents through the consolidation process to their implementation and back. A scaled down version is available on-line (<http://csipg-roadmap.lanl.gov/>) and can be located along with the other databases accompanying this report.⁽⁹¹⁾

7.9 INEEL Remediation Worker Training

All workers are required to complete training based on their job classification, specific duties, tasks and/or assigned project. Training, qualification, and certification requirements for personnel are established by management or by the subcontractor company with guidance from LMITCO's Human Resources department and INEEL Training Institute. Courses ranging from orientation to comprehensive training are based on employee needs. Records are maintained by the Technical Training (TRAIN) System.

All workers assigned to facility disposition teams are required to take approximately 200 hours of classroom training on various subject areas, such as asbestos, confined space, electrical safety, fall protection, man-lift operation, OSHA 40-hour HAZWOPER, radiation worker II, respiratory protection, and others. Workers with numerous years of INEEL work history received this training over a period of several years as new training requirements were implemented. Workers new to the INEEL site receive this training in a period of six to eight weeks. Hands-on training at the job site, which is usually provided by fellow workers who are experienced in the particular subject matter area, is viewed as a component of training that is vital to safe work performance. ⁽⁹²⁾

ANL-W subcontractors must have their own health and safety training before entry to the site. ANL-W may do job specific training for contractors (i.e. lockout/tagout) or may send employees to off-site (in-town) training. ^(90, 93)

7.10 INEEL Site Demographic / Human Resource Data

For purposes of this Exposure Assessment Feasibility Study, data concerning total numbers of remediation workers were obtained and summarized in this document except data for the M&O contractor from 1989 to 1994. As mentioned previously, data kept prior to 1994 is incomplete and unavailable through LMITCO. To obtain this information, each contractor prior to 1994 would need to be contacted. Some INEEL past contractors are presently no longer the same company or still in business. The effort to obtain this information was described by a site contact as 'difficult'. ⁽⁵⁵⁾

Other demographic data (i.e. race, gender, age, work histories, etc.) were not obtained, but are available through LMITCO's Human Resource Information System (HRIS) and ANL-W's InPower Database. EG&G began HRIS in 1989 for their own human resources data tracking but failed to keep track of other workers in other companies. In 1994, LMITCO took over the M&O contract and began to include teaming partner employees and subcontractors into the HRIS. However, the LMITCO site contact stated that not all employees have been tracked through HRIS since 1994. It has been LMITCO's goal to include everyone into the HRIS overtime.⁽⁵⁵⁾ ANL-W's InPower Human Resources Database began in 1995. Electronic records from an accessible data system (name not known) are kept for human resources data from 1989 to 1994.⁽⁷⁷⁾

The following data fields are available through HRIS and ANL-W's InPower databases:

- 1) INEEL ID
- 2) name (first, middle initial, last).
- 3) social security number
- 4) LMITCO ID number or ANL-W ID number
- 5) date of birth
- 6) gender
- 7) employer company
- 8) job title/description
- 9) salary grade/pay type
- 10) area/building/room/activity
- 11) exempt or nonexempt status
- 12) hire/start date
- 13) bargaining unit
- 14) record service date and department effective date
- 15) job class/description
- 16) equal employment opportunity code
- 17) management level/capacity
- 18) work discipline/description
- 19) regular/temporary code
- 20) common occupation code and minority code
- 21) education level/degree
- 22) home address/phone number.⁽⁹⁴⁾

Besides the HRIS and ANL-W InPower database, demographic data also exists in an employee's medical records. These are provided by the site's occupational medical department. This database called the Occupational Medical Surveillance System (OMSS) is described in Section 8.1.3 on page 67.

8.0 INEEL Remediation Worker Exposure Information

Overview

This section addresses INEEL site publicly available exposure data and current measures for site risk assessment and safety management. The purpose of this section is to explain where chemical, radiological, and occupational medical data is kept, who it is kept for, and who is responsible for the maintenance and reporting of the data.

With the institution of the Integrated Safety Management System (ISMS) at the INEEL site, efforts have been made to better the quality, assessment, and tracking of environmental, safety and health data. Major site-wide efforts been taking place since 1997. Full validation of the INEEL ISMS is expected for August 2000. ⁽⁷⁹⁾

8.1 INEEL Site Exposure Databases

8.1.1 LMITCO Radiological Exposure Data Systems

Since 1994, LMITCO has managed radiological monitoring for the entire site except the Naval Reactors Facility (NRF). Prior to 1994 each contractor (Protection Technology, EG&G Idaho, Inc., Babcock & Wilcox Idaho, Inc., Westinghouse Idaho Nuclear Co., MK-Ferguson Company - ID, and MK-Ferguson Subcontractors-ID) ⁽⁹⁵⁾ had their own radiological control organizations while EG&G centrally kept Thermoluminescence Dosimeter (TLD) data for the entire site. In 1994, LMITCO developed procedures so that all INEEL areas report to the site radiological control manager. As mentioned by a site contact, the LMITCO radiological control manager only has responsibility for the program and not the implementation. ⁽⁹⁶⁾ At the facility level, area managers (TAN, TRA, INTEC, CFA, ANL-W etc.) are responsible for radiological control implementation.

Current TLD's are stored and tracked at each facility area as well as centrally located at LMITCO's Radiological Control Organization at CFA. A site contact indicated that a worker could have multiple TLD's issued during a given monitoring period. As a result, multiple low level exposures would go unrecorded due to detection limits.

Radiological Work Permits (RWPs) have been maintained at the facility level since 1989. Facility areas will track RWPs for one year then store the records in a repository in Seattle. ⁽⁹⁶⁾ Data archives are discussed in Section 8.8 on pages 77 through 79.

The INEEL Radiological Control Information Management System (RCIMS)

Since late 1998, the Radiological Control Information Management System (RCIMS) has slowly been implemented at the INEEL. The implementation process has occurred in module or phase format. The computerized system verifies that workers have met entry requirements prior to allowing access to radiological areas, and reads and sets electronic pocket dosimeter alarm levels based on RWP requirements. ⁽⁸⁹⁾

As described by the Site Technology Coordination Group (STCG), *A craftsman prepares for a job at the Chemical Processing Plant. They scan their badge and assigned task with a bar-code laser scanner at an access control center. The worker then places an electronic dosimeter on a reader. The central computer calculates year-to-date exposure, compares it to the scheduled job, downloads the specified alarm set points into the dosimeter, checks the worker's training, makes sure they attended the pre-job briefing, validates the work has been approved, and tells the craftsman which personal protection equipment is required. Then, and only then, it allows access.* ⁽⁹⁷⁾

The RCMIS will eventually hold all radiologically related information for the entire site (including ANL-W) including RWPs, worker ingress and egress, dosimetry and respirator use, dose recording, bioassay program information, air quality monitoring, and a system for issuing, checking, and calibrating radiation monitoring equipment. ⁽⁹⁷⁾

During implementation phases, LMITCO...

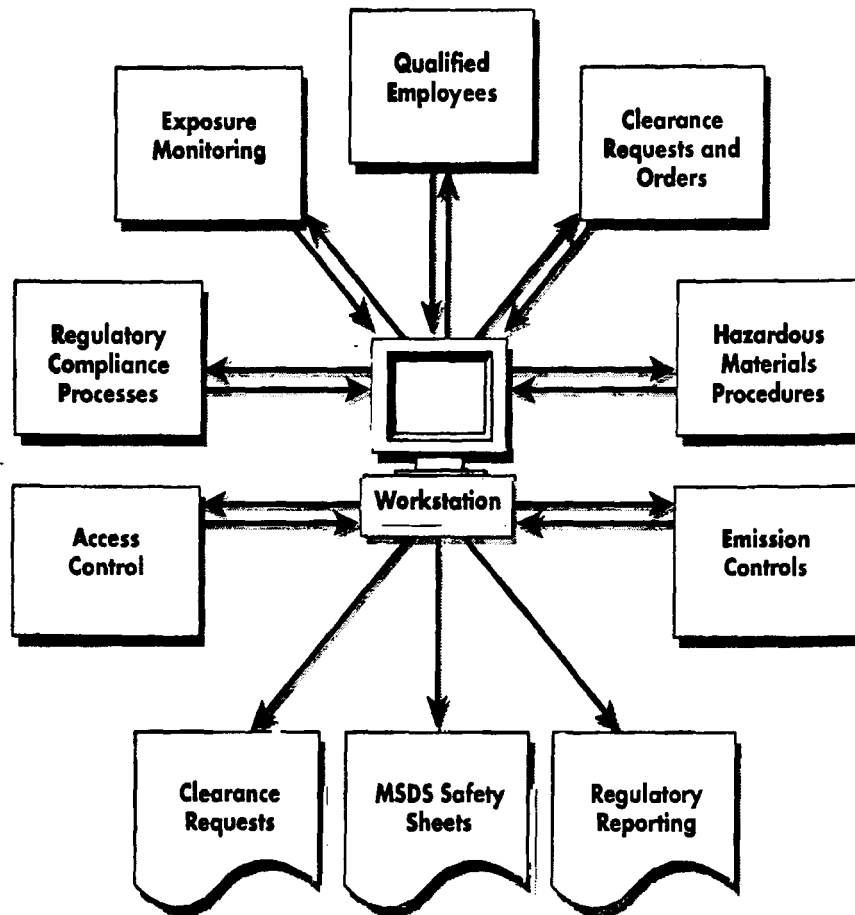
has already reaped tremendous benefits from RCIMS by its helping ensure compliance and speed information retrieval. The system prevented untrained or unqualified workers from entering the work area. It denied access to those that did not follow the radiological work permit requirements and stopped workers who were overdue on bioassays. Recently, the Savannah River Site was levied a stiff fine for this very incident. ⁽⁹⁷⁾

The almost impossible task of finding archived or stored radiological work permits has been replaced by electronic record retrieval. ⁽⁹⁷⁾

RCIMS will standardize radiological work practices across the site. Occupational radiation dose data is now on a central data base and accessible from every site; an employee can work at the INTEC in the morning and since the worker's current dose information is immediately available, they can safely perform work at the TRA in the afternoon. In addition to compliance and standardization practices, other tasks are easier. Managers and supervisors with the necessary software can access current dose information on their employees from their office. Job supervisors and facility managers can approve RWP's from their desks. ⁽⁹⁷⁾

The following figure represents the INEEL RCIMS. LMITCO has developed the site specific RCIMS networked system from INDUS Corporation's proprietary PassPort information management system software. PassPort contains many processes divided into modules.

Figure 8.1 A: Representation of the Networked RCIMS System at INEEL (98)



Note: Figure 8.1 A is a schematic prepared by INDUS corporation. INEEL's RCIMS system has used modules from the PassPort system that fit INEEL's specific needs.

8.1.2 ANL-W Radiological Exposure Data System

ANL-W maintains radiological exposure data in an information system separate from LMITCO. This system is referred to as the **Dose Database** and is currently on an NT server with clients written in Microsoft Access. The system tracks the following data:

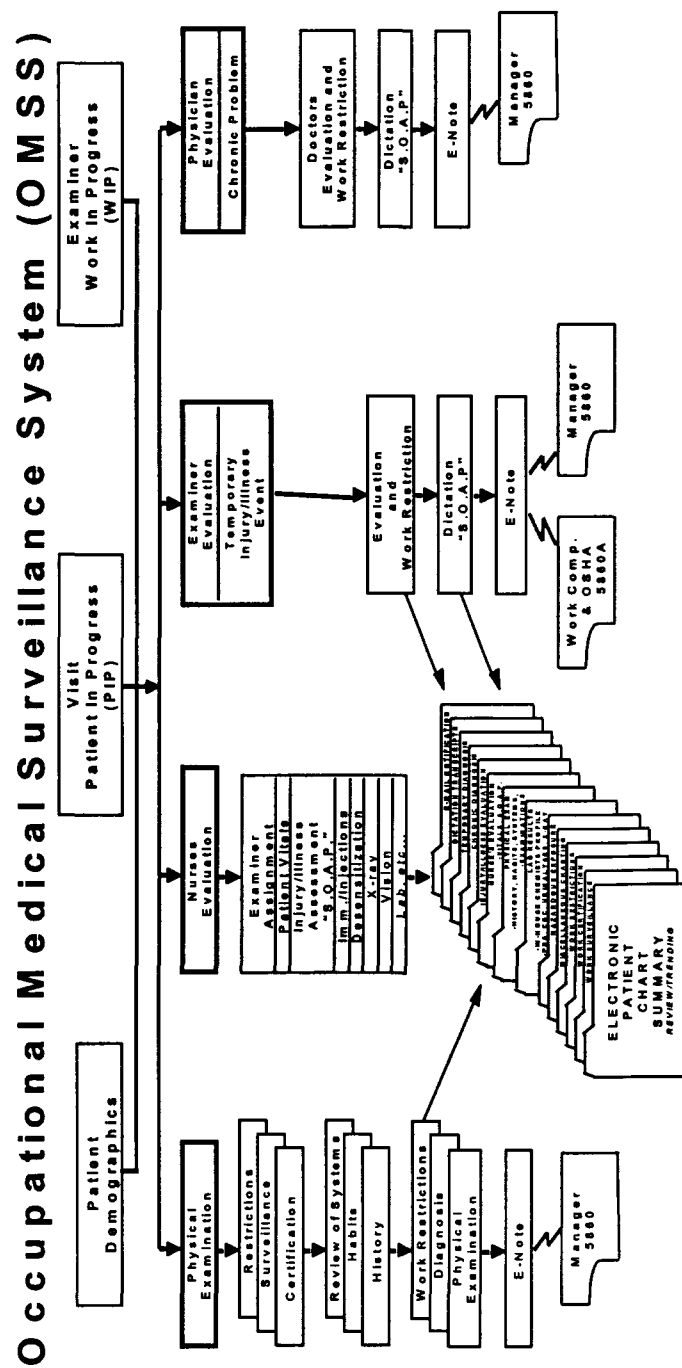
- 1) Self Reading Dosimeter (SRD) readings
- 2) Extremity dose
- 3) Special TLD pulls
- 4) Bioassay Scheduling and Results
- 5) Health Physics Training
- 6) Air Monitoring Results
- 7) Personnel Contamination Results
- 8) Environmental Dosimeter Results
- 9) Hand Held Instruments

The data in the **Dose Database** is kept overtime (since 1989) and not routinely archived.

As reported by a site contact, ANL-W receives dose data from the prime contractor (i.e. LMITCO). The prime INEEL contractor reads ANL-W TLDs and enters the data into the RCIMS. A report is then run for the ANL-W doses and results are sent to ANL-W where dose data is then entered into the **Dose Database**. At the end of the year, the data are sent to the DOE Radiological Exposure Monitoring System (REMS) (described in Section 8.2.2 on page 70) by the prime contractor. The data in the **Dose Database** are not original or official data. The RCIMS data is used by ANL-W to keep track of their own exposure and to make summary reports. All official use and reports to individuals are completed by the INEEL prime contractor. ⁽⁹⁹⁾

8.1.3.3 LMITCO Occupational Medical Record Data System

The **LMITCO Occupational Medical Surveillance System (OMSS)** tracks medical records for all employees at the site. The **OMSS** covers lower-tiered subcontractors in emergency situations only. The paperless system has been in place since approximately 1995 and contains approximately thirty two medical surveillance exams. Prior to 1995, the prime INEEL contractor used a paper system to track medical records and exams. Refer to the following Figure (8.1 B) for a pictorial presentation of OMSS. Exhibit 12.8 on pages 192 through 209 presents data types and data screens within the OMSS. ⁽¹⁰¹⁾



8.1.4 LMITCO Industrial Hygiene Exposure Data Systems

An electronic LMITCO IH data system was not implemented at the INEEL site until July 1997. Prior to 1997, a system was used to track IH sampling data and performance reviews, but was stated by an INEEL site contact as 'not useful' and extremely limited. ⁽⁸⁸⁾

The current LMITCO IH data system integrates exposure and risk assessment for work planning processes. The database is called the **Hazard Assessment Sampling System (HASS)** and stores assessment and sampling data on INEEL (LMITCO only) workers, facilities, and areas. ⁽¹⁰²⁾ Types of data entered into the system include, but are limited to: 1) sampling data (i.e. method, type, reason), 2) administrative controls selection, 3) PPE selection, 4) work area selection (i.e. open air, enclosed indoor space, confined space), 5) survey follow up type selection (i.e. IH take additional samples, IH discusses medical surveillance requirements with manager / supervisor, employee must have medical exam, 6) agent sample result selection, 7) noise exposure, 8) sample monitor device selection, 9) area monitor device selection, 10) agent inquiry, and 11) employee agent exposure letter to manager. ⁽¹⁰³⁾ As of December 1998, 1,200 exposure assessments had been entered into the system. ⁽⁸⁸⁾

8.1.5 ANL-W Industrial Hygiene Exposure Data

The system used at ANL-W to track ANL-W employee and subcontractor personal and area industrial hygiene samples is called the **Industrial Hygiene Sample Database**. The system is located on an ANL-W server and has been used since November 1992. An electronic database was not used prior to 1992. This database is separate from LMITCO's HASS System. The database contains four separate tables. It includes the following information:

- 1) **Calibration Information:** Example fields: Pump Number, Pre Cal, Post Cal, Average
- 2) **Exposure Monitoring:** Example fields: Facility, Date, Sample Type, Collection Media, Analytical Method, Process Description, Comments, Results
- 3) **Samples:** Example fields: Pump Number, Start time, Stop time, Duration, Volume, Concentration
- 4) **Additional Information:** Example fields: Name, SSN, Job Class, STEL, TWA, TLV, PEL

Information is made available to the INEEL prime contractor when necessary. ⁽¹⁰⁴⁾

8.2 DOE Site-wide Exposure Monitoring Databases

8.2.1 The DOE Occurrence Reporting and Processing System (ORPS)

INEEL environmental occurrences are required to be publicized (DOE Order 232.1A) and are tracked by the DOE Occurrence Reporting and Processing System (ORPS). ⁽¹⁰⁵⁾ This permission required on-line database is searchable by numerous parameters (site, facility, date, contractor, etc.) and contains all emergency, unusual, and off-normal occurrence reports, including event descriptions and corrective actions. This system may be used as a valuable source for radiological and chemical exposure information.

The INEEL site also displays 'INEEL (except ANL-W and NRF) final occurrence report listings by facility code (TAN, TRA, INTEC, PBF, CFA etc.)' on a web-page linked to the INEEL home page. The reports can be found at '<http://www.inel.gov/orps/index.html>'. ⁽¹⁰⁶⁾ These reports exclude personal identifiers.

The following table presents the number of ORPS reports for the INEEL site from 1990 to 1999.

Table 8.2.1 A: Number of ORPS Reports from 1990 to 1999 for the INEEL Site ⁽¹⁰⁵⁾

Site	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
INEEL	178	509	393	338	291	230	198	187	198	318	2840

The ORPS web-site also provides bulletins relating to occurrence reporting such as general site compliance issues and updates.

8.2.2 The DOE Radiological Exposure Monitoring System (REMS)

Radiological monitoring data is also available for INEEL through the **DOE Radiological Exposure Monitoring System (REMS)** operated by Science Applications International Corporation (SAIC). The INEEL site prime contractor (LMITCO) and ANL-W are required to submit data to the REMS annually. This on-line searchable database is publically available without password access and provides data from 1989 to 1999. ⁽¹⁰⁷⁾ Public domain data fields in this system include:

- 1) year
- 2) operations office
- 3) site
- 4) reporting organization
- 5) facility type
- 6) labor category
- 7) occupation
- 8) monitoring status
- 9) TEDE
- 10) CEDE
- 11) Total Number Monitored
- 12) Dose Ranges
- 13) DDE Photon
- 14) DDE Neutron
- 15) SDE_WB (Shallow Dose Equivalent: Skin)
- 16) SDE_ME (Shallow Dose Equivalent: Extremity)

Requests for an individual's dose history may be submitted to the REMS Project Manager to obtain a report of the individual's dose records. Dose records in the REMS system, however, only cover the years 1987 to the present. For dose records prior to this period, the site that provided monitoring must be contacted.

DOE-REMS data analysis is published annually in the DOE Occupational Radiation Exposure Report. These reports are available through Portable Document File (PDF) format via the DOE-REMS web-site (<http://rems.eh.doe.gov/>). ⁽¹⁰⁸⁾

8.2.3 The Computerized Accident and Incident Record Keeping and Reporting System (CAIRS)

The Computerized Accident and Incident Record Keeping and Reporting System (CAIRS) is a database used to collect and analyze DOE and DOE contractor reports of injuries, illnesses, and other accidents that occur during DOE operations in accordance with DOE Order 231.1. Access to CAIRS is available through registration. CAIRS does contain sensitive information and fields containing this data will be masked from the view of general users. Access to sensitive data requires special authorization. CAIRS Standard Reports (yearly and quarterly discussed in Section 8.6 on page 76) are available to any Internet user by selecting the Statistics icon at <http://tis-nt.eh.doe.gov/cairs/>.⁽¹⁰⁹⁾

The data contained in CAIRS consists of DOE and DOE contractor reports of injury/illness, property damage, and vehicle accident events. It also includes exposure information such as hours worked, miles driven, property valuation, etc. that can be used to calculate accident rates. The database contains individual accident reports and exposure information from 1983 to the present for injury/illness cases and for vehicle accidents. It also contains individual property damage cases and exposure information from 1975 to the present. Statistical data (rates and summarized counts of events) are also available from 1975 through the present for all accident types.⁽¹⁰⁹⁾

The information in CAIRS provides a centralized collection of DOE accident data for users to perform various analyses, including developing trends and identifying potential hazards. The results of these analyses can be used to evaluate safety and health performance, to analyze causes of inadequate performance, to define and prioritize means for improvement of safety and health performance, and to determine needs for modification of DOE safety and health requirements in order to reduce the probability of future accidents.⁽¹⁰⁹⁾

CAIRS differs from ORPS (Section 8.1.2 on page 69) in that CAIRS contains strictly injury, illness, and accidents where ORPS contains everything from injury and accidents to environmental type occurrences such as loss of power. ORPS contains everything at a site that is abnormal, unusual, or off-normal. CAIRS also contains summary data where ORPS contains singular reports with less summary data.

8.2.4 The DOE Medical Surveillance Information System (MSIS)

The DOE Medical Surveillance Information System (MSIS) was conceived in 1992 to benefit DOE Occupational Medical Programs by converting their clinical and demographic information into a useful relational form which they could use to look at worker cohorts and subsets, and to provide the capability to analyze complex-wide worker health trends. Of the >40 DOE Occupational Medical Programs, 15 to 20 sites capture clinical data electronically ⁽¹¹⁰⁾ (including INEEL). Although currently not yet available, this on-line database is intended to function similar to REMS, ORPS, and CAIRS. SSDS, Inc. is under contract to plan and develop the MSIS. It is not known when this system will be implemented.

8.2.5 The DOE Industrial Hygiene National Database Program

Like the MSIS, the DOE Industrial Hygiene National Database Program was conceived, but has not yet been made operational. In 1994, the program was established to meet the DOE's obligations under 42USC Sec. 7274i, *Program to Monitor Department of Energy Workers to Hazardous and Radioactive Substances derived from the National Defense Authorization Act of FY 1993, Section 3162*, which required that the Secretary of the DOE establish a program to monitor the health of workers based upon the hazards to which they were exposed during DOE operations. The DOE and DOE contractors are encouraged to consider appropriate aspects of the program in the development of their sites Occupational Medicine and Industrial Hygiene programs information systems. The objective should be to link these data together based upon the needs for implementing a comprehensive worker protection and health surveillance program. This project is supported by the U.S. Department of Veterans Affairs under contract to SSDS, Inc. SSDS was selected to develop the DOE's System Requirements (i.e. operational concept) for an industrial hygiene information system ⁽¹¹¹⁾ and it's coordination with the MSIS previously described in the paragraph above.

8.3 Other Useful INEEL Data Systems

The INEEL Non-radiological **Waste Management Information System (INWMIS)** is a computerized database that replaced the Industrial Waste Management Information System (IWMIS) on October 1, 1991. It serves as the official record for all types of industrial (non-radiological) waste generated at the INEEL.

DOE-ID contractors routinely input data into the INWMIS. The system provides routine and special reports for non-radiological airborne and liquid effluents, fuel oil consumption, water usage, and landfill disposal of solid wastes.

Waste oil, hazardous waste, and mixed wastes were recorded in the INWMIS until 1998. These wastes are now entered into the **Integrated Waste Tracking System (IWTS)**.⁽¹¹²⁾

Other useful waste management data systems include, but are not limited to, the **Radioactive Waste Management Information System (RWMIS)** and the **Transuranic Waste Management Information System (TWMIS)**.

8.4 Summary of INEEL Radiological Exposure Monitoring Data

The 1992-1994, 1996, 1997, and 1998 DOE Occupational Radiation Exposure Reports discuss INEEL radiation exposure trends. Refer to Table 8.4 A: Total Effective Dose Equivalent (TEDE) for Monitored DOE, DOE Contractor Employees and Visitors from 1989 through 1998 at the INEEL Site for a view of trends. In 1992, there was a decrease in TEDE of more than 79% but this decrease is not consistent from year to year. In 1994, the TEDE increased at INEEL as a result of increased activities at the INTEC.⁽⁹⁵⁾ The principal reason for the TEDE dose reduction at the INEEL between 1996 and 1997 was a change in overall work scope at INTEC. The High Level Liquid Waste Evaporator work was completed in 1996 and two other significant 1996 projects at the INTEC Tank Farm and Calciner were completed during the summer of 1997. In the later part of 1997, INTEC moved from the overhaul phase to an operating phase resulting in a reduction in collective dose.⁽¹¹³⁾ The site collective CEDE (Committed Effective Dose Equivalent) at INEEL dropped 43% from 1997. Again, the completion of several jobs during 1997 contributed to a significant dose reduction. A maintenance stand-down, continued reductions in the scope of operations at INEEL, and ongoing ALARA initiatives worked to drive down the collective dose during 1998. As in past years, most of the exposure comes from reactor and reprocessing operations.⁽¹¹⁴⁾

Table 8.4 A: Total Effective Dose Equivalent (TEDE) for Monitored DOE, DOE Contractor Employees and Visitors from 1989 through 1998 at the INEEL Site

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
TEDE (person-rem)	315	347	162	87	236	237	284	164	115	65

Refer to Exhibit 12.9: INEEL Site Radiological Performance Indicators for 1997 as Reported by the Department of Energy Office of Oversight on page 210 for INEEL summary radiological performance data. The Office of Oversight conducts and reports annual site performance.⁽⁸⁹⁾

For this exposure assessment feasibility study, queries were made from the on-line DOE REMS database and graphed in Microsoft Excel to examine the INEEL remediation workforce in terms of occupational radiation exposures. Exhibit 12.10 on pages 211 through 213 shows INEEL M&O (i.e. LMITCO / WINCO) occupational radiation exposure summary data from 1986 to 1998 in order of decreasing exposure risk. It should be noted that this query could not select data specifically from 1989 to 1998.⁽¹¹⁵⁾ Exhibits 12.11 A through 12.11 H on pages 214 through 221 show summary Deep Dose Equivalent (DDE) photon and DDE neutron exposure data from 1989 to 1997 for the top 15 M&O job classifications showing the greatest exposure risk identified in Exhibit 12.10. Exhibit 12.12 on pages 222 through 224 and Exhibits 12.13 A through 12.13 H on pages 225 through 232 shows radiological exposure data for Argonne National Laboratory West (ANL-W). Radiological exposure data is tracked separately for the site M&O contractor and ANL-W.

8.5 Summary of INEEL Industrial Hygiene Exposure Monitoring Data

Industrial hygiene exposure monitoring summary reports are not available by DOE-ID, LMITCO or ANL-W. IH sampling and exposure data are primarily kept in the LMITCO HASS system and the ANL-W industrial hygiene database system. Both systems will not, however, provide historical (1989 to approximately 1995) exposure monitoring data. Summary data on current exposure assessments and samples may be obtained through area (i.e. TAN, TRA, ANL-W etc.) Industrial Hygienists.

Besides using INEEL IH data systems, chemical exposure data may also be obtained from DOE ORPS or the Chemical Occurrences web-site. The Chemical Occurrence web-site provides summaries and reviews of DOE complex wide occurrence reports. *The DOE has been tracking, trending, analyzing, and compiling chemical safety concerns at its facilities since August 1992. These concerns have been summarized in monthly reports and analyzed in quarterly and annual reviews and posted on the site. Monthly reports present a quickly available summary of chemical safety occurrences (events and conditions) at DOE facilities including short descriptions of the more significant concerns. Quarterly reviews contain analysis of occurrences, causes, corrective actions, and lessons learned as well as some statistical analysis of chemical safety performance across the DOE complex as determined from ORPS monitoring.*⁽¹¹⁶⁾

The following descriptions are summaries of significant chemical occurrences from 1996 to March 1998. Other significant occurrences are summarized via the chemical occurrences web-site (<http://www.dne.bnl.gov/etd/csc>).

1) ID-LITC-ATR-1996-0011 (NE) : 05/28/96

A worker received neck burns when splashed with sulfuric acid while working on acid distribution piping due to an unclamped hose forced off by pressure.⁽¹¹⁶⁾

2) ID-LITC-ATR-1997-0025 (NE) : 11/20/97

A worker was sprayed with a foam-like sulfuric acid spray while disconnecting an air hose to an air sparge line of a bulk acid storage tank. The tank was being cleaned. Apparently, acid had accumulated in the air line over a period of time. The operator was treated at the dispensary where it was determined that he had been burned on the neck, ears, and arms. The airline hose connection was not included inside the boundaries of the safe work zone. Since the operator was working outside the posted area, he did not wear personal protective equipment.⁽¹¹⁶⁾

3) ID--LITC-WASTEMNGT-1997-0020 (EM) : 08/25/97

Workers preparing to conduct a remote video inspection in a valve box reported a strong smell of nitrogen oxides (NOx). The workers were sent to the facility dispensary, but showed no immediate symptoms of excessive NOx exposure. Surveys subsequently performed indicated a potential exposure of 5 to 15 ppm.⁽¹¹⁶⁾

4) ID--LITC-ATR-1998-0006 (NE): 3/28/98

A craftsman reported to the shift supervisor complaining of a swollen tongue and cheeks. He stated that he had been working with acetone and may have gotten some on his hands; he had not been wearing gloves. The craftsman was transported to the dispensary for evaluation by the shift nurse. The nurse administered medication and the craftsman was transported to a hospital for further evaluation. The craftsman was subsequently administered intravenous medication which immediately stopped the allergic reaction. He was released to return to work. He later indicated to the shift supervisor that his allergic reaction may also have been due to a prescription drug. The area where the craftsman had been working was investigated and a strong odor was noted. It was determined that there was an odor of spray paint. Personnel noticed several cans of spray paint and a bottle of 2-propanol (rubbing alcohol); no acetone bottle was found out of storage. An Industrial Hygienist performed measurements and did not find any health hazards present.⁽¹¹⁶⁾

8.6 Summary of INEEL Occupational Injury and Illness Data

As mentioned previously, DOE and DOE contractor injury and illness experience by year and quarter (summary data) may be obtained through the on-line Computerized Accident and Incident Record Keeping and Reporting System (CAIRS) statistics web-page. Exhibit 12.14 on pages 233 through 238 presents CAIRS statistics from 1994 to 1999 for Idaho Field Office and LMITCO production, research, services, construction, architecture/engineering, security, and subcontractor personnel.⁽¹⁰⁹⁾ Data from 1989 to 1993 was not available through the system.

CAIRS also presents Type A (i.e. death) and Type B (i.e. serious injury) accident investigation and summary information. Two Type A accidents occurred at INEEL in 1996 and one Type A accident in 1998:

1) *On February 20, 1996, a fatality occurred when a construction subcontractor project engineer fell from a temporary work platform in the Radioactive Waste Management Complex (RWMC) Transuranic Storage Area - Retrieval Enclosure (TSA-RE). The investigation of this accident resulted in six judgements of need (JONs) for the site.⁽¹¹⁷⁾*

2) *On August 13, 1996, a non-fatal, electrical shock accident occurred at the Test Reactor Area (TRA), Building 609. A worker, who was modifying a 2400 VAC electrical switchgear cabinet, inadvertently contacted an energized transformer in that cabinet. The investigation of this accident resulted in 12 JONs.⁽¹¹⁷⁾*

3) One fatality and nine injuries occurred on July 28, 1998 as a result of a CO₂ release from a fire suppression system in Building 648 at Test Reactor Area (TRA). *Workers were engaged in de-energizing electrical circuit breakers in preparation for preventative maintenance activity on the electrical system in Building 648. Thirteen people were in the building, including foreman, operators, electricians, and fire protection personnel. As the last electrical circuit breaker was opened, the CO₂ fire suppression system unexpectedly discharged without an evacuation warning alarm. Within seconds, the workers found themselves struggling to escape the potentially lethal atmosphere under near zero visibility and disordering effects of CO₂.*⁽¹¹⁸⁾ According to the Accident Investigation Board, the incident was avoidable. LMITCO was not timely in implementing integrated safety management policy.

8.7 INEEL Beryllium

INEEL currently monitors beryllium exposure data through the LMITCO HASS and OMSS and ANL-W's industrial hygiene sampling system. Unlike Rocky Flats, Oak Ridge, and Hanford, INEEL was not included in the Beryllium Survey Project conducted by DOE in 1996. All Argonne employees (i.e. ANL-W and ANL-E involved in technology development for SNF and waste treatment, reactor and fuel cycle safety, and facility decommissioning) were, however, included in this survey.⁽¹¹⁹⁾ Sites like Rocky Flats were more involved in producing beryllium products that were supplied to DOE by vendors.⁽¹²⁰⁾

8.8 Other Record Series Relevant to the Remediation Worker Population at INEEL

The following record series are also available for obtaining remediation worker exposure data. These series are reported by the DOE Openness: Human Radiation Experiments web-site (<http://tis-nt.eh.doe.gov/ohre/roadmap/records/>).

1) **Personnel Medical Records (1947 to present):** *This alphabetical series consists of the medical records of each past and present employee of the Idaho National Engineering Laboratory. The records have been microfilmed and the hard copies sent to the Federal Records Center in Seattle, Washington. The microfilmed records are maintained by the Idaho National Engineering Laboratory, Office of Occupational Medicine. This series includes the records of volunteers who are known to have participated in human radiation experimentation. The records are located at the Office of Occupational Medicine, Willow Creek Building, Idaho Falls, ID 83401 and the Federal Records Center Seattle, WA 98115.*⁽¹²¹⁾

2) Occupational Dosimetry Records (1947 to present): *These records are alphabetical by subject and contain the results of whole body counts, urinalysis tests, and thyroid counts measuring personnel for exposure to ionizing radiation. They also contain a calibration history for the whole body counting equipment. The records include: occupational radiation records; bioassay records; whole body count records; individual personnel records; and record storage receipts dating back to the late 1940s. There are bound notebooks containing log entries of whole body counts, including personnel names, dates, and comments; raw spectra data; viewgraphs of whole body counts, etc. There are also logbooks containing entries that show the name of the subject, date, and a comments section for the whole body count which notes the experiment or study for which the count was performed. Raw spectra data of whole body counts are also noted. The majority of the records are on microfiche and have been sent to the Federal Records Center (FRC), Seattle. There are a few records from 1990 to the present retained onsite. Most of the records have been entered into an electronic database. The records are located at the Operational Dosimetry Unit Offices, Central Facilities Area, CFA 690 Room 205, Room 11, and Room 115, the INEL Records Storage Vault at Central Facilities Area, CFA 674 E, and the Federal Records Center Seattle, WA 98115.*⁽¹²¹⁾

3) Radiological and Environmental Sciences Laboratory (RESL), Environmental Sciences Branch: Subject Files and INEL Historical Dose Evaluation Project Files Collected by Eddie Chew (1952 to 1991): *These records arranged by subject contain information used in the INEL Historical Dose Evaluation (IHDE) Project, along with related subject files of information collected during the normal course of business. The Historical Dose Evaluation Project studied radiation dose levels associated with releases and accidents; it produced a final report in two volumes. The IHDE files contain project reports, task group meeting minutes, and correspondence. Also included are records documenting operational and episodic releases and the SL-1 accident. The subject files contain correspondence, contracts, and reports and are filed according to an AEC filing system. These files concern subjects which include: CERT, Experimental Cloud Exposure Study, SL 1, SNAPTRAN, CONVAIR Test, SPERT, and LOFT Release. The records are located at the INEL Central Facilities Area (CFA) Building CFA 690, RESL, Room 191 Idaho Falls, ID 83401 and the Federal Records Center Seattle, WA 98115.*⁽¹²¹⁾

4) Radiological and Environmental Sciences Laboratory: Files of Doug Carlson, Director (1958 to 1994): *These records arranged by chronological subject include reading files of monthly reports, correspondence from 1992, and files containing collected information concerning human experiments. They contain information on: CERT tests, CERTLE tests, van calibration experiments, human nuclide studies, capsule experiments, the SL-1 accident, and an experiment apparently conducted on a University of Arkansas graduate student at that facility who later became an INEL employee. The document types include: monthly activity reports, AEC Reports, journal articles, correspondence, and notes and reports summarizing experiments. Important information in this series includes: lists of experiment participants, summaries of experiments, CERT progress reports, information on CERT funding, and experiment logbooks containing consent forms. The records are located at INEL, CFA, Office of the Director Building, RESL, CFA 690 Idaho Falls, ID 83401 and the Federal Records Center Seattle, WA 98115.*⁽¹²¹⁾

5) Radiological and Environmental Sciences Laboratory: Whole Body Counting Records Collected by Dale G. Olsen (1961 to 1994): *These records arranged by chronological subject include the journal articles, dectapes and dectape logs, reports on bioassay techniques, and whole body counting logbooks kept in the office of the Branch Chief of the Laboratory Accreditation Program. The logbooks record whole body counts conducted by Dale Olsen and others. One logbook entitled "Human Ingestion Capsule" contains information on body counts of people who voluntarily swallowed capsules containing radioisotopes. This log includes 10 signed consent forms. The records are located at INEL, Central Facilities Area (CFA) Building RESL CFA 690, Room 115 Idaho Falls, ID 83401 and the Federal Records Center Seattle, WA 98115 (cabinet DOELAP, drawer #4 and adjacent bookcase).*⁽¹²¹⁾

6) Contractor Medical and Bioassay Records (1951 to 1989): *This series contains bioassay (chronologically arranged) and medical records (alphabetically arranged) from the Science and Technology Branch's Operational Dosimetry Organizations and the Quality Assurance, Safety, and Security Industrial Safety Medical Departments of the Idaho National Engineering Laboratory. The medical records were kept for personnel working under various DOE contractors during this period, including ENICO, AS&S, Industrial Safety, Allied Chemical Corporation, Aerojet, and Idaho Nuclear Corporation. Document types included in the series are bioassays and medical records of individuals from 1951 to 1989. Bioassay records are kept by analysis number which are roughly chronological. Medical records include physical examinations of employees, medical tests, and other medical information and are kept alphabetically by employee last name. The records are located at the Federal Records Center Seattle, WA 98115.*⁽¹²¹⁾

9.0 Overview of Integrated Waste Management at INEEL

The narratives in this section describe the management (i.e. treatment, storage, and final disposition) of waste streams at the Idaho National Engineering and Environmental Laboratory (INEEL). In order to properly manage all INEEL wastes, the integration of on-site and off-site facilities and contractors is necessary.

For the following waste streams, refer to the appropriate disposition flow chart at the end of this section. The flow charts are divided into seven areas including the disposition of: 1) low level radioactive waste (**LLRW or LLW**), 2) environmental restoration activity wastes (i.e. **contaminated media**), 3) INEEL low level mixed waste (**LLMW or MLLW**), 4) transuranic waste (**TRU and TRU mixed**), 5) high level waste (**HLW**), and 6) the disposition of spent nuclear fuel (**SNF**).

Waste types / streams and their definitions were previously presented in Section 6.1 on page 31.

Later in this document, specific example activities relating to the treatment, storage, disposal, maintenance, operations, and management of INEEL wastes will be described in greater detail. Refer to Sections 10.0 through 10.4 pages 100 through 138 for primary INEEL projects and associated activities.

For convenience, INEEL facilities mentioned throughout each narrative are in bold type. All treatment, storage, and disposal processes are operated by INEEL's primary contractor Lockheed Martin Idaho Technology Company (LMITCO) unless otherwise noted.

9.1 Industrial / Commercial Waste Disposition

Source and Inventory

Industrial / commercial waste is solid waste (such as paper, wood, asbestos, and construction / demolition debris) generated by manufacturing or industrial processes.⁽¹²²⁾ The INEEL site annually generates between 46,000 and 85,000 cubic meters of uncompacted, solid, industrial, and commercial waste.⁽⁴⁷⁾

Treatment and Disposal

Treatment and disposal of industrial / commercial waste occurs at **Central Facilities Area (CFA)** and Bonneville County landfills. Scrap lumber, office paper, and flammable, non-hazardous construction and demolition debris is burned at the **Idaho Nuclear Technology and Engineering Center's (INTEC) Coal Fired Steam Generation Facility.**⁽⁴⁷⁾

9.2 Hazardous Waste (HW) Disposition *(Refer to INEEL ER Baseline Disposition Maps 1 through 4 and INEEL Mixed Low Level Waste (MLLW) Baseline Disposition Maps 1 through 3 located on Pages 89 through 95)*

Source and Inventory

Hazardous Wastes (HW) generated at the INEEL primarily consist of process wastes, solvents, lead-contaminated debris and laboratory packs of unused and out-of-date chemicals containing no radiological material. Approximately 100 cubic meters of hazardous waste is generated annually.⁽¹²³⁾

Treatment and Disposal

Currently, HW is shipped to commercial off-site permitted facilities within a 90 day time frame. *Avoidance of hazardous waste generation is emphasized through an effective waste elimination and pollution prevention program. Materials such as batteries, circuit boards and precious metals are recycled.*⁽¹²²⁾

9.3 Low Level Radiological Waste or Low Level Waste (LLRW) *(Refer to INEEL LLW Baseline Disposition Map and INEEL ER Baseline Disposition Maps 1 through 4 located on Pages 88 through 92)*

Source

Weapons production, spent fuel reprocessing, facility deactivation, and the treatment and handling of transuranic waste and low level mixed waste (See Section 9.4) have generated existing Low Level Waste (LLW) inventories at INEEL. Missions related to the clean-up of INEEL, including the decontamination and dismantlement of various facilities at the INEEL, treating and characterizing other waste streams and ongoing processes, will continue to generate LLW. ⁽¹²⁴⁾

Inventory

The waste inventory consists of approximately 9,400 m³ of LLW. ⁽¹²²⁾ *The INEEL is projected to generate about 115,000 m³ of additional LLW in the next 35 years.* ⁽¹²⁴⁾

Treatment

The treatment of LLW at INEEL includes: 1) sizing and compaction of LLW at the on-site **Waste Experimental Reduction Facility (WERF)** or 2) off-site commercial sizing, compaction, and incineration. ^(27, 124)

Storage

Interim storage of untreated LLW occurs at the **WERF**. ⁽²⁷⁾

Disposal

The INEEL disposes of LLW in an active pit at the **Radioactive Waste Management Complex (RWMC) Subsurface Disposal Area**. Untreated and non-treatable LLW will be disposed of at an off-site LLW disposal area that is 'to be determined'. ^(124, 125)

9.4 **Low Level Mixed Waste (LLMW) Disposition** *(Refer to INEEL MLLW Baseline Disposition Maps 1 through 3, INEEL ER Baseline Disposition Maps 1 through 4, and INEEL TRU Baseline Disposition Map on Pages 89 through 96)*

Source

Most INEEL generated Low Level Mixed Waste (LLMW) results from defense nuclear processes and current facility dismantlement activities and research. The INEEL serves as a regional treatment center for DOE LLMW and accepts it from several DOE sites. The WERF is currently the only DOE incinerator licensed to treat solid LLMW generated at other DOE facilities.

Inventory

The INEEL has approximately 1,613 m³ of LLMW in inventory.⁽¹²²⁾ The state of Idaho has approved the INEEL facility to treat more than 840 m³ of incinerable LLMW currently stored throughout the DOE national complex. An estimated 1,600 m³ of LLMW is expected to be generated in the next five years.

Treatment

Treatment of LLMW currently exists or is planned for the following processes: 1) incineration followed by ash stabilization at the WERF, 2) verification sampling and repackaging at the **Mixed Waste Storage Facility (MWSF)**, 3) sizing/segregation and macroencapsulation at the **Waste Reduction Operations Complex (WROC)**, 4) horizontal auger hearth incineration at the **Advanced Mixed Waste Treatment Project (AMWTP)**^(126, 127) to be operated by BNFL, Inc., 5) cask dismantlement at **Test Area North (TAN)** (provides a lead recycling process for lead shielding), 6) reactive metal treatment at **Argonne National Laboratory West's (ANL-W) Sodium Process Facility**⁽¹²⁸⁾, 7) water washing, chemical washing, high-pressure water and steam sprays, and ultrasonic cleaning at the **New Waste Calcining Facility (NWCF) Debris Treatment and Containment Storage Building**, 8) sodium and sodium potassium alloy (NaK) contaminated operational components cleansing at **ANL-W's Sodium Components Maintenance Shop (SCMS)**, and 9) characterization, segregation, treatment, and repackaging of remote-handled mixed low-level, alpha-contaminated mixed low level and transuranic wastes at the **Remote Treatment Facility**.⁽¹²⁹⁾

LLMW containing mercury will be treated at an off-site commercial treatment facility. Non-treatable LLMW will be shipped to processing facilities outside the state of Idaho.⁽¹²⁵⁾ Currently, facilities capable of LLMW treatment include Oak Ridge National Laboratory in Tennessee and at the Savannah River Site in South Carolina.⁽¹³⁰⁾

Storage

RCRA approved interim storage of LLMW occurs at the MWSF and other permitted facilities across the INEEL. ⁽¹³¹⁾

Disposal

LLMW will be disposed of at RCRA subtitle C off-site commercial disposal sites. ⁽¹³²⁾ Small quantities of ash residue is characterized and stabilized as required before disposal at the RWMC. ⁽¹³¹⁾

9.5 Environmental Remediation (ER) Waste (Contaminated Media) Disposition *(Refer to INEEL ER Baseline Disposition Maps 1 through 4 on Pages 89 through 92)*

Source / Inventory

Contaminated media is the direct result of past operations and research activities at INEEL. It is classified as LLMW and LLRW contaminated soil, debris, and groundwater. It also includes Hazardous Waste (HW) soil, rubble, and debris, and TRU sludge, soil, rubble, and debris. ^(47, 133) The expected amount of ER waste to be generated by cleaning up contaminated soil and groundwater at the INEEL is approximately 420,000 m³. ⁽⁴⁷⁾

Treatment

Treatment of contaminated media includes response measures such as 1) collection and direct disposal, storage, or treatment, 2) in situ stabilization, containment, and capping, 3) in situ vitrification and institutional control (i.e. spray surfactant) ^(47, 133), and 4) ANL-W Phytoremediation. ⁽¹³⁴⁾

Disposal

Disposal of excavated wastes will be at a 'to be determined' on-site disposal facility. Contaminated media containing TRU waste will be disposed of at RWMC's Pit 9. Treated waste maybe returned to the remediation unit for capping (**Warm Waste Pond**). ⁽¹³³⁾

9.6 Transuranic (TRU) and Transuranic Mixed (TRU Mixed) Waste Disposition *(Refer to INEEL ER Baseline Disposition Maps 1 through 4 and INEEL TRU Baseline Disposition Map located on Pages 89 through 92 and Page 96)*

Source / Inventory

Transuranic (TRU) and transuranic mixed (TRU Mixed) waste at the INEEL consists of plutonium-contaminated protective clothing, filters, containers, and tools resulting mostly from weapons production at facilities other than INEEL. The site has approximately 65,900 m³ of TRU waste in inventory, the largest inventory of any DOE site. ^(47, 122)

Treatment

The treatment of TRU / TRU Mixed waste at INEEL may include one or more of the following: 1) characterization, segregation, repackaging of remote handled TRU Mixed waste at the **Remote Treatment Facility** to be located at the **AMWTP**, 2) incineration of alpha-LLMW and TRU Mixed waste at the **AMWTP** to be operated by BNFL, Inc., ⁽¹²⁹⁾ 3) characterization of drummed TRU waste at the **Stored Waste Examination Pilot Plant (SWEPP)** ⁽¹³⁵⁾, 4) certification and shipping at the **RWMC**, and 5) **INTEC** Hot Cell repackaging and characterization. ⁽¹³⁶⁾

Storage

The interim storage of TRU / TRU Mixed waste currently occurs at 1) above ground facilities at the **RWMC's Transuranic Storage Area (TSA)**, 2) **Subsurface Disposal Area** at **RWMC** (mostly Rocky Flats Plant TRU waste), and 3) **ANL-W**. ⁽⁴⁷⁾

Disposal

Final disposition of TRU / TRU Mixed waste at the INEEL site will occur at an off-site facility such as the **Waste Isolation Pilot Plant (WIPP)** in New Mexico. ⁽⁴⁷⁾

9.7 Spent Nuclear Fuel (SNF) Disposition *(Refer to INEEL SNF Baseline Disposition Map located on Page 97)*

Source and Inventory

The INEEL has 559 m³ of spent nuclear fuel (SNF) in inventory. It originates *at a variety of sources, including research reactors at the INEEL, U.S. Navy submarine and surface-ship propulsion reactors, the decommissioned Fort St. Vrain power plant in Colorado, the damaged core from the Three Mile Island (TMI) power plant in Pennsylvania, and university and foreign research reactors.* ⁽⁴⁷⁾

Treatment

Treatment of SNF involves stabilization through 1) packaging, 2) drying, and 3) transfer in licensed canisters to dry interim storage. ⁽¹³⁵⁾

Storage/Disposal

Interim storage of SNF takes place at **TAN, TRA, INTEC (CPP-603 and CPP-666), PBF/ARA, NRF, and ANL-W.** ⁽⁴⁷⁾ Final disposition will occur at an off-site geologic repository such as Yucca Mountain.

9.8 High Level Waste (HLW) Disposition *(Refer to INEEL HLW Baseline Disposition Map located on Page 98)*

Source and Inventory

High-level waste (HLW) at the INEEL resulted from the chemical reprocessing of SNF to extract uranium. Reprocessing at INEEL ceased in 1991. The site has approximately 10,000 m³ of HLW and sodium-bearing wastes in inventory. ^(47, 122)

Treatment

The treatment of HLW at INEEL can include one or more of the following: 1) evaporation at the **High-Level Liquid Waste Evaporator**, 2) tank stabilization, 3) debris treatment, water wash and segregation at INTEC ⁽¹³⁶⁾ 4) calcination (liquid high-level waste turned into solid calcine) at the **New Waste Calcining Facility (NWCF)** at INTEC, and 5) on site commercial radionuclide separation, grouting, or vitrification. ^(47, 136, 137)

Storage

The INTEC is the primary management and storage location for liquid and solid high-level wastes. ⁽¹²²⁾ Calcine is stored in stainless steel bins within concrete vaults at the INTEC.

Disposal

Final disposition for HLW will occur at an unknown off-site geologic repository. ⁽¹³⁷⁾

9.9 Special Nuclear Material (SNM) Disposition *(Refer to INEEL Nuclear Materials Baseline Disposition Map on Page 99)*

Source and Inventory

Special Nuclear Material (SNM) is comprised of a variety of materials ranging from fuel scrap at INTEC and RWMC, *slightly irradiated Al Fuel, fluorinel denitrator product, rocky flats* U_3O_8 containing plutonium, uranium-233, or uranium enriched in the isotope-233 or 235. Existing inventory of SNM is approximately 3,256.5 kg.

Treatment / Disposal

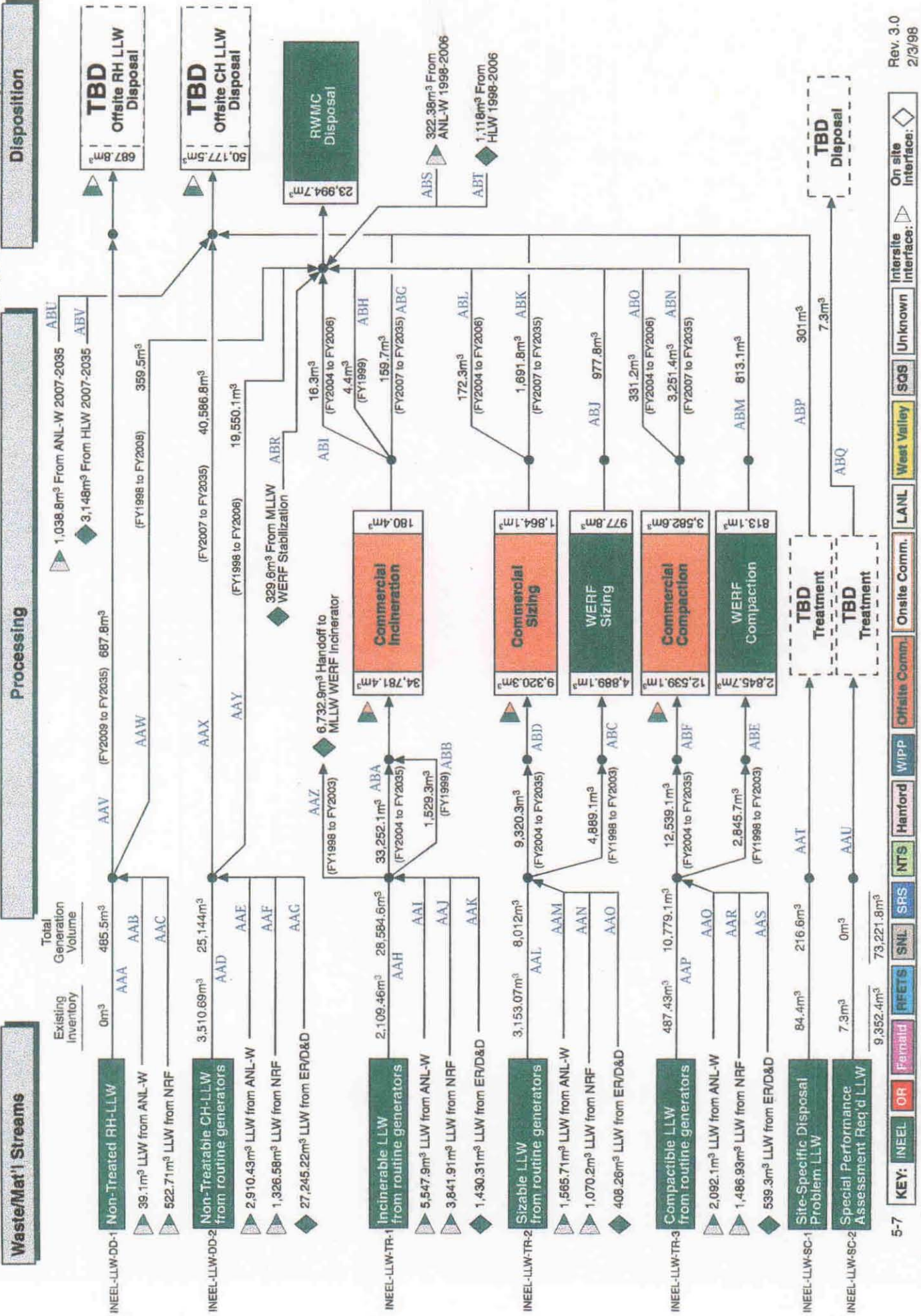
Treatment of SNM includes stabilization through dry blending to lower enrichments. Most materials will be directly disposed of at 1) a DOE designated offsite commercial recovery process, 2) Savannah River Site (SRS) Canyons, 3) Oak Ridge National Lab (ORNL) Y-12, or 4) ANL-W.

Storage

Interim storage of SNM may occur at 1) INTEC, 2) RWMC, or 3) ANL-W.

INEEL LLW Baseline Disposition Map

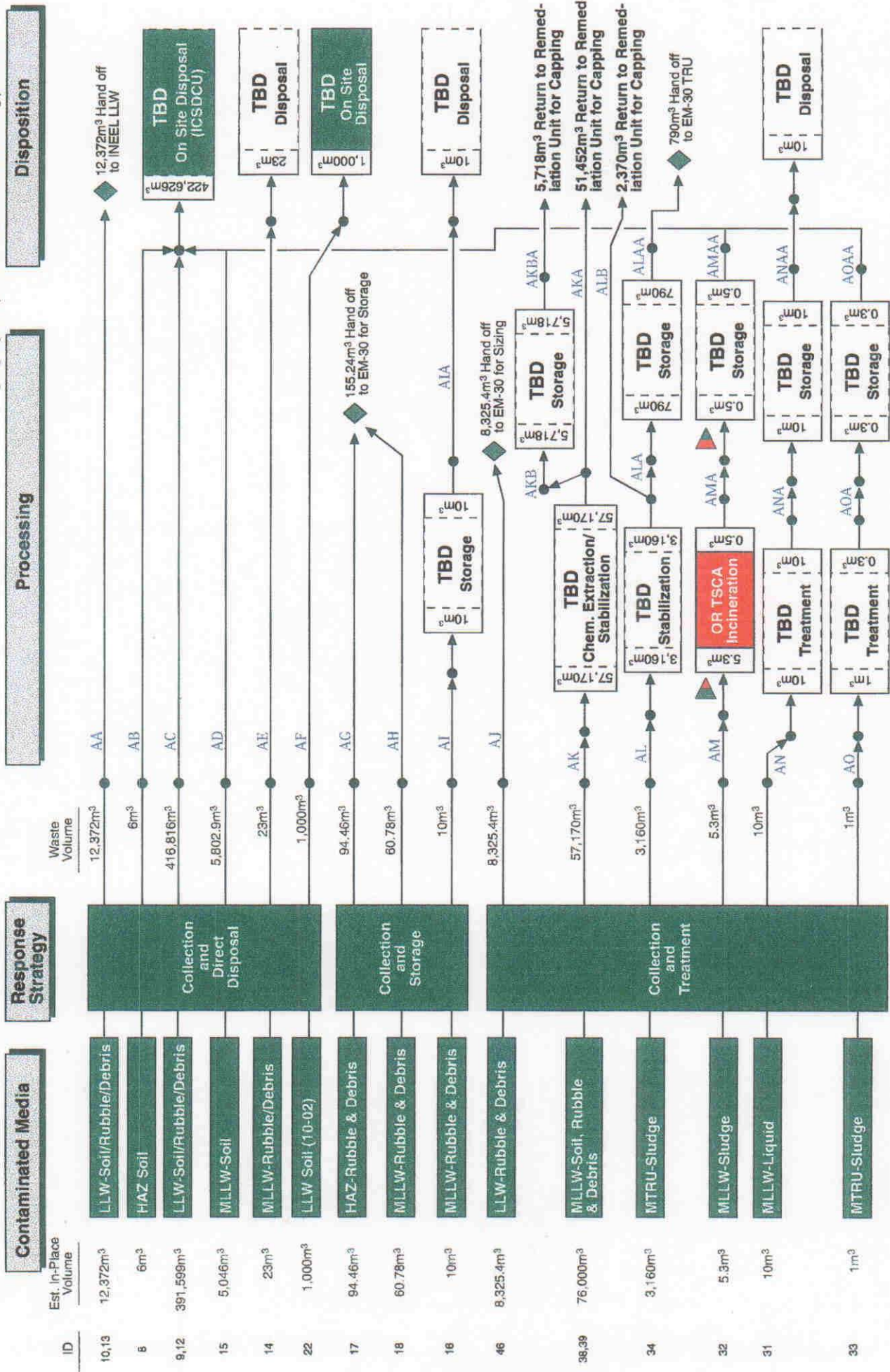
This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the ongoing regulatory and stakeholder decision-making processes.



INEEL ER Baseline Disposition Map (Page 1 of 4)

PREDECISIONAL DRAFT

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Letters in blue are link identifiers

PREDECISIONAL DRAFT

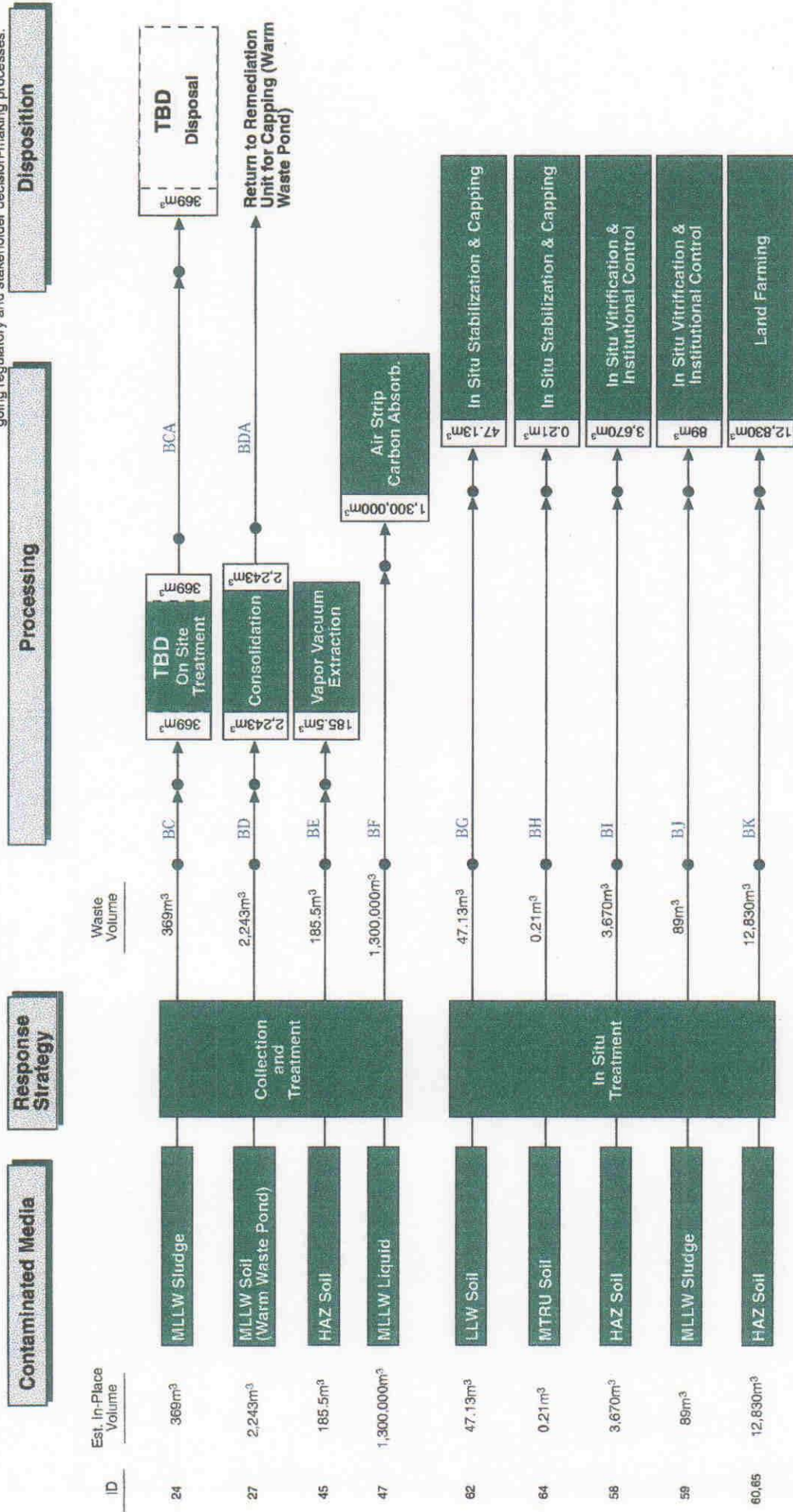
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INEEL ER Baseline Disposition Map (Page 3 of 4)

PREDECISIONAL DRAFT

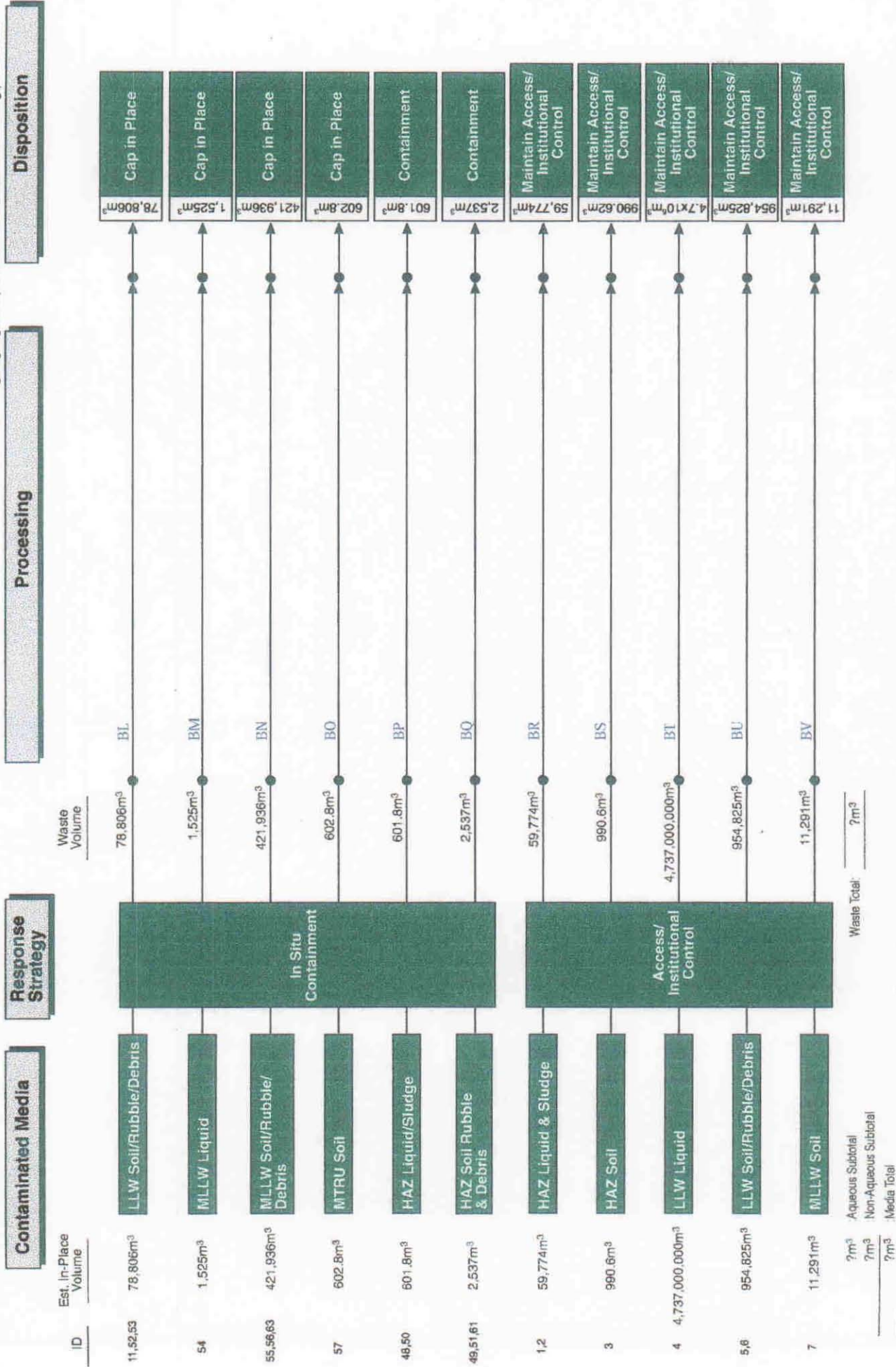
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INEEL ER Baseline Disposition Map (Page 4 of 4)

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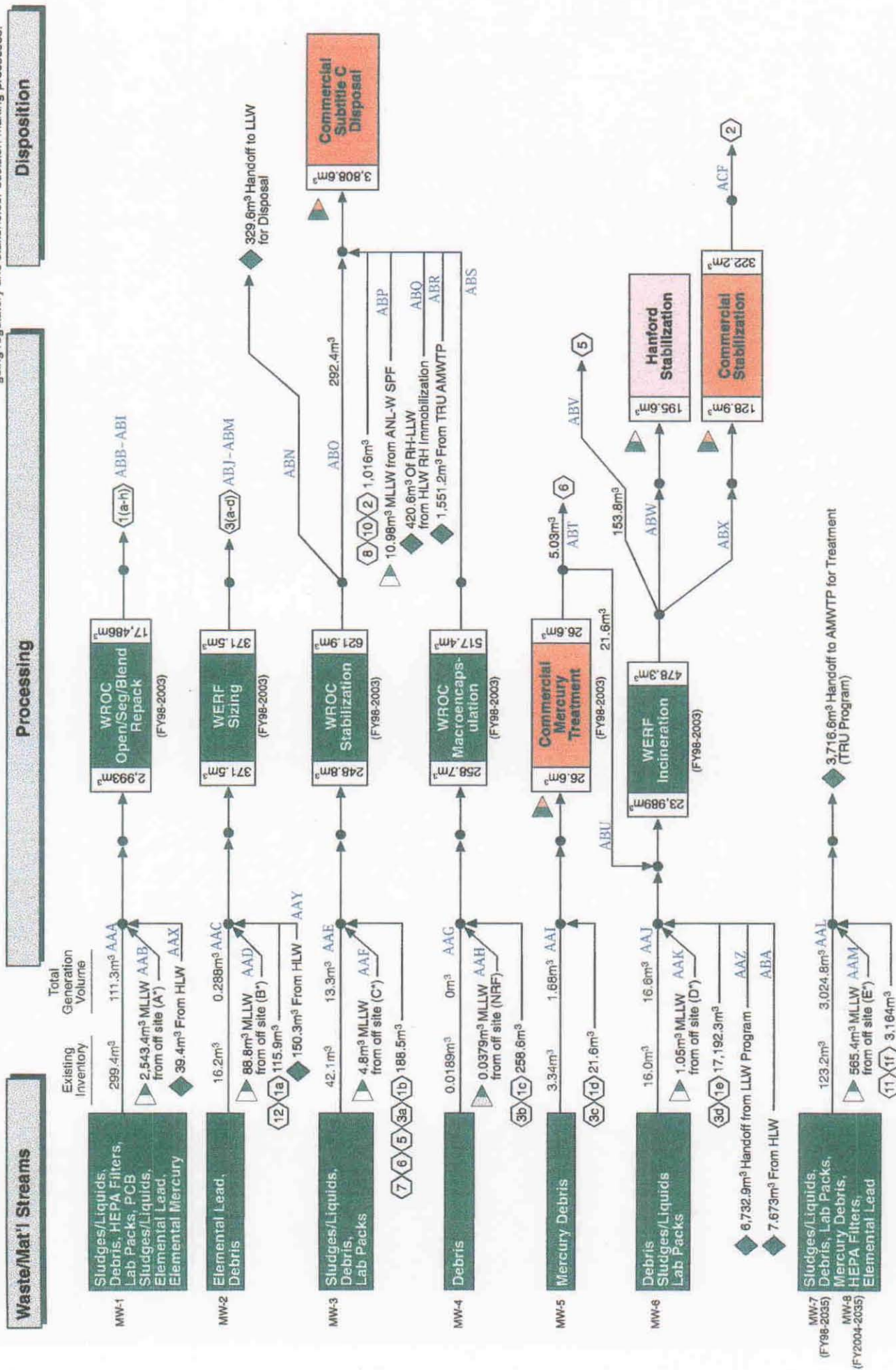
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7-11.4 KEY: INEEL OR Fernaid RFETS SNL SRS NTS Hanford WIPP LANL West Valley SQS Unknown On site interface: Intersite interface:  

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3-7.1

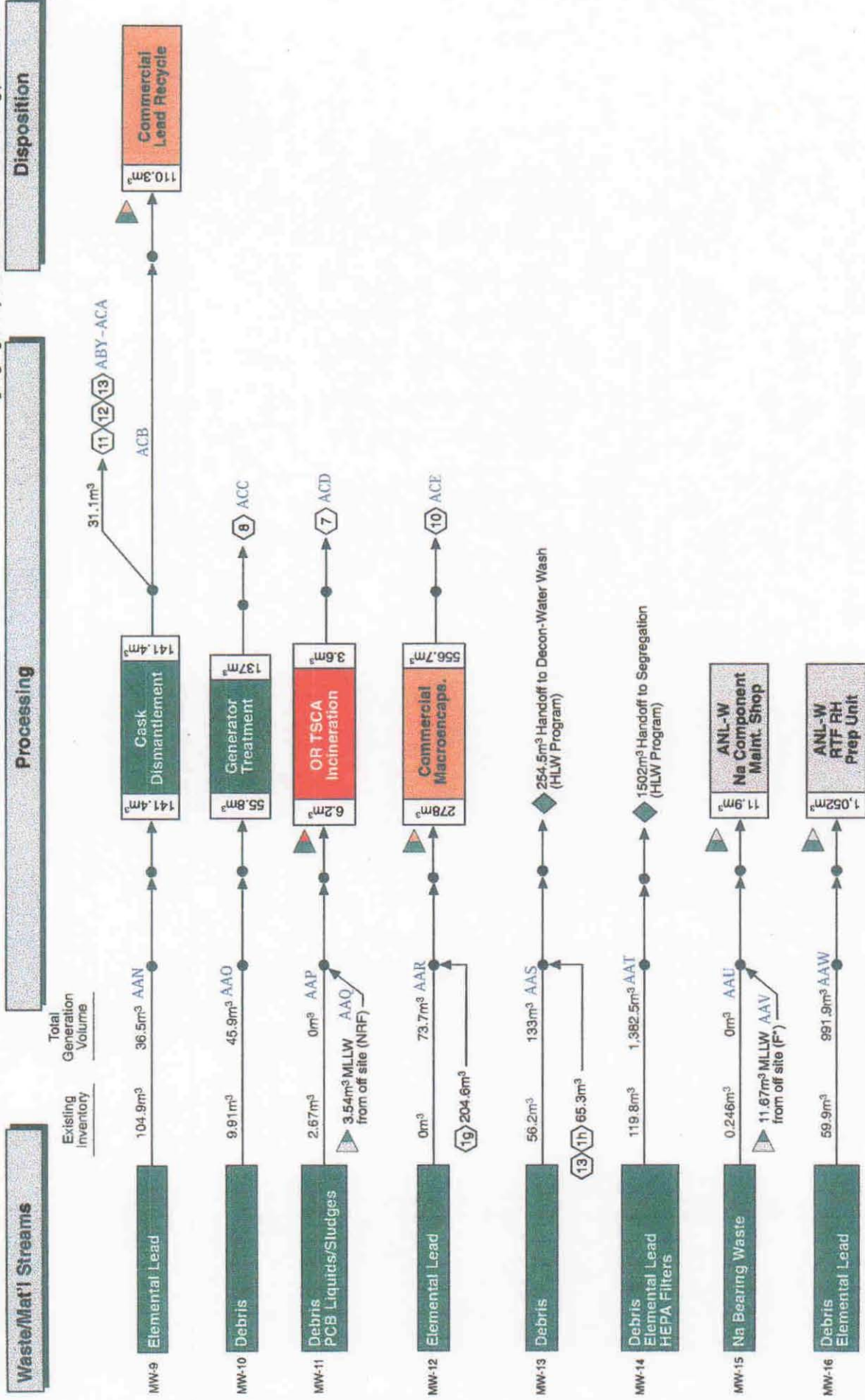
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INEEL MLLW Baseline Disposition Map (Page 2 of 3)

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PREDECISIONAL DRAFT

This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the ongoing regulatory and stakeholder decision-making processes.

1a	104.9m ³	ABB
1b	10.65m ³	ABC
1c	40.05m ³	ABD
1d	18.32m ³	ABE
1e	17.059m ³	ABF
1f	0.092m ³	ABG
1g	204.6m ³	ABH
1h	48.37m ³	ABI
2	322.2m ³	ACF
3a	15.46m ³	ABJ
3b	218.6m ³	ABK
3c	3.29m ³	ABL
3d	134.2m ³	ABM
5	153.8m ³	ABV
6	5.031m ³	ABT
7	3.574m ³	ACD
8	137.1m ³	ACC
10	556.7m ³	ACE
11	3.072m ³	ABY
12	11.07m ³	ABZ
13	16.97m ³	ACA

Detail of Off Site receipts to INEEL MLLW (in m³):

Stream A*		Stream B*	
AE	12.32	ANL-W	0.1323
ANL-W	5.9493	BT	0.8000
BT	1.6953	CN	1.3627
CN	0.4164	KA	1.4300
ET	16.692	KK	0.5100
GA	6.363	KW	0.5500
KA	4.5866	LA	38.4400
KK	2.2968	MI	10.7657
KW	2.7389	NN	1.9360
LA	117.22	NRF	32.5525
LB	13.5738		
LL	16.5471		
MD	10.1		
MI	7.2983		
MU	3.40		
NN	4.90		
NRF	42.0354		
PA	122.6116		
PH	0.05		
PN	0.024		
PO	444.2840		
PS	7.880		
PX	50.69		
RF	170.703		
RL	1397.25		
SA	67.1082		
WS	10.63		
WV	2.9877		

Stream C*		Stream D*	
ANL-W	1.4806	ANL-W	0.0115
ET	1.5800	NRF	1.0402
NRF	0.7240		
SR	1.0000		

Stream	E*
BN	0.0350
BT	12.6510
ET	0.0002
KA	42.7090
KK	35.1110
KW	5.0300
LA	123.6760
LB	4.9461
LL	183.9200
MI	0.4164
NRF	2.8753
PO	9.5700
PS	8.1320
RF	135.4960
SR	0.8250

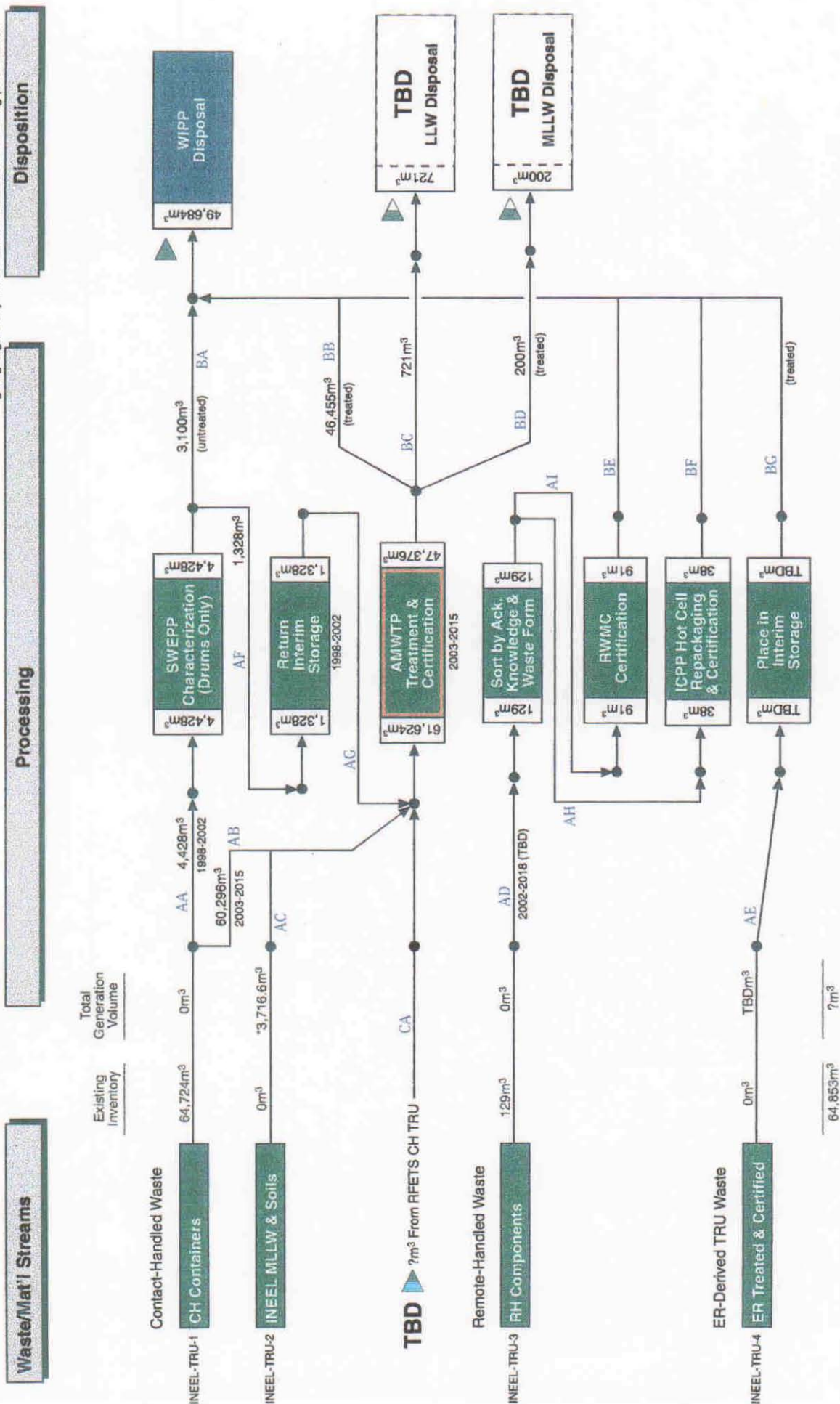
Stream	F*
LA	6.1800
RP	5.4900

AE:	Argonne National Laboratory-East
ANL-W:	Argonne National Laboratory-West
BT:	Bettis Atomic Power Laboratory
BN:	Brookhaven National Laboratory
CN:	Charleston Naval Shipyard
ET:	Energy Technology Engineering Center
GA:	General Atomics
KA:	Krolls Atomic Power Laboratory-Schenect
KK:	Krolls Atomic Power Laboratory-Kesseling
KW:	Krolls Atomic Power Laboratory-Windsor
LA:	Los Alamos National Laboratory
LB:	Lawrence Berkeley Laboratory
LL:	Lawrence Livermore National Laboratory
MD:	Mound Plant
MI:	Mare Island Naval Shipyard
MU:	University of Missouri
NN:	Norfolk Naval Shipyard
NRF:	Naval Reactor Facility
PA:	Paducah Gaseous Diffusion Plant
PH:	Pearl Harbor Naval Shipyard
PN:	Portsmouth Naval Shipyard
PO:	Portsmouth Gaseous Diffusion Plant
PS:	Puget Sound Naval Shipyard
PX:	Pantex Plant
RF:	Rocky Flats Plant
RL:	Hanford Site
RP:	Rensselaer Polytechnic Institute
SA:	Sandia National Laboratory-New Mexico
SR:	Savannah River Site
WS:	Weidon Springs Site
WV:	West Valley Demonstration Project

INEEL TRU Baseline Disposition Map

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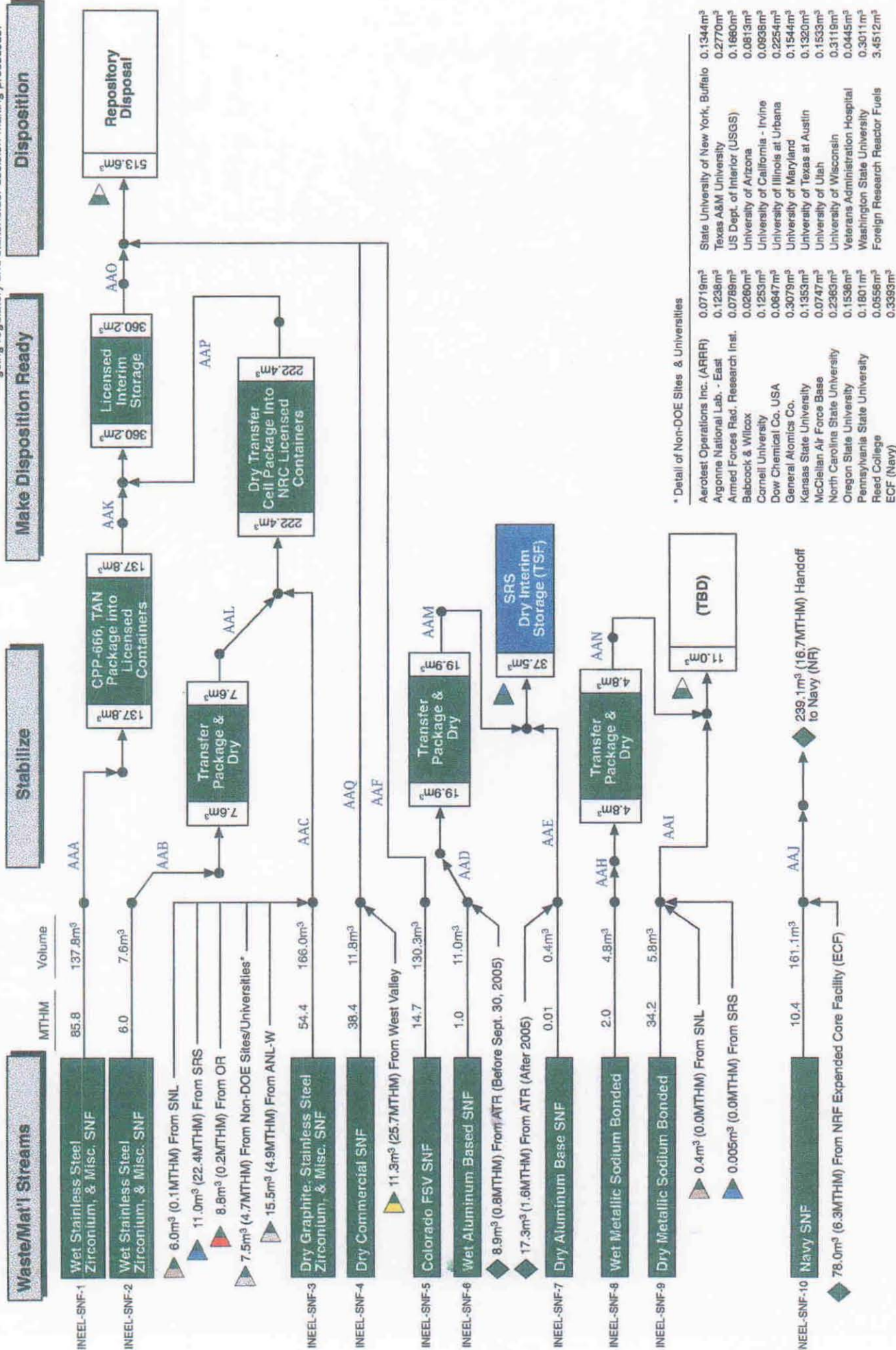


Notes:

- All volume estimates are rounded to the nearest whole number.
- Reference: Inventory Analysis of Stored Transuranic (TRU) Waste at the Radioactive Management Complex (RWMC), K.M. Croft and V.S. Scowen, INEL-96/0308, November 1996.
- The source document estimates the CH inventory as 84,784m³ and the RH inventory as 89,684m³. The CH inventory cited in the reference includes a derived value for early waste receipts for which container-specific data does not exist, plus an estimated 40m³ of RH waste stored and managed as CH waste (i.e., waste stored in shielded drums).
- *4. Input stream AC reflects INEEL MLLW anticipated to go to AMWTP for treatment, actual acceptability by AMWTP for treatment has not yet been determined. Therefore, disposition profile for stream has not yet been determined or included in AMWTP volumes.

PREDECISIONAL DRAFT

This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the ongoing regulatory and stakeholder decision-making processes.



On site Interface:

Letters in blue are link identifiers

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INEEL Nuclear Materials Baseline Disposition Map

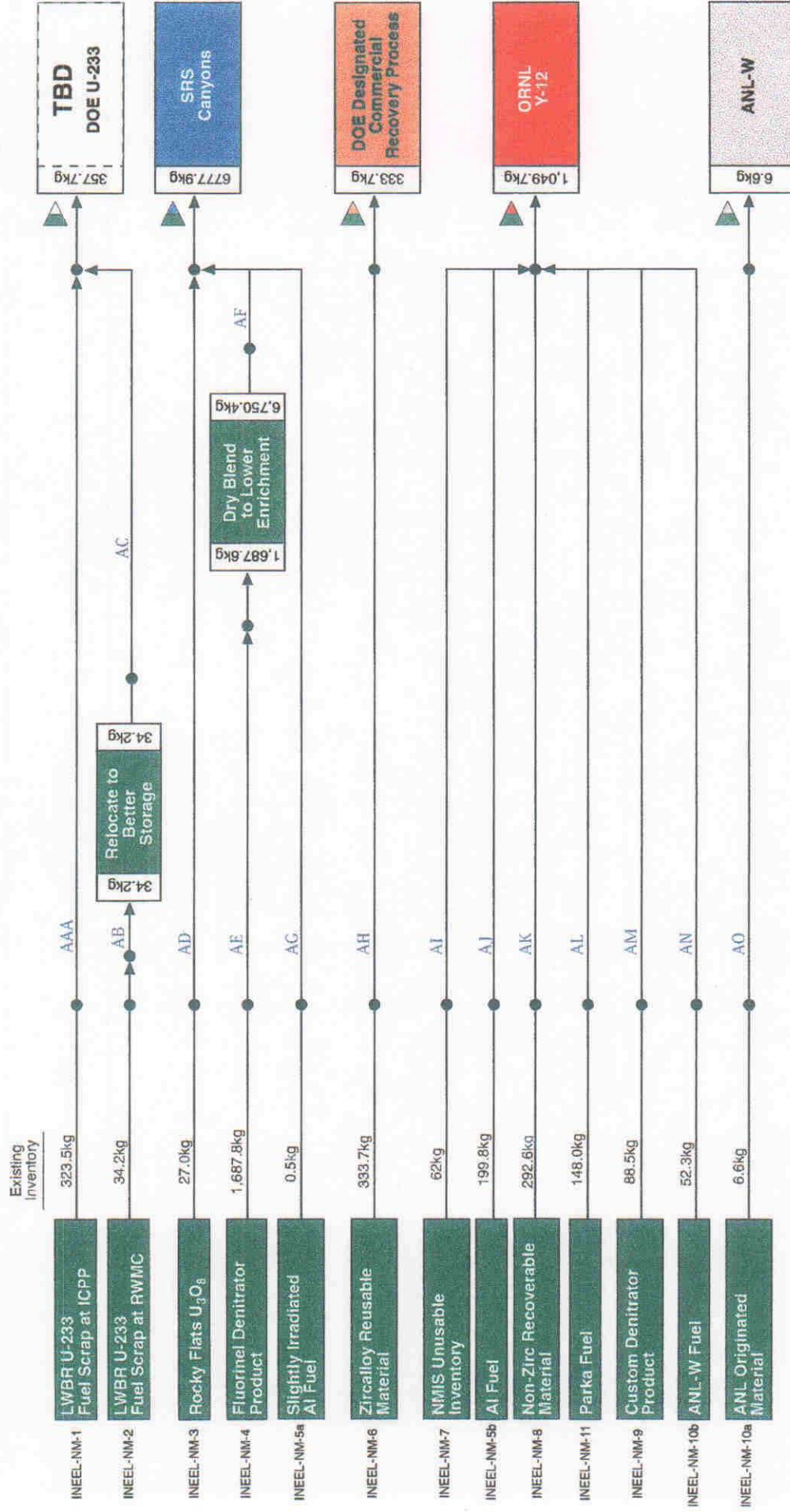
This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the ongoing regulatory and stakeholder decision-making processes.

Mat'l Category

Stabilize

Make Disposition Ready

Disposition



3,256.5kg

13-2

KEY: INEEL OR Fermat RFETS SNL SRS NTS Hanford WIPP Offsite Comm. Onsite Comm. LANL West Valley SQS Unknown

On site Interface: Intersite Interface:

Rev. 3.0
1/21/98

Letters in blue are link identifiers

10.0 INEEL Past, Present, and Proposed Remediation Worker Activities

For presentation purposes, INEEL site remediation worker past, present, and proposed activities (i.e. Hazardous Waste (HW), Decontamination and Decommissioning (De), Dismantlement (Di), and Clean-up Worker (CW) tasks as previously defined in Section 6.2: Remediation Worker Task Definitions on pages 30 to 36) are presented **by project**. Major INEEL site clean-up projects include: **Waste Management, Spent Nuclear Fuel, Environmental Restoration, and Deactivation (Facility Stabilization), Decontamination and Dismantlement.**

Within each of the four major projects at INEEL, activities presented in this section include: 1) a full description of the task or activity; 2) wastes type (s) associated with the activity; 3) specific contaminants of concern (COCs); 4) the associated regulatory driver(s); 5) task time lines and classifications (past: November 1989 to June 1998, present: June 1998 to June 1999, and future: June 1999 and beyond) [Note: 'beyond' for this report is classified as post 2006. DOE has stated their goal is to cleanup 90% of DOE sites by 2006. ^(132: ES-1)]; 6) the remediation task classification (HW, CW, De, or Di); and 7) the estimated number of workers per activity or task. Ranges for the estimated number of workers per activity or task are LOW:<10, MED: 11-75, and HIGH:>75.

Facility profiles and activity diagrams presenting necessary background information are also provided prior to activity presentations.

The activities in this section were selected according to the following criteria: 1) the activity was highly publicized; 2) the activity identifies particular COCs, exposure potential, and safety interests to remediation workers on a particular project; and 3) the activity was an example of work routinely performed across the site.

All activities described in Sections 10.1 through 10.6 are presented in tabular format. (Refer to Table 13.2: INEEL Remediation Worker Activity Descriptions as Reported June 1999 on pages 292 through 298.)

10.1 INEEL's Waste Management Project (WM)

LMITCO is the primary contractor responsible for solid and liquid waste management operations at INEEL. ANL-W (the primary contractor within WAG 9), BNFL, Inc. (the AMWTP privatization contractor), and Westinghouse Electric Corporation (the NRF area contractor) also work in conjunction with LMITCO to manage INEEL waste. LMITCO and its teaming partners operate the facilities that store, treat, examine, characterize and re-package solid and liquid waste types including Industrial/Commercial Waste, HW, LLW, LLMW, TRU/TRU Mixed Waste, Spent Nuclear Fuel, and HLW.

The following table ^(47: P. 1) presents current INEEL Waste Management Activities (storage, treatment, and disposal) by area. Also refer to Section 9.0 on pages 80 through 99 for a detailed description of INEEL inventory, storage, treatment, and disposal by waste type. Waste management activities discussed in this section are in bold type. Spent Nuclear Fuel management will be discussed in Section 10.2 on page 112.

Activity	Area	Waste Type (s)
Waste Storage	TAN	SNF
	TRA	SNF
	INTEC	LLW, LLMW, HLW, SNF
	PBF/ARA	SNF
	WERF	LLW, LLMW
	RWMC	TRU/TRUMixed
	NRF	SNF
	ANL-W	SNF, TRU/TRUMixed
Waste Treatment	INTEC	HLW
	CFA	Industrial/Commercial Waste
	WERF	LLW, LLMW
Waste Disposal	CFA	Industrial/Commercial Waste
	RWMC	LLW

LMITCO is the primary contractor involved in the following waste management activities unless otherwise noted.

Remediation Worker Waste Management Activities

Waste Experimental Reduction Facility (WERF) Facility Profile:

The Waste Experimental Reduction Facility (WERF), located in waste area group (WAG) 5, is a versatile LLW/LLMW treatment facility that began operating in August 1982. The WERF treats and reduces current volumes of INEEL LLW and LLMW. The facility employs waste repackaging, incineration, stabilization, compaction and metal sizing processes. In February 1991, the facility underwent a planned shutdown to improve operating procedures. Sizing (where metals are cut up using plasma arc torches) and compaction operations resumed in 1994. The dual chambered permitted incinerator resumed operating in July 1995.



Activity 1: WERF: Incinerator Operations ^(138, 139)

Personnel at the WERF identify, characterize, and repackage (from metal drums to burn boxes) LLMW to be incinerated. Repackaged waste is staged in the WERF waste storage building and is inspected daily. After waste preparation, the incinerator is brought to a temperature of 870 degrees Celsius over a 16 hour period. LLW solid waste is then gravity fed to the primary chamber through the solid waste feed chute. Once an ash pile develops and the secondary chamber is above 980 degrees Celsius, LLMW incineration is started. After all LLW and LLMW is incinerated, the incinerator is cooled down for ash removal and refractory inspection. When the ash is below 50 degrees Celsius it is sampled and analyzed for radioactive and hazardous constituents. The ash is then transferred to metal drums for stabilization and direct disposal.

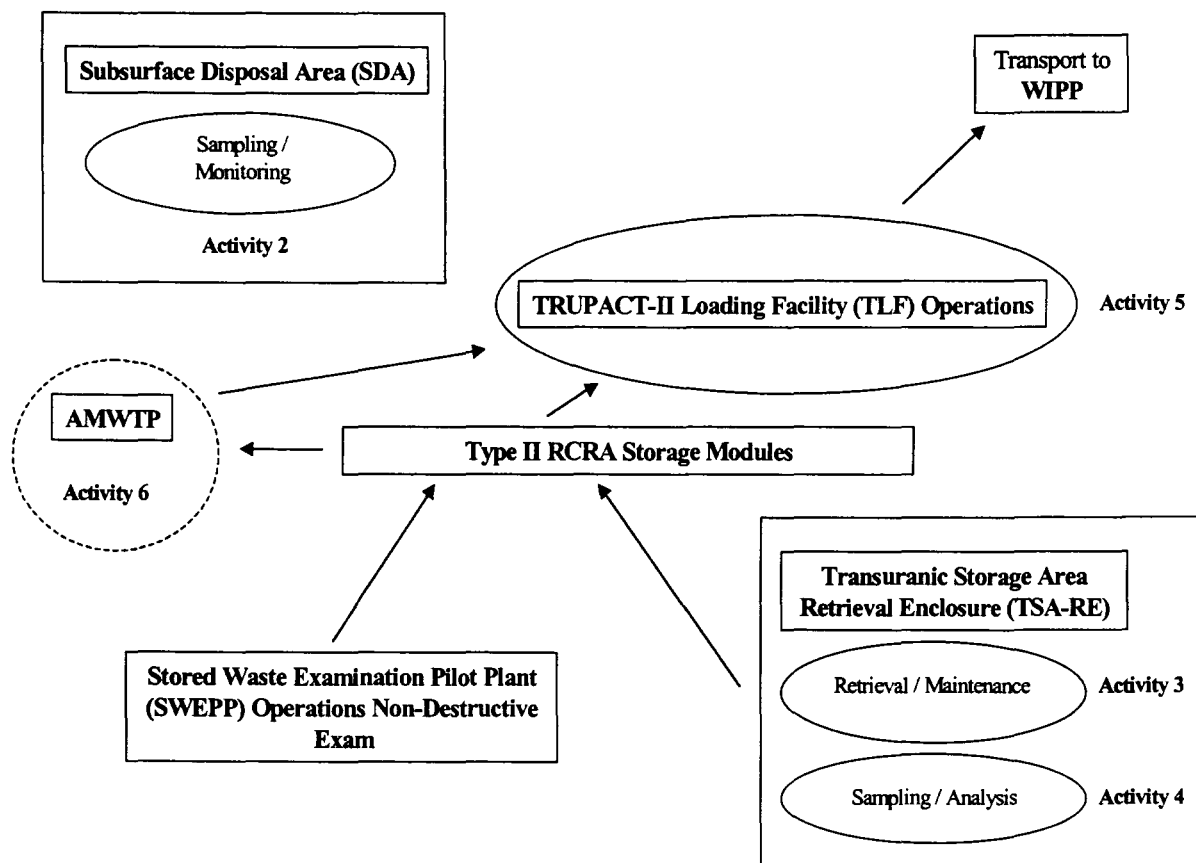
Contaminants of concern to WERF operations personnel include exposure to LLW and LLMW in the forms of wood, paper, cloth and plastics during characterization and repackaging activities and incinerator ash containing radiological and hazardous components. LLMW may contain volatile organic compounds (VOCs), fixed carbon, polyvinyl chloride, polyethylene, and sulfur. Fire protection concerns exist for some materials.

WERF incinerator operations are classified as a past, present, and future **HW tasks** performed by MED: 11-75 workers. As reported by a site contact, there are 16 operators and 6 shift supervisors. When support personnel (i.e. scheduling, planning, and cleaning) are included, the total number of workers falls between 50 and 60 personnel. ⁽¹⁴⁰⁾ Incineration activities began in 1984, ceased in 1991, restarted in 1995 and will continue until the WERF completes its intended operations. This is predicted beyond 2006. Regulatory drivers associated with this activity include Resource Conservation and Recovery Act (RCRA) Part B Permit Application and the Clean Air Act (CAA).

Radioactive Waste Management Complex Profile:

The **Radioactive Waste Management Complex (RWMC)**, located in WAG 7 at INEEL, was established in 1952 to store and dispose solid radioactive waste. TRU waste was received at the RWMC from other DOE facilities until 1989. It now receives radioactive waste from INEEL site clean-up and operations activities. The RWMC currently disposes LLW and stores TRU waste in two areas: the **Transuranic Storage Area (TSA)** and the **Subsurface Disposal Area (SDA)**. *In addition, the recent award of the contract for the **Advanced Mixed Waste Treatment Project (AMWTP)** will expand the RWMC's waste management operations to include treating and preparing LLW and TRU wastes for shipment out of Idaho.* The following figure presents activities within the RWMC area. ⁽¹⁴¹⁾

Figure 10.1 A: Radioactive Waste Management Complex (RWMC) Activity Diagram



Activity 2: Surveillance, Monitoring, and Sampling at Subsurface Disposal Area (SDA)

At the SDA, radioactive waste materials (approximately 88,000 gal of organic waste) have been buried in underground pits, trenches, soil vault rows, and one aboveground pad (Pad A).⁽¹⁴²⁾ Personnel at RWMC's SDA routinely conduct subsurface monitoring through core drilling to determine if radionuclides have migrated to the Snake River Plain Aquifer. Since radionuclides have migrated into the ground, clean-up is recommended at the SDA. Refer to Activity 18 on page 128 for a detailed description of SDA, specifically Pit 9, remediation.

Contaminants of concern during sampling tasks include mixtures of chlorinated solvents (CCl₄, TCA, PCE, TCE) and lubricating oil (i.e. chloroform, vinyl chloride).⁽¹⁴³⁾ Radionuclides within subsurface basalt layers include Am-241, Co-60, Pu-238, Pu-239, and Pu-240.⁽¹⁴²⁾

SDA sampling and monitoring activities are classified as a past, present, and future **CW and HW tasks** performed by MED: 11-75 workers.⁽¹⁴⁴⁾ Refer to Table 10.1 B on page 107 for a list of RWMC job classifications and headcounts. Monitoring began in the early 1970s and will continue until the SDA is remediated. Remediation goals are set for 2006. Regulatory drivers associated with this activity include the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Federal Facility Agreement and Consent Order (FFA/CO).

Activity 3: Retrieval and Maintenance of TRU Mixed Waste Containers at the Transuranic Storage Area (TSA)⁽¹⁴⁵⁾

At TSA, TRU mixed waste is stored in eight cells in TSA Pad 1, three cells in TSA Pad 2, and three cells in TSA Pad R. Cells are covered by the TSA Retrieval Enclosure (TSA-RE). Waste containers (drums and boxes) are topped with wood and polyvinyl sheeting followed by a minimum of 2ft of soil cover above the highest container of the cell. Soil over some of the containers may exceed 4ft.

Operations at TSA include: **1)** clean soil removal using an excavator (*a track-mounted, electric motor-powered, multi-use 97,000 pound class piece of equipment*) fitted with a bottom dump bucket end effector and a mobile vacuum system, **2)** manually removing contaminated soil with a hot vacuum system mounted on a cart with HEPA filters and a 55 gallon drum, **3)** manually stacking clean plywood on pallets and lowering, using the excavator, to floor level or placing directly on a flatbed trailer, **4)** manually size reducing clean fabric and placing it on pallets, and **5)** in place decontamination and size reducing contaminated fabric, timber and plywood. Fifty Drum Equivalents per day based on 17 days of retrieval per month are expected for a retrieval rate.

Once containers are retrieved, personnel at the TSA-RE and recently constructed Type-II modules (seven buildings approved for storing retrieved mixed waste), will conduct 1) contamination checks with survey instrumentation and swipes within a shielded box area, 2) bar code labeling of waste containers, 3) vertical drum retrieval with the use of a drum grapple (*a drum lifting device that lifts the drum by applying opposing forces around the clamp ring of the drum*), and 4) horizontal drum retrieval with special fork lifts.

Contaminants of concern at TSA include those listed in Table 10.1 E and F on page 111. Radiological safety, contamination control, and general (non-radiological) safety measures are conducted in order to maintain a protective environment for TSA workers. ⁽¹⁴⁶⁾

Operations at TSA are classified as past, present, and proposed **CW and HW tasks** performed by MED: 11-75 workers. ⁽¹⁴⁴⁾ Refer to Table 10.1 B on page 107 for a list of RWMC job classifications and headcounts. Storage of TRU Mixed waste containers has occurred at TSA since 1970. Retrieval operations have occurred since approximately 1995 and will continue until waste is properly treated and transported to an off-site disposal facility such as WIPP. Regulatory drivers associated with this activity include the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Federal Facility Agreement and Consent Order (FFA/CO).

Activity 4: Sampling and Analysis of TSA Overburden (Background) Soil and Decontamination of Sampling Equipment ⁽¹⁴⁶⁾

Personnel sample and analyze TSA overburden with a gas chromatograph. Systematic, random, and biased sampling will be employed to characterize overburden. Personnel will also perform decontamination of sampling equipment as it is used throughout the work day. Sampling equipment decontamination procedures include: 1) *wash and scrub equipment with non-phosphate detergent*, 2) *rinse with tap water*, 3) *rinse with deionized water*, 4) *rinse with pesticide grade methanol*, 5) *collect equipment blank (rinsate) from last water rinse (when needed)*, 6) *air dry all sampling equipment (if possible) prior to sample collection*, and 7) *wrap in aluminum foil*. ⁽¹⁴⁶⁾

Equipment and materials (*disposable clothing, tools, or other equipment as well as contaminated overburden from drilling and sampling activities* ⁽¹⁴⁶⁾) not able to be decontaminated will be disposed of in appropriate waste containers. *Waste Management Programs will be responsible for final disposition of all wastes. It is the responsibility of all site personnel to minimize waste generation where possible.* ⁽¹⁴⁶⁾

Contaminants of concern at TSA include those listed in Table 10.1 E and F on page 111. Radiological safety, contamination control, and general (non-radiological) safety measures are conducted in order to maintain a protective environment for TSA workers.

Operations at TSA are classified as past, present, and proposed **CW, HW, and De tasks** performed by MED: 11-75 workers.⁽¹⁴⁴⁾ Refer to Table 10.1 B on page 107 for a list of RWMC job classifications and headcounts. Storage of TRU Mixed waste containers has occurred at TSA since 1970. Sampling and decontamination operations have occurred since approximately 1990 and will continue until waste is properly transported to an off-site disposal facility such as WIPP. Regulatory drivers associated with this activity include the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Federal Facility Agreement and Consent Order (FFA/CO).

Activity 5: TRUPACT-II Loading Facility (TLF) Operations⁽¹⁴⁷⁾

At the TLF, personnel will package contact-handled transuranic (CH-TRU) materials in a payload container that is either a 55-gallon drum, a standard waste box (SWB), or a ten gallon drum overpack (TDOP). The operator in the waste generating area will visually examine and verify CH-TRU physical waste prior to placement into plastic bags and the payload containers. The operator will inspect and remove all prohibited waste forms prior to filling and closing the payload container. The operator may use real-time radiography (RTR) to perform the above tasks. (RTR is a nondestructive testing method that allows the operator to ascertain the physical form within a payload container without opening it.)

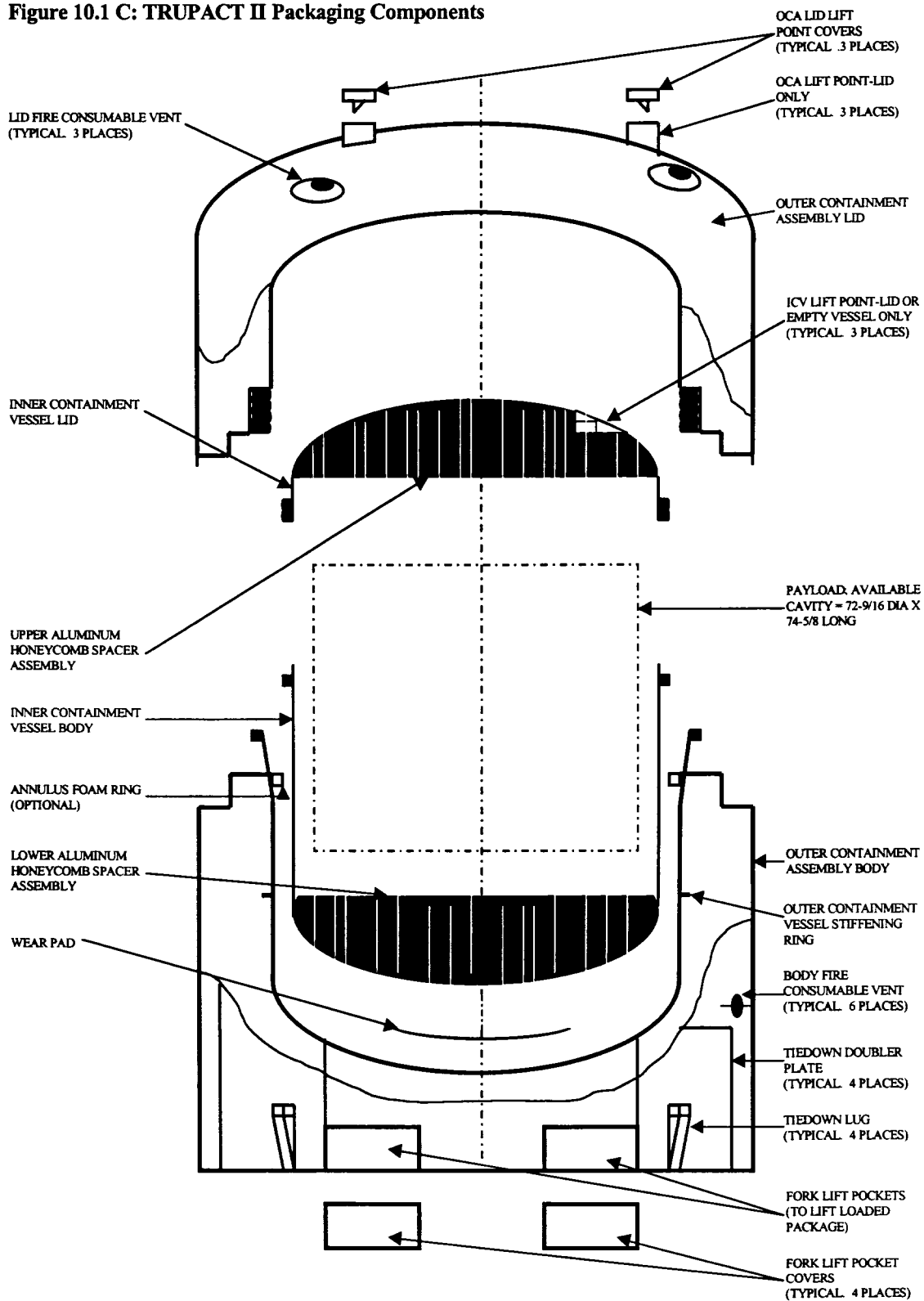
The TRUPACT-II packages ready for transport can be loaded and ready within eight hours. Personnel use a lift to fill the package. Refer to the Figure on page 108 for a diagram of the TRUPACT-II package. Contaminants of concern include wastes such as plastic, metal, glass, paper, salts, absorbents, oxides, filters, filter media, cloth, sludges, and other items having very small amounts of transuranic radioactivity. Pu-239 is the primary radioisotope of concern.

Operations within the TLF are classified as **CW tasks** performed by MED: 11-75 workers.⁽¹⁴⁴⁾ Refer to Table 10.1 B on page 107 for a list of RWMC job classifications and headcounts. TRUPACT-II loading began in 1999 and will continue until all TRU waste is shipped to an off-site repository such as WIPP. The first shipment of TRU waste left INEEL on April 27, 1999 for the WIPP. Regulatory drivers associated with this activity include RCRA.

Table 10.1 B: Disciplines and headcounts for remediation workers at the INEEL Radioactive Waste Management Complex as of December 1998

Discipline	Number of Workers
Laborers	12
Equipment Operators	4
Heavy Equipment Operators	7
RCTs	17
Instrument Technicians	4
Foremen	4
Supervisors	5
SWEPP Operators Only	16
Total	69

Figure 10.1 C: TRUPACT II Packaging Components



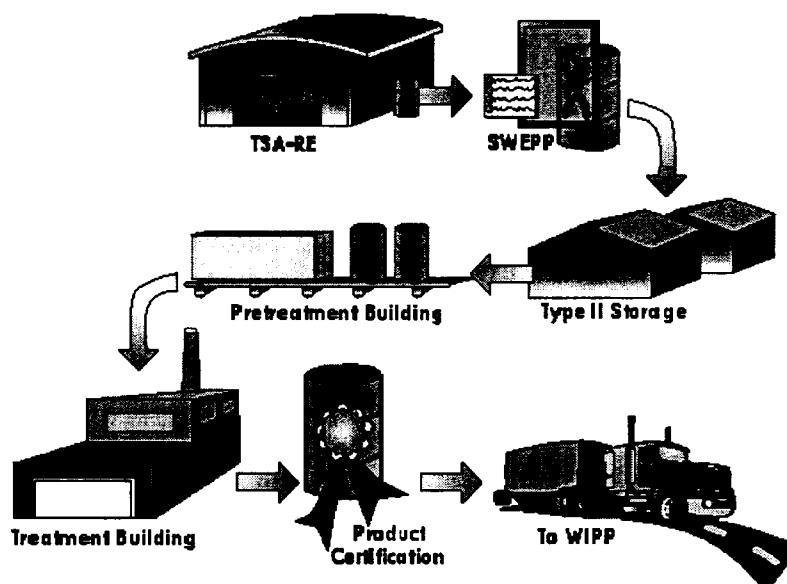
Advanced Mixed Waste Treatment Project (AMWTP) Profile: ^(148, 149)

The **Advanced Mixed Waste Treatment Project (AMWTP)** facility, designed and operated by BNFL Inc. (a DOE privatization contractor), will be located within the boundaries of the RWMC (WAG 7) near TSA. The project will treat mixed wastes from the TSA to meet disposal criteria and package it for shipment out of Idaho. Refer to Figure 10.1 D on page 110 for a diagram of activities relating to the AMWTP. As the diagram indicates, retrieved TRU mixed waste from the TSA-RE will be characterized at the **Stored Waste Examination Pilot Plant (SWEPP)**, stored in RCRA-compliant Type II modules, staged at a pre-treatment facility, treated at a BNFL, Inc. facility, certified and transported from the **TRUPACT-II Loading Facility** to the **WIPP**. BNFL, Inc. planned treatment technologies include supercompaction, macroencapsulation, incineration, and microencapsulation. Ash from incineration processes will be vitrified.

The AMWTP is divided into three phases. Phase I consists of permitting stages and expects completion after the completion of this report. Phase II includes the detailed design, equipment development and manufacture, and facility construction, and will run through 2002. Phase III consists of continued waste retrieval and facility operations, and runs from 2003 through 2015.

The proposed AMWTP facility would be composed of the following areas: 1) Administrative / Personnel Support Areas, 2) Personnel Access/Security Areas, 3) Offices / Meeting Room Areas, 4) Control / Computer Room Areas, 5) Men's / Woman's Clean Change Rooms, 6) Backup Monitoring Room, 7) Subchange Rooms, 8) Waste Receiving and Staging Line, 9) Supplies Receiving / LLW Loading Area, 10) Pretreatment Areas, 11) Box Lines, 12) Box Size Reduction Area, 13) Drum Assay Area, 14) Analytical Laboratory, 15) Drum Staging Area, 16) Central Conveyor Area, 17) Grout Preparation Area, 18) Treatment Areas, 19) Supercompaction / Macroencapsulation Area, 20) Drum Cure Area, 21) Special Case Waste Glovebox, 22) Incineration Area, 23) Thermal Treatment Offgas Systems Areas (includes brine evaporation), 24) Vitrifier Feed Staging Area, 25) Glass Former Mixing Area, 26) Vitrification Area, 27) Loading Staging Area, 28) Maintenance Areas (Hot and Cold), and 29) Mechanical / Electrical Support Areas.

Figure 10.1 D: The AMWTP Proposed Treatment Process ⁽¹⁴⁹⁾



Activity 6: Supercompaction at the AMWTP Facility

BNFL, Inc. personnel conducting activities during the AMWTP supercompaction process will: 1) receive drums of sorted waste debris from pretreatment lines or direct feed drums from the waste receiving and staging areas via the central conveyor system, 2) puncture waste drums, 3) compact drums with a hydraulic press that controls the shape of the resultant supercompacted puck through the use of a mold, 4) under extreme pressure, vent gas and process the drums through the facility air pollution control system, 5) place pucks into a puck drum within the postcompaction glovebox and 6) transfer puck drums to the macroencapsulation process. Contaminants of concern during this process include those listed in Tables 10.1 E and Table 10.1 F on page 111.

Operations at the AMWTP supercompaction process are classified as proposed **CW and HW tasks** performed by HIGH: >75 workers. Facility operations will occur from approximately 2003 through 2015 and will continue until waste is properly transported to an off-site disposal facility such as WIPP. Regulatory drivers associated with this activity include the Resource Conservation and Recovery Act (RCRA) and the Settlement Agreement.

Table 10.1 E: Organic Compounds and Target Metals at the TSA-RE and AMWTP ⁽¹⁴⁶⁾

Organic Compounds		
Carbon Tetrachloride	Methylene Chloride	Nitrobenzene
1,1,2,2-tetrachloroethylene (PCE)	1,1,1-trichloroethane (TCA)	Trichloroethylene (TCE)
1,1,2-trichloro-1,2,2-trifluoroethane	Xylene	Polychlorinated Biphenyls
Target Metals		
Beryllium	Cadmium	Chromium
Lead	Mercury	--

Table 10.1 F: Target Radionuclide List for TSA-RE and AMWTP ⁽¹⁴⁶⁾

Radionuclide		
Actinium-228	Americium-241	Antimony-125
Cerium-144	Cesium-137	Cobalt-60
Europium-152	Europium-154	Europium-155
Manganese-54	Plutonium-238	Plutonium-239
Plutonium-240	Radium-226	Silver-110
Strontium-90	Uranium-234	Uranium-238
Zinc-65	--	--

Radionuclides in bold type are the most abundant based on records of waste.

10.2 INEEL's Spent Nuclear Fuel Project (SNF)

The mission of INEEL's Spent Nuclear Fuel Program is to safely manage, store, and dispose of DOE-owned spent nuclear fuel stored at the INEEL by 2035. *The objective is being achieved by following a three-part strategy of (1) resolving existing vulnerabilities associated primarily with storage of spent nuclear fuel in outdated underwater storage facilities; (2) preparing and storing INEEL assigned spent nuclear fuel in consolidated, on-site, interim dry storage; and (3) preparing the spent nuclear for off-site disposal at a monitored retrievable storage facility or federal repository.* ⁽¹⁵⁰⁾

The major activities underway to accomplish the above objectives include: ⁽¹⁵⁰⁾

- 1) Safe operation of existing SNF storage facilities, while undertaking SNF transfers to remove all SNF from the underwater storage facilities and consolidate it at two dry storage sites at the INEEL.
- 2) Receipt of SNF from foreign research reactors and domestic sources in accordance with records of decision. *(In 1999, the INEEL received a consolidated shipment of foreign fuel from Europe (Italy, Germany, Slovenia, and Romania)).* ⁽¹⁵¹⁾
- 3) Construction of additional dry storage and packaging facilities to place the SNF inventory into modular storage containers under Nuclear Regulatory Commission (NRC) licenses, ready for shipment out of Idaho.
- 4) Development of the appropriate technologies, SNF information, and program systems for the INEEL SNF inventory in concert with the DOE and the National Spent Nuclear Fuel Program, which will define and establish the process for shipment of the spent nuclear fuel to a repository.

The 1995 Settlement Agreement (described in detail in Section 5.1 on page 20) lists milestones and requirements for the clean-up and management of SNF at INEEL. Refer to Exhibit 12.15: 1995 Settlement Agreement Requirements for Spent Nuclear Fuel and Exhibit 12.16: 1995 Settlement Agreement Milestones for Spent Nuclear Fuel on pages 239 through 244 for a comprehensive list of completed and anticipated actions concerning INEEL SNF.

LMITCO and it's teaming partners store SNF at INEEL in the areas and facilities listed in Table 10.2 A: Spent Nuclear Fuel (SNF) Storage Facilities by Area.

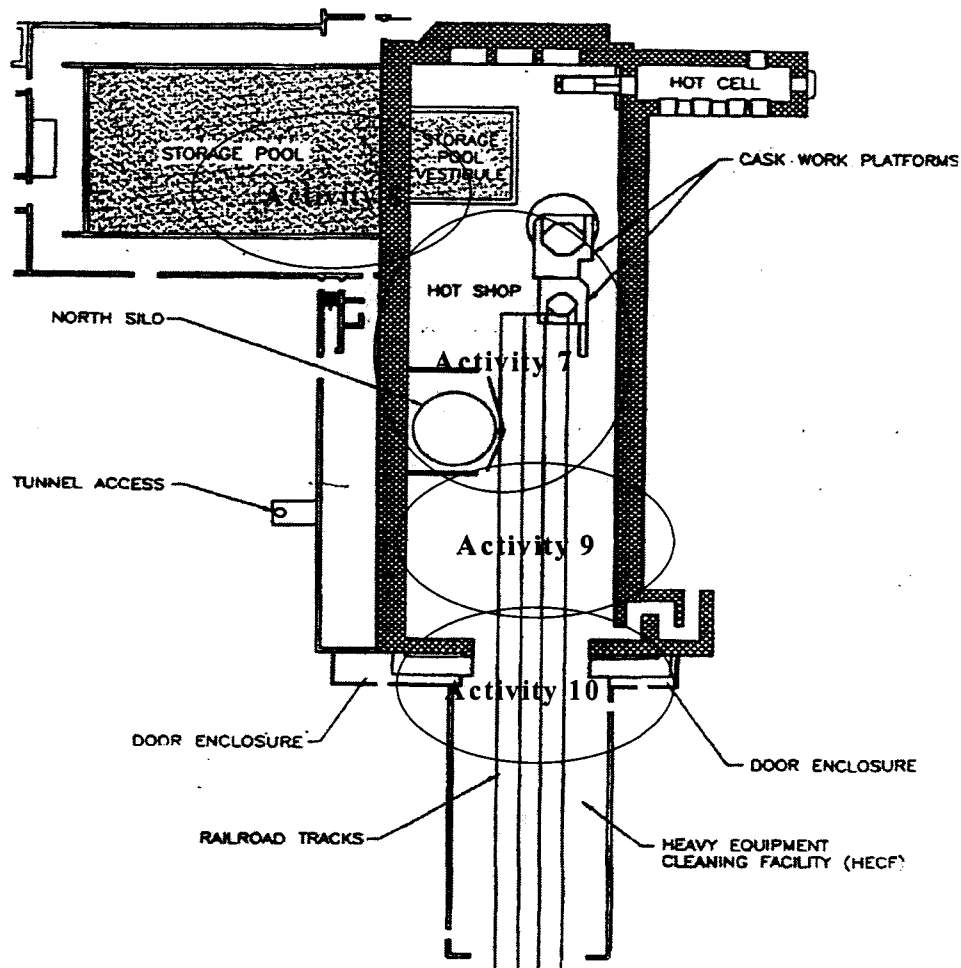
Table 10.2 A : SNF Storage Facilities by Area

Area	SNF Storage Facilities
ANL-W	Hot Fuel Examination Facility (ANL-W 785)
	Transient Reactor Test Facility (ANL-W 720)
	Fuel Conditioning Facility (ANL-W 765)
	Radioactive Scrap and Waste Facility (ANL-W TR-46)
TAN	Pool (TAN-607)
	Pool (TAN-791)
NRF	Expended Core Facility
TRA	ATR Canal (TRA-760)
	MTR Canal (TRA-630)
INTEC	Fluorinel and Storage Facility (CPP-666)
	Irradiated Fuel Storage Facility (CPP-603)
	Dry Storage Vaults (CPP-749)
	Unirradiated Fuel Storage Facility (CPP-651)
PBF	Reactor Building PER-620

Remediation Worker Spent Nuclear Fuel Activities

TAN-607 Facility Profile:

The TAN-607 facility, which includes the TAN Pool and Hot Shop, was constructed in 1954. The TAN Pool is designed to store radioactive materials and is presently loaded with Three Mile Island (TMI) core debris canisters, Loss of Fluid Test Facility (LOFT) fuel assemblies, commercial fuels (consisting of fuel rods and assemblies from commercial water reactors), and hardware. The TAN Hot Shop is a large shielded high bay containing an interim storage silo and cask work platforms. Between the pool and the hot shop lies a storage pool vestibule. The following figure presents a diagram of the TAN-607 Facility and associated activities. ^(152: P.7)



Activity 7: TAN Hot Shop Operations ⁽¹⁵²⁾

Personnel in the TAN Hot Shop examine, test, and monitor SNF using overhead cranes, a large overhead manipulator, auxiliary wall mounted manipulators, and other equipment for remote handling of SNF and storage casks. Operators will also temporarily position and store SNF assemblies in the TAN Hot Shop silo, a shielded enclosure, and the Hot Shop floor. The equipment is operated by technicians from control stations in the north and south gallery areas.

Contaminants of concern within the TAN Hot Shop include those listed in Table 10.2 E on page 120. Hot Shop operations are carried out under facility work procedures. Contamination levels are maintained at low levels to permit nonremote operation and maintenance when necessary. ⁽¹²⁾

Operations during TAN Hot Shop monitoring activities are classified as past, present, and proposed **CW tasks** performed by HIGH: >75 workers.⁽¹⁵³⁾ Monitoring operations have occurred since 1989 and will continue until SNF is properly processed and transported to an interim storage facility such as a storage facility. (A dry storage facility was constructed in 1998 at INEEL's INTEC). Regulatory drivers associated with this activity include the 1995 Settlement Agreement.

Activity 8: Removal of SNF from the TAN Pool

While submerged in the TAN Pool, TMI canisters are dewatered. To dewater, the canisters are purged with a gas (such as air, nitrogen or argon) to displace the majority of free water in the canister. Once they are dewatered, the canisters are removed from the pool and prepared for drying in the Hot Shop area. TAN operators use underwater exam / handling equipment to perform canister dewatering and overhead cranes for removal. ^(152, 12)

Commercial SNF is removed from the TAN Pool, washed to remove loose surface contamination, and suspended in the Hot Shop to dry prior to placement into dry storage. The commercial fuels may be staged in the shielded silo within the Hot Shop or in an existing dry storage cask located on the existing pad at TAN prior to transport to a dry storage facility. ^(152: P. 9)

Contaminants of concern within the TAN Hot Shop include those listed in Table 10.2 E on page 120. Operations are carried out under facility work procedures.

Operations during TAN Pool TMI canister and commercial fuel removal are classified as present and proposed **CW tasks** performed by 12 to 13 FTEs (MED: 11-75 workers). ⁽¹⁵³⁾ In March 1999, TMI SNF and core debris was removed from the TAN pool and transported to a INTEC dry storage facility. This will continue until December of 2000. Regulatory drivers associated with these tasks include the 1995 Settlement Agreement.

Activity 9: Drying Operations at the TAN Hot Shop

After initial dewatering of TMI canisters and commercial fuel, the canisters are dried further to remove remaining free water. Personnel remove canisters from the TAN pool using an overhead crane system and place one to four canisters into a portable Heat Vacuum Drying System (HVDS) located in the TAN Hot Shop. Personnel operate an electrically-powered furnace that provides the heat source for drying operations. They also operate monitors, controllers, condensers, and vacuum pumps mounted on a skid next to the furnace. The vacuum furnace is sealed and heated to approximately 600 degrees F while the vacuum pump is in operation.

Contaminants of concern during TAN Hot Shop drying operation include those listed in Table 10.2 E on page 120. Heat from the electrically-powered furnace may also be of concern. *The TAN Safety Analysis Review would be revised to ensure the safe operation of the drying system in the Hot Shop.* ^(152: P.10)

Drying operations within the TAN Hot Shop are classified as present and proposed **CW tasks** performed by 7 FTEs (LOW: <11). ⁽¹⁵³⁾ Drying operations will continue until remaining SNF is shipped to the INTEC (formerly ICPP). This is expected to occur by December 2000. Regulatory drivers associated with this activity include the 1995 Settlement Agreement.

Activity 10: Loading SNF Casks and Transportation to INEEL Dry Storage

After removing water from the canisters and fuels, operators load processed SNF into casks for shipment to INTEC dry storage. Hardware to be disposed of as LLW would be placed in boxes and shipped to RWMC. Handling operations for SNF debris are displayed in Table 10.2 D on page 118. Different types of casks may be used during the process such as the Sierra Nuclear Corporation (SNC) cask or the DURCRETE cask. Figure 10.2 C on page 117 presents an example of an SNF transport cask.

Contaminants of concern associated with loading and transport activities include those listed in Table 10.2 E on page 120. These activities are classified as past, present and proposed **CW tasks** performed by MED: 11-75 (approximately 32 FTEs) workers. ⁽¹⁵³⁾ Cask loading began in late 1995 and has continued through 1999. Transport and storage activities will continue through December 2000. Regulatory drivers associated with this activity include the 1995 Settlement Agreement.

Figure 10.2 C: Sierra Nuclear Corporation SNF Storage Cask

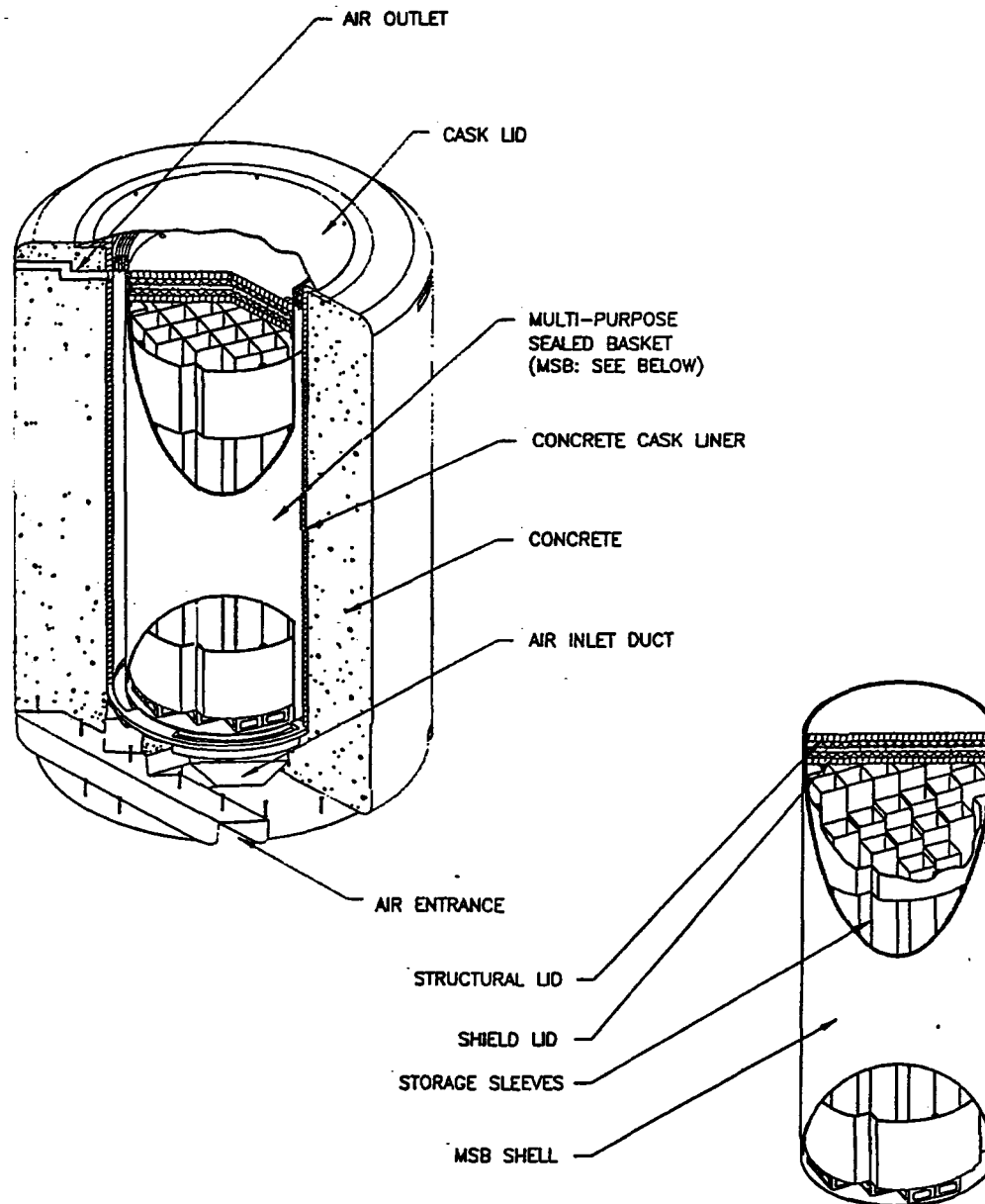
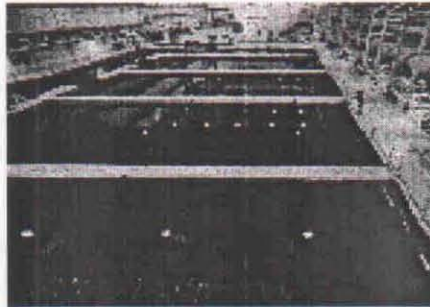


Table 10.2 D : Listing of SNF Loading and Transport Tasks, Associated Man-hours and Dose for SNF Transport and Storage ⁽¹⁵⁴⁾

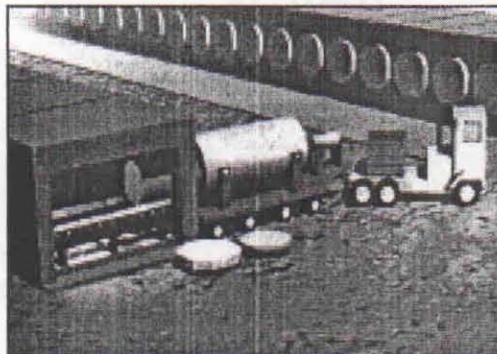
Activity Type	Specific Task	Manhours	Dose mrem
Fuel Loading	Lift and lower transfer cask (MTC) with Multipurpose Canister (MPC) into Pool	16	33
	Load MPC with SNF assemblies	16	12
	Lift and place shield lid on MPC	24	30
	Lift MTC with MPC and wash exterior	24	40
MPC Closure	Weld MPC shield lid and inspect	72	125
	Decon MTC	6	20
	Weld structural lid and inspect	60	64
	Drain MPC	8	0
	Vacuum dry MPC	20	5
	Backfill with helium	0.3	0
	Weld valve covers and inspect	16	21
MPC Transfer to Ventilated Storage Cask (VSC)	Lift MTC above VSC	10	5
	Install MTC hydraulics	4	2
	Open MTC bottom doors	2	10
	Lower MPC into VSC	6	42
	Remove MTC from VSC	6	6
	Place shield ring in VSC	2	40
VSC Storage	Tow VSC to Dry at ICPP	12	36
	Place VSC in Dry Storage	36	18

Activity 11: Storage of SNF at INTEC's CPP-666 Fluorinel and Storage Facility (FAST) and Dry Storage Vaults



The CPP-666 fuel storage area will receive and store fuel from aging underwater storage facilities at the INEL until the fuel can be transferred to dry storage.

Personnel at the CPP-666 fuel storage area (pictured above) survey and maintain fuel assemblies transferred from aging underwater storage facilities at INEEL via above-pool grates. Personnel will also rinse storage casks using hand held sprayers prior to dry storage at INTEC.



The new facilities will be based on existing commercially available designs that feature storage canisters that are approved for both storage and transport of spent fuel.

The Dry Independent Spent Fuel Storage Installation (ISFSI) at INTEC (represented by the above concept drawing) would receive transport casks, store canisters and commercial fuels, allow inspection and monitoring of key safety parameters during storage, and provide for retrievability of canisters and commercial fuels to allow for further processing and disposal. Personnel at the ISFSI will operate vehicles involved in the above tasks. The ISFSI will be located near CPP-666. ⁽¹⁵⁵⁾

Contaminants of concern include those listed in Table 10.2 E. Personnel will wear PPE and RPE when performing transfer or rinsing operations. Operations at both facilities are classified as **CW tasks** performed by LOW: <11 workers (6 FTEs).⁽¹⁵³⁾ CPP-666 has been operating since 1995 and will continue operations until all SNF is shipped from Idaho. This is expected beyond 2035. The ISFSI is classified as a proposed storage facility and will accept SNF casks when facility construction is completed. In 1999, DOE-ID selected a team lead by Foster Wheeler Environmental Corp. of New Jersey to design, construct and operate the ISFSI.⁽¹⁵⁶⁾

Table 10.2 E: Potential Radionuclide Inventory Releases as reported in 1996 and 1997 at TAN and ICPP SNF Facilities

Nuclide	Curies (Ci) in Fuel	Current TAN Pool Storage Release (Ci/yr)	Dewatering and Drying Release (Ci/yr)	ICPP storage Release (Ci/yr)
H-3	7.80E+02	7.80E+01	7.80E+01	7.80E+01
Co-60	1.13E+04	3.89E-06	6.78E-12	6.63E-06
Kr-85	1.52E+04	1.52E+03	1.52E+03	1.52E+03
Sr-90	2.43E+05	8.36E-05	1.46E-10	1.43E-04
Y-90	2.43E+05	8.36E-05	1.46E-10	1.43E-04
I-129	1.14E-01	1.14E-02	1.14E-02	1.14E-02
Cs-134	2.34E+02	1.03E-07	1.40E-13	1.37E-07
Cs-137	2.85E+05	1.10E-04	1.71E-10	1.67E-04
Ba-137m	2.70E+05	1.05E-04	1.62E-10	1.58E-04
Eu-154	2.29E+03	7.87E-07	1.37E-12	1.34E-06
Pu-238	9.48E+02	3.26E-07	5.69E-13	5.56E-07
Pu-239	9.34E+03	3.21E-06	5.60E-12	5.48E-06
Pu-240	2.86E+03	9.83E-07	1.72E-12	1.68E-06
Pu-241	1.03E+05	3.54E-05	6.18E-11	6.04E-05
Am-241	4.67E+03	1.61E-06	2.80E-12	2.74E-06

10.3 INEEL's Environmental Restoration Project

INEEL's Environmental Restoration Project is currently managed by LMITCO and its teaming partners (*BBWI, Inc. effective October 1999*). Environmental restoration at INEEL is based upon the clean-up process and schedule outlined in the Federal Facility Agreement and Consent Order signed by the State of Idaho, the DOE and the EPA in 1991.⁽⁴⁷⁾ For each waste area group (WAG) at INEEL, the CERCLA process (a multi-step risk-based approach for identifying and cleaning up sites⁽¹⁵⁷⁾) is followed. Refer to Table 10.3 A on page 122 for WAG clean-up status as of January 1999. Also refer to Section 4.4 on pages 10 through 16 for a description of each INEEL WAG.

This section is presented so that an example environmental restoration activity is provided for each WAG. Most environmental restoration project activities are soil and groundwater related efforts to clean legacy waste from past operations and research activities. With each WAG, a comprehensive list of associated waste sites is available within Appendix 1. The lists are a compilation of the INEEL site Administrative Record, annual / progress reports and fact sheets for each WAG. The data presented in each list is compiled in a functional database available in Microsoft Access. The structure of this database will be described in detail at the beginning of Appendix I.

For a brief view of INEEL and ANL-W facility missions and hazards, refer to Exhibits 12.17 and 12.18 on pages 245 through 247. Each Exhibit presents INEEL facility area, nature of work, and principal hazards and vulnerabilities associated with each facility area.

Table 10.3 A: Clean-up Status of INEEL's WAGs As Determined by the CERCLA Multi-Step Process

Records of Decision	Investigation	Public Comments and Decision	Remedial Design and Action	Ongoing Maintenance/ Monitoring	Comments
Test Area North					
Groundwater Interim Action	x	x	x	x	Action completed; routine monitoring ongoing
Groundwater Final Action	x	x	o	o	Hotspot containment, bioremediation study and groundwater monitoring in progress
Comprehensive	x	o			Record of Decision expected in 1999
Test Reactor Area					
Warm Waste Pond	x	x	x	o	Action completed; routine monitoring ongoing
Perched Water	x	x	x	o	Action completed; routine monitoring ongoing
Comprehensive	x	x	o		Cleanup in progress
Idaho Nuclear Technology and Engineering Center					
Comprehensive	x	o			Record of Decision scheduled for 1999
Tank Farm	o				
Central Facilities Area					
Motor Pool Pond	x	x	NA	NA	Investigation determined no action was necessary
Landfills	x	x		o	Action completed; routine monitoring ongoing
Soil Sites	x	o	x		Public comment scheduled for Summer 1999
Comprehensive	o				Record of Decision scheduled in 2002
Power Burst Facility/Auxiliary Reactor Area					
PBF Evaporation Pond	x	x	x	o	Action completed; routine monitoring ongoing
ARA Chemical Evaporation Pond Stationary Low	x	x	x	o	Action completed; routine monitoring ongoing
Power Reactor-1/Boiling Water Reactor Experiment	x				
Comprehensive	x				
Experimental Breeder Reactor-1/Boiling Water Reactor Experiment					
Radioactive Waste Management Complex					
Pit 9	x	x	o		Contingency plan in progress
Pad A	x	x	x	o	Action completed; routine monitoring ongoing
Vadose Zone	x	x	o		Vapor vacuum extraction in progress
Pits and Trenches	o				Concurrent with the comprehensive investigation
Comprehensive	o				Scheduled for completion in 2003
Naval Reactors Facility					
Industrial Waste Ditch	x	x	x	o	Action completed; routine monitoring ongoing
Comprehensive	x	x	o		Cleanup in progress
Argonne National Laboratory-West					
Comprehensive	x	x	o		Cleanup in progress
Miscellaneous Sites and Snake River Plain Aquifer					
Unexploded Ordnance	x	x	o		Cleanup in progress
Comprehensive	o				

x=completed, o=in progress, comprehensive=comprehensive remedial investigation

Remediation Worker Environmental Restoration Activities

Test Area North Environmental Restoration Profile:

Sources of mixed (radionuclide and chemical) contamination at Test Area North (TAN) include releases in disposal (burn) pits, surface soil releases from LLW operations, releases to surface ponds/ditches, past discharges to an injection well (leading to contamination of the aquifer beneath TAN), wind-blown releases, a mercury spill and a release from a fuel-oil line. The TAN comprehensive investigation was completed in 1997 evaluating 62 sites of known or suspected contamination. Following a public comment period and Record of Decision (ROD), a remedial design and action phase will begin. Implementation of the selected remedy is scheduled to begin by January 2000.

Activity 12: Operable Unit 1-07A and 1-07B: TAN Injection Well (TSF-05) Maintenance and Monitoring ^(47, 158)

The Technical Support Facility Injection Well (TSF-05) at TAN was used to dispose industrial and sanitary wastes from 1952 to 1972. Types of wastes disposed included mixed wastes such as process wastes, corrosive wastewater, ignitable wastes, chromium, lead, and mercury. Currently, personnel at TSF-05; 1) monitor and secure the area, 2) oversee groundwater pumping and treatment facilities, 3) treat pumped groundwater using filtration, air stripping, carbon adsorption, and ion exchange methods and instrumentation, 4) install equipment such as additional monitoring wells, and 5) monitor bioremediation field operations (the injection of 300 gallons/per week of 60% sodium lactate solution so that biochemical reactions can break down groundwater contamination).

Contaminants of concern at TSF-05 include trichloroethene (TCE), 1,2,-dichloropropane, tritium, strontium, cesium-137, and lead. Activities at TSF-05 are classified as past, present, and proposed **CW and HW tasks** performed by LOW: <11 workers at the TAN. ⁽¹⁵⁹⁾ The groundwater treatment facility began pumping and treating contaminated groundwater in March 1994 and is expected to continue until 2006. In 1998, a bioremediation field test for contaminated groundwater began. ⁽¹⁶⁰⁾ The test will continue for at least one year. Regulatory drivers associated with this activity include FFACO, RCRA, and CERCLA.

Test Reactor Area Environmental Restoration Profile:

Sources of mixed contamination at the Test Reactor Area (TRA) include waste disposal ponds, storage tanks and sewage lagoons. Waste disposal ponds have contaminated groundwater beneath the TRA. Major contaminants of concern include polychlorinated biphenyls (PCBs), metals, and organics. Cleanup of eight remaining TRA contaminated sites began in 1999. Cleanup actions will consist of covering contaminated soil at three sites, excavating and disposing of contaminated soil at one site and implementing institutional controls and monitoring at all eight sites. Clean-up completion is expected by the completion of this report.

Activity 13: Operable Unit 2-10 and 2-13: TRA-03B Warm Waste Pond Containment, Excavation, and Monitoring

The TRA-03B Warm Waste Pond is composed of three wastewater infiltration / evaporation ponds that received, over a course of 40 years, mixed waste including reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange columns. Personnel at the Warm Waste Pond will execute the methods necessary for onsite physical separation and containment of large and fine-grained materials. The actions will consist of covering contaminated soils in the area, excavating and disposing contaminated soil, implementing institutional controls such as spraying surfactant to control dust, and monitoring.

Contaminants of concern include hexavalent chromium, cesium-137, and cobalt-60. Activities at TRA-03B are classified as past, present, and proposed **CW and HW tasks** performed by MED: 11-75 workers. As reported by a site contact, 17 personnel engaged in about 8,000 man hours during the project. ⁽¹⁶¹⁾ Remedial action at the Warm Waste Pond occurred in June of 1994. Monitoring of this site will continue indefinitely. Regulatory drivers associated with this activity include FFACO and CERCLA.

Idaho Nuclear Technology and Engineering Center Environmental Restoration Profile:

Sources of mixed contamination at the Idaho Nuclear Technology and Engineering Center (INTEC) include the underground tank farm, an injection well (sealed in 1989 and contaminating groundwater), soils beneath buildings, and waste disposal ponds. Major contaminants on concern include metals, organics and nitrates. Ninety five sites of known or suspected contaminant release are at the INTEC. These were evaluated in the comprehensive investigation and Proposed Plan issued in October 1998. The Proposed Plan identified 44 sites requiring cleanup.

Activity 14: Operable Unit 3-13: CPP-69 Abandoned Liquid Radioactive Waste Tank Remediation

This Hot Waste Tank System, taken out of service in March 1977, consists of an abandoned radioactive liquid waste storage tank containing approximately 400 gallons of liquid and 55 gallons of sludge. A preliminary investigation conducted in 1984 indicated that the tank liquid and sludge contained elevated levels of Cs-137, Cs-134, Co-60, Sr-90 and isotopes of europium, plutonium, and uranium. Previous spills within the tank vault and pump pit contained similar contaminants.

Personnel will continue to implement institution controls at this waste site including security, access restrictions, site inspections, environmental monitoring, and general maintenance, however, the preferred clean-up method includes removal of the tank system, treatment of tank liquid, and disposal. Tasks will include: 1) removal of tank liquid and treatment at the PEW evaporator, 2) filling the tank and associated structures with concrete or grout to solidify and stabilize remaining contaminants, 3) drumming and disposing the sludge at a suitable engineered disposal facility, 4) excavating, removing, and disposing remaining components of the tank system, and 5) backfilling the excavation to grade with clean soils.

This clean-up proposal is classified as a present and proposed CW tasks performed by MED: 11-75 workers at the INTEC. These activities will begin pending the Record of Decision expected to be issued by completion of this report. Regulatory drivers associated with this activity include FFACO and CERCLA.

Central Facilities Area Environmental Restoration Profile:

Sources of mixed contamination at the Central Facilities Area (CFA) include landfills, a waste disposal pond, a wastewater drain field and underground storage tanks. Contaminants of concern include metals and nitrates. In 1998, a comprehensive investigation for CFA was completed. It identified 3 sites requiring cleanup and nitrate contamination exceeding drinking water standards. A Proposed Plan for the interim action is scheduled for release in August 1999.

Activity 15: Operable Unit 4-12: CFA-02 and 03 Landfill II and III Investigation, Sampling, Action, and Monitoring

Landfills II and III and CFA were used until 1984 to dispose of INEEL site construction related wastes, trash and sweepings, cafeteria garbage, wood and scrap lumber, masonry / concrete, weeds, grass, dirt, gravel, asphalt, asbestos, oil sludge, solvents, paint, paint thinner, and chemicals. In 1993, employees conducted the following activities 1) soil cover investigations and surveys, 2) shallow soil gas surveys, 3) borehole soil gas surveys, 4) well investigation of 27 Snake River Plain Aquifer monitoring wells, 5) groundwater sampling of 10 Snake River Plain Aquifer monitoring wells, and 6) soil sampling of seven boreholes in Landfill II.

Sampling showed the presence of the following COCs at the CFA landfills: volatile and semi-volatile organic compounds, methane, asbestos, and bis (2-ethylexyl) phthalate. In 1997, personnel placed a uniform native soil cover over the landfills using heavy equipment. Currently, institutional controls (such as administrative controls and the use of fences) are used for maintenance and monitoring purposes. Additional soil cover will be laid for routine maintenance measures.

Activities at the CFA landfills are classified as past, present, and proposed **HW tasks** performed by MED: 11-75 workers per task. ⁽¹⁶²⁾ On going monitoring will continue beyond 2006. Associated regulatory drivers include CERCLA, RCRA, and FFAO.

Power Burst Facility / Auxiliary Reactor Area Environmental Restoration Profile:

Sources of mixed contamination at the Power Burst Facility and Auxiliary Reactor Area include underground tanks, hot cells, waste disposal ponds, a sewage system and buried reactor debris. Contaminants include heavy metals, radionuclides and organic chemicals including PCBs. In 1998, a comprehensive investigation for the Power Burst Facility/Auxiliary Reactor Area was completed. A Proposed Plan summarizing the investigation was issued in May 1999. The Record of Decision is scheduled to be issued in late 1999.

Activity 16: Operable Unit 5-05: ARA-06 ARA-II SL-1 Burial Ground Containment and Monitoring

The ARA-06 site consists of radioactive debris, soil, and gravel from the 1961 SL-1 Reactor accident and cleanup. (Refer to Section 4.3 for a detailed description of the SL-1 accident.) In 1996, personnel at the site 1) sampled inside the SL-1 Burial Ground perimeter fence, 2) consolidated contaminated soils over pits and trenches before placement of a barrier, 3) placed a barrier using heavy equipment consisting of a biotic barrier (cobble and pea gravel) and a human intrusion barrier (basalt boulders), and 4) erected a chain link fence.

The major contaminant of concern at ARA-06 is Cs-137. Remediation activities performed by personnel (Parsons subcontractor personnel) at ARA-06 are classified as past **CW tasks** performed by MED: 11-75 workers.⁽¹⁶²⁾ Although remedial action has occurred, this site is included in the WAG 5 proposed plan. The record of decision is scheduled for late 1999. On-going maintenance and monitoring activities will occur through 2006. Associated regulatory drivers include CERCLA and FFACO.

Experimental Breeder Reactor-I (EBR-I) / Boiling Water Reactor Experiment (BORAX) Environmental Restoration Profile:

No operations other than monitoring currently take place in this area. The comprehensive investigation for this area has been combined with the Miscellaneous Sites and Snake River Plain Aquifer (WAG 10) comprehensive investigation. Therefore, the following activity is currently managed through WAG 10. Refer to the list of Site wide Area (WAG 10) waste sites located in Appendix I for further information (i.e. status and current activities) on WAG 06 and INEEL site wide waste sites.

Activity 17: Operable Unit 6-02: BORAX-02 BORAX-I Burial Ground Remediation

The BORAX-I reactor was a small experimental reactor used in 1953 and 1954. The reactor was destroyed after completion of it's mission. Destruction methods led to surface contamination. Personnel later collected the radioactive debris, consolidated it in the below ground foundation of the former reactor, and buried it using heavy equipment using approx. five feet of soil. Surrounding the buried reactor, a 84,000 square foot area of radiologically contaminated surface soil was covered with approximately 6 inches of gravel to reduce radiation levels at ground surface. It is not documented when these remediation activities occurred.

Major contaminants of concern associated with this site include cesium-137, cobalt-60 and U-235. Approximately MED: 11-75 personnel worked to perform remedial action on this site.⁽¹⁶²⁾ Tasks are classified as past **CW tasks**. Associated regulatory drivers include CERCLA and FFACO.

Radioactive Waste Management Complex Environmental Restoration Profile:

The main sources of mixed contamination at the RWMC are subsurface disposal areas (20 pits, 58 trenches, and 21 soil vault rows). Groundwater beneath the RWMC has been contaminated with solvents leaking from organic waste. Major COCs include organic chemicals, nitrate salts, metals and radionuclides such as cesium, uranium, and plutonium. An ongoing comprehensive investigation is scheduled for completion in 2002. Following the period of public comment, the Record of Decision is scheduled to be issued in 2003.

Activity 18: Operable Unit 7-10: RWMC-04 Pit 9 Process Demonstration Remediation

Pit 9 is located in the northeast corner of the Subsurface Disposal Area (SDA) at the RWMC and cannot be easily distinguished from the surface since soil was placed over the pit. The inventory of wastes buried within Pit 9 was estimated from shipping records and the Radioactive Waste Management Information System (RWMIS). The waste buried at Pit 9 is primarily TRU waste generated from the Rocky Flats Environmental Technology Site (RFETS) and additional wastes (LLRW) from waste generators located at INEEL. The waste consists of drums of sludge, solid waste, and cardboard boxes containing empty contaminated drums. Personnel at Pit 9 initially conduct exploratory surveying and analysis, core drilling to obtain waste samples (using a drill rig), characterization of samples, and bench-scale treatability studies of the samples. Full-scale remediation would occur after 2003.

Contaminants of concern at Pit 9 include TRU mixed wastes containing americium, thorium, yttrium, barium, cesium, strontium, uranium, plutonium, cobalt, beryllium, asbestos, tetrachloroethylene, trichloroethane, calcium silicate, carbon tetrachloride, mercury, potassium / sodium nitrate, lithium, lead and zirconium. Pit 9 activities are classified as present and proposed **CW and HW tasks** conducted by LOW: <11 workers. The crew consists of a Field Team Leader, Drill Operator, two Drill Helpers, an RCT, an IH, and two Equipment Operators.⁽¹⁶³⁾ In 1998, a subcontract tasked to complete contingency plans at Pit 9 was terminated. Remediation of Pit 9 will continue through 2006. Associated regulatory drivers include CERCLA, RCRA, and FFAO.

Naval Reactors Facility Environmental Restoration Profile:

Sources of mixed contamination include tile drainfields and waste disposal basins. During 1998, monitoring and maintenance continued at three landfills that were contained with engineered covers in 1996. This work consisted of maintaining the landfill covers and monitoring groundwater contamination beneath the site. A Record of Decision for the comprehensive investigation of the Naval Reactors Facility was signed in September 1998. It addressed 64 remaining sites, of which 9 require cleanup. Cleanup work at these sites, which will include excavation and disposal of contaminated soil and construction of engineered covers, is scheduled to begin in late Summer 1999.

Activity 19: Operable Unit 8-08: NRF-17 S1W Retention Basin Remediation

The retention basins are concrete basins partially below the surface that previously collected radioactive waste water from various facilities at NRF. Release of the water occurred onto sites NRF-11, NRF-12, and NRF-14. The basins have leaked approximately 33,000 gallons of radioactive water on one occasion. Soil sampling will occur after the basins have been removed. Remedial action tasks will include decontamination, dismantlement, and removal of the basins. The area will then be backfilled with soil.

Contaminants of concern associated with NRF-17 include cesium-137 and strontium-90. Remediation activities associated with NRF-17 are classified as present and proposed **De and CW tasks** performed by MED: 11-75 workers (estimated and not verified by a site contact). (Workers performing NRF site remediation are employees of Westinghouse Electric Corporation) Associated regulatory drivers include the FFACO and CERCLA.

Argonne National Laboratory West Environmental Restoration Profile:

Sources of mixed contamination at Argonne National Laboratory West (ANL-W) include an industrial waste pond and industrial waste ditches, sanitary sewage lagoons and a storm water canal. In September 1998, the Record of Decision for ANL-W identified five sites requiring cleanup and phytoremediation as the preferred method for removing contaminants from the soil at these sites. Phytoremediation began at ANL-W in May 1999 and will be used at five waste sites. ⁽⁴⁷⁾

Activity 20: Phytoremediation at ANL-W Selected Waste Sites

Phytoremediation uses selected plants to extract radionuclides and heavy metals (mixed contamination) from surface soils and water. Personnel at ANL-W (personnel may include ANL-W labor or INEEL contractors as backup support) will 1) plant and harvest selected plants at various ANL-W waste sites (i.e. ANL-01 Industrial Waste Pond and Ditches where contaminants of concern include cesium-137, chromium, mercury, selenium, silver, and zinc), 2) sample, package and transport harvested plants to an incinerator, and 3) transport the incinerated wastes to a landfill for final disposal. ^(164, 165)

Phytoremediation activities are classified as present and proposed **CW and HW tasks** performed by LOW: <11 workers at ANL-W. ⁽¹⁶⁶⁾ ANL-W planted a crop of selected plants in the Spring of 1999. The plants were harvested in the late summer of 1999. ⁽¹⁶⁵⁾ *It is anticipated that phytoremediation will remove contaminants to acceptable levels after five field seasons.* ^(164: P.16) *If phytoremediation is unsuccessful after two years of fieldwork, ANL-W will hire a contractor to use heavy equipment to scoop up contaminated soil and remove it to an acceptable disposal facility.* ⁽¹⁶⁵⁾ Associated regulatory drivers include the FFACO, RCRA, and CERCLA.

Miscellaneous Sites and Snake River Plain Aquifer Environmental Restoration Profile:

WAG 10 includes miscellaneous sites at INEEL that are not associated with the other nine areas by location or function (Refer to Activity 16 as an example site wide activity). *The boundaries of WAG 10 are the INEEL boundaries or beyond, as necessary, to encompass actual or potential impact from the INEEL's activities.* WAG 10 includes the Eastern Snake River Plain Aquifer and WAG 06 (Experimental Breeder Reactor-I/Boiling Water Reactor Experiment). Sources of mixed contamination include a chemical disposal area, a leach pond, and a former U.S. Navy ordnance testing area. ⁽⁴⁷⁾

During 1998, an ordnance removal action was completed. The comprehensive investigation began in early 1999 with the Record of Decision scheduled for completion in 2002. A separate investigation into sitewide groundwater contamination is scheduled to begin in April 2002. Following a period of public comment, the Record of Decision is scheduled for 2004.

10.4 INEEL's Deactivation, Decontamination, and Dismantlement Project

The Office of Nuclear Material and Facility Stabilization (EM-60) is the Landlord Secretarial Office (SO) at INEEL and is responsible for all common-use buildings and structures in addition to most INEEL land. When the mission of an operating building or structure ends, the current SO owner may determine the building or structure to be 'excess' and request that it be transferred to EM-60 for deactivation or reuse. INEEL deactivation includes removal of SNF (managed under the INEEL Spent Nuclear Fuel Program: refer to Section 10.2 on page 112), draining and/or deenergizing nonessential systems, and removal of stored radioactive and hazardous materials. EM-60 deactivates contaminated buildings and structures to reduce the risk and cost of surveillance and maintenance, and then manages them with minimal surveillance and maintenance until a new owner is found or until scheduling and funding allow transfer to the Office of Environmental Restoration (EM-40) for Decontamination and Dismantlement (D&D). Determination of whether a building or structure will be converted to another use or transferred to EM-40 for D&D depends on the building's level of contamination, age, and other uses or needs identified for the building or structure. The INEEL Excess Facility Action Plan and the INEEL Comprehensive Facility and Land Use Plan identify present and proposed deactivation and demolition projects. These projects are listed in Exhibits 12.19 and 12.20 on pages 248 through 277, respectively.

The INEEL Decontamination and Dismantlement (D&D) Program, directed by EM-40, was established in late 1977 and is still active. Of the original 45 surplus contaminated facilities originally identified, 27 have been decommissioned as of January 1999. In the last four years the D&D Program has demolished over 100 buildings and structures. There are currently over 200 facilities planned to undergo some sort of D&D at the INEEL over the next ten years. ⁽¹⁶⁷⁾

The INEEL Deactivation, Decommissioning, and Dismantlement (D&D) Program currently involves DOE-ID facilities managed by LMITCO (Bechtel BWXT Idaho, LLC (BBWI) as of October 1999). The LMITCO D&D Program includes surplus facilities transferred to EM-40 located at TAN, TRA, ICPP, CFA, PBF, ARA, and RWMC. Areas of the INEEL excluded from this plan are the areas assigned to ANL-W and the NRF, operated by Westinghouse Electric Corporation (Bechtel Bettis as of October 1999). The INEEL D&D Program does interface with ANL-W and NRF D&D Programs to share technology and planning. ⁽¹⁶⁷⁾

This section provides detailed examples of INEEL Decontamination and Dismantlement projects. Comprehensive lists of facilities and structures included in EM-40 and EM-60 programs are located in Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects, Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL Comprehensive Facility and Land Use Plan, Exhibit 12.21: Priority Deactivation Projects Reported by the Excess Facility Action Plan as of June 1999, and Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999.

Remediation Worker Decontamination and Dismantlement Activities

Activity 21: Operable Unit 4-13: CFA-08 Sewage Treatment Plant Remediation and D&D

The CFA-08 Sewage Treatment Plant (STP) site consists of a pumphouse, auxiliary structures including clarifiers, trickle filters, digesters, septic tanks and drying beds. The STP was used to treat and dispose of CFA process wastewater from 1953 to 1995.

D&D and environmental restoration work was performed by a subcontractor under the direction of Parsons I&T. The STP was demolished using standard D&D techniques including a universal processor / excavator, hoisting and rigging equipment, frontend loader, and other equipment necessary to dismantle structures. General activities are described in Figure 10.4 A on page 133. ⁽¹⁶⁸⁾

Contaminants of concern at CFA-08 include radionuclides such as Am-241, Pu-238, Pu-239, U-234, U-235, U-238, Sr-90, Cs-134, Cs-137, Co-60, and Eu-152 and chemicals such as volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. ⁽¹⁶⁸⁾

Activities at CFA-08 are classified as present and proposed **Di, De, HW, and CW tasks** performed by MED: 11-75 workers (15 INEEL workers and 5 subcontract personnel) at CFA. ⁽¹⁶⁹⁾ D&D work is scheduled to end in October 1999. *The subcontractor(s) working with LMITCO safety, RCT, safety engineer, and IH will establish appropriate work zones. All excavation work will comply with the LMITCO Health and Safety Manual.* ^(170: P.1-12) According to LMITCO, *the subcontractor shall fence, barricade, and identify exclusion zones, lay down areas, contamination reduction zones (CRZs) etc. as directed by the IH and RCT (if radiological contamination is found) prior to commencing work.* ^(170: P.1-12) Associated regulatory drivers include CERCLA, RCRA, and the National Environmental Policy Act (NEPA).

Figure 10.4 A: Work Scope for CFA STP Decommissioning and Dismantlement Project

-
- 1) Asbestos sampling
 - 2) Perform preliminary radiological surveys and hazardous material sampling
 - 3) Isolate all utilities
 - 4) Establish temporary electrical power for the site trailer
 - 5) Treat buildings for Hanta Virus
 - 6) Excess any equipment and materials currently stored in the facilities
 - 7) Remove all asbestos-containing materials as required by company procedures
 - 8) Remove lights
 - 9) Remove interior mechanical, electrical, fire protection, heating and ventilating systems, and accessible process pipes, tanks, pumps, and instruments
 - 10) Remove all underground pipes and conduits, only 3ft maximum of contaminated soil around any pipe or structure
 - 11) Perform soil sampling
 - 12) Demolish all structures including all foundations, only 3ft maximum of soils around any piping structures
 - 13) Excess materials at the INEEL excess yard, and recycle or dispose of materials
 - 14) Demolish all site concrete and asphalt
 - 15) Remove utility poles
 - 16) Backfill and regrade to match surrounding topography using existing gravel and top soil fill
 - 17) Perform any closure sampling
 - 18) Reseed area with native plants
-

ARA-III Facility Profile: ⁽¹⁷¹⁾

The ARA-III facility was initially constructed in 1956 for development and experimental testing of an Army Gas-Cooled Reactor (AGCR). The site was originally called the Gas-Cooled Reactor Experiment Facility (GCRE). The goal of the first Gas-Cooled Reactor Experiment (GCRE) program was the test operation for a development model of an AGCR, contributing to large quantities of radioactive liquid waste containing low levels of contamination. Later, the revised goal was actual demonstration of a prototype plant called the Mobile Low-Power plant (ML-1). The reactor was shutdown in 1961 because of a leak in the stainless heating tubes. The GCRE was then deactivated. The ML-1 was set up for testing in 1964 until several additional leaks halted testing. Reactor test programs were conducted at ARA-III until 1965. Since 1966, the facility has been used as a component and instrumentation laboratory for testing and evaluating items used in nuclear reactor experiments. No known contamination has spread from these experiments.

Activity 22: ARA III Decontamination and Dismantlement

The ARA III D&D project consisted of the D&D of the following: the ARA-608 Reactor Building, ARA-612 Pumphouse, ARA-708 Storage Tank, ARA-714 Process Stack, ARA-735 HLW Storage Tank, ARA-736 LLW Storage Tank, and the ARA-715 Ventilation Stack.

D&D operations and waste disposal activities included: 1) site preparation through asbestos removal and radiation surveys, 2) removal of ventilation stacks using sectioning techniques for hauling on a flatbed trailer to excess and a bulldozer to remove the stack's concrete foundations, guidewire anchors, and backfill the pits, 3) removal of tanks through excavating the surrounding berm and stockpiling (*The top of ARA-708 was first removed with a mechanical nibbler. A pressure piston was found inside ARA-708; it was cut and removed. The tank top was sectioned with a hydraulic shear, surveyed, and excessed. Radiological contamination was identified in the tank, removed, and boxed for shipment to RWMC. The remainder of the tank was then sectioned with the nibbler, sized further with the shear, and excessed.*), 4) removal of contaminated underground piping, 5) survey and backfill of trenches, 6) removal of radiological contamination by spot decontamination techniques that included scabbling, hand wiping and the use of hand tools, 7) removal of a heater through lifting (*The lift was conducted by utilizing a crane subcontractor in conjunction with an INEEL crane operator to perform a double lift. The heater was picked from the building with both cranes, rotated, and set.*), 8) installation of a new roof over the heater pit, 9) dismantlement of entire structures including roofs, walls, slab on grade, and foundation, and 10) post D&D activities including characterization and backfill.

Contaminants of concern during operations included mixed hazards including Co-60, Ag-108, Cs-137, and asbestos. Activities at ARA III are classified as past **Di, De, CW, and HW tasks** performed by MED: 11-75 workers (approximately 20).⁽¹⁶⁹⁾ D&D activities began in November 1992 and was completed in September 1994. Final clean-up occurred in 1997. Regulatory drivers associated with these tasks include CERCLA, and RCRA.

Waste Management Office Building 601/601A (WMO-601/601A) and Argonne Experimental Facility 603 (AEF-603) Facility Profiles:

The WMO-601/601A and AEF-603 facilities were located approximately 6 miles southwest of CFA. WMO-601/601A was constructed in 1954 and was used to house the Zero Power Reactor (ZPR-III). WMO-601A was added later for more office space for the Radioactive Waste Management Complex (RWMC). A 1974 D&D project decontaminated the ZPR-III reactor and merged this equipment with the EBR-I historical display, the INEL then converted WMO to storage. AEF-603 was constructed in 1952 and was used to house the control building for the Boiling Water Reactor Experiment (BORAX). By 1994 the buildings had exceeded their useful life. The buildings were restricted for personnel access which led to its selection for D&D in 1995.

Activity 23: WMO-601/601A and AEF-603 D&D

The following D&D and waste disposal activities occurred at WMO-601/601A and AEF-603 from March to October 1995:

Task 23A: Site Preparation

All utilities were verified as disconnected or isolated. Phone lines were rerouted to EBR-I and the D&D office trailer. Power for the office trailer was rerouted and connected. The buildings were remediated for hanta-virus. All openings were sealed and a negative pressure system was created using negative air machines with HEPA filters so the asbestos could be removed from the interior without spreading asbestos particles outside of the buildings.

Task 23B: Remove and Dispose Hazardous/Radioactive Materials

All identified asbestos was removed from the windows, walls, piping, boiler, boiler room ceiling, and roofing. Further asbestos abatement was accomplished in conjunction with dismantlement of the interior structure. This is explained in Task 23D.

All radioactive contamination was removed from the highbay floor, and heating and ventilating system. Roof trusses and a crane were removed/sized and placed in rad waste boxes for disposal at RWMC. The septic systems contents were pumped through a filter press to remove all the liquids. The sludge, leftover from the filter press was placed in rad waste boxes for disposal at RWMC. The liquid was sampled with the results indicating free of radiation and releasable.

Task 23C: Remove and Dispose Equipment and Interior Systems

All equipment was disposed of at the CFA landfill or recycled by hauling the items to the CFA Excess Yard. Each item of equipment going to the CFA landfill or recycle center were surveyed and a release tag attached to certify that the item was not contaminated. Known equipment includes highbay doors and motors, 5-ton bridge crane, a boiler, boiler gasoline tank, doors, cabinets, air conditioning and ventilation equipment, and an auxiliary diesel generator. All interior mechanical, electric, lighting, and heating and ventilation systems were surveyed, decontaminated, and removed before demolition.

During the remediation of the Argonne Fast Source Reactor (AFSR) foundation, an underground storage tank was uncovered. This was a 1,000 gallon fuel oil tank with approximately 20 gallons of fuel oil in it. The tank was the old heating oil supply tank for the AFSR structure. The liquid was sampled with the results verifying fuel oil that could be recycled. The liquid was recycled and the tank cut down and properly disposed of.

Task 23D: Dismantle and Dispose Main Structure

All Asbestos Containing Material (ACM) was removed, packaged, and then disposed of at the CFA landfill.

Following release of the building, the following general tasks were performed:

- 1) Equipment was removed for excess, recycle, and salvage.
- 2) The NaK pump barrel was removed from the highbay and placed in a D&D metal bin for outside storage
- 3) Interior/architectural items were removed.
- 4) The building was demolished and then processed through the concrete crusher for fill material at WMO. The demolition was specified in the work order procedures, the hydraulic universal processor was used to dismantle the structure, the rubble was stock piled using a front-end loader. All rubble was surveyed by the RCT to verify that no radiative contamination existed above releasable levels.
- 5) All low density concrete and cinder block was processed by the concrete crusher. The high density concrete was hauled to the CFA landfill.
- 6) The concrete floor and foundation was removed and disposed of using a bull dozer, excavator, front-end loader, and dump trucks. During removal of the concrete floor sections containing floor drains and trenches, radiological surveys were performed to verify that the bottom side of the concrete was not contaminated. All contamination above releasable levels was placed in rad boxes for disposal at the RWMC. All noncontaminated low density concrete was run through the crusher and use as fill material, all high density concrete was hauled to the CFA landfill.
- 7) The underground piping, septic systems, tanks, and activated concrete shielding was excavated, radiologically surveyed, sectioned, and appropriately disposed of.
- 8) The area was backfilled with crushed concrete, then top soil was brought in and the area prepared for seeding and finally seeded with native grasses and herbs.

During excavation, the removed soil was monitored for radioactivity, all soil 100 cpm or more above background (beta-gamma) was analyzed for hazardous constituents in accordance with the integrated planning sheets. The analyses showed no mixed waste, the contaminated soil was placed in containers and shipped to the RWMC.

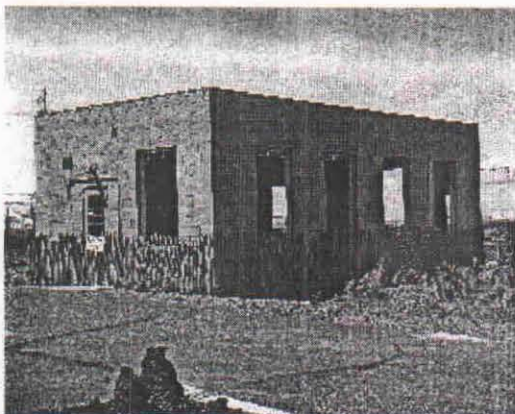
Task 23E: Post-D&D Activities

The post dismantlement characterization of WMO-601/601A and AEF-603 consisted primarily of radiation measurements performed on trenches and berms of soil formed during excavation, as well as the entire site following back filling, grading and seeding. Since no chemical hazards were present at the site, no chemical sampling was performed.

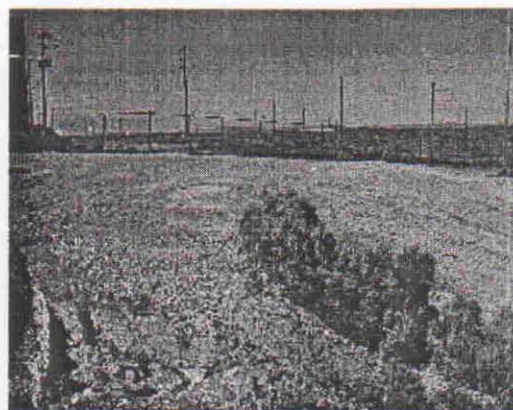
Contaminants of concern associated with the D&D of the WMO-601/601A and AEF-603 facilities include the following radioisotopes: Pu-238, Pu-239, Th-228, Th-230, Th-232, U-234, U-235, and U-238 located within associated sewer tank sludge and crust. Chemical hazards includes asbestos and Asbestos Containing Material (ACM).

The above tasks are classified as past **Di, De, CW, and HW** tasks performed by MED: 11-75 workers (approximately 20 workers plus 3 subcontract personnel) at the WMO-601/601A and AEF-603 site.⁽¹⁶⁹⁾ Associated regulatory drivers include CERCLA, RCRA, and the Asbestos Hazard Emergency Response Act. The following Figure presents before and after photographs of the project.

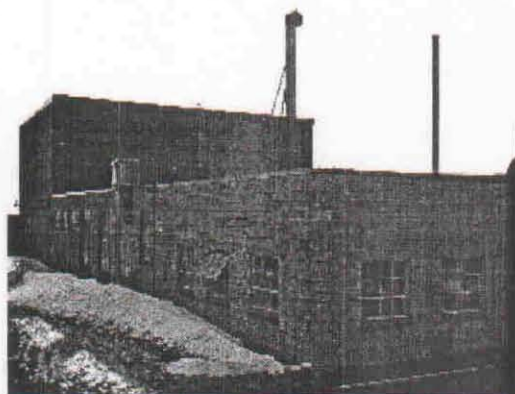
Figure 10.4 B: WMO-601/601A and AEF-603 D&D Before and After Photographs Available via the INEEL D&D Homepage



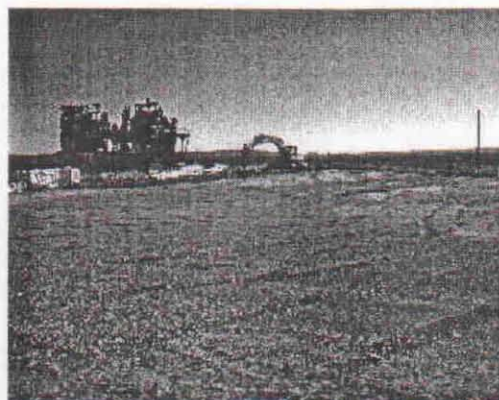
AEF-603, BORAX IV Control Building, prior to D&D.



Project complete.



WMO-601/601A, Waste Management Office and Addition, prior to D&D.



Project complete.

Activity 24: Decommissioning and Decontamination of the Central Liquid Processing Area and Hot Tank Rooms at ANL-W

The Central Liquid Processing Area (CLPA) was constructed in 1959 to support operations at the ANL-W Analytical Laboratory. This system received, stored, and concentrated radioactive liquid waste from the ANL-W Analytical Laboratory and from other facilities on site. The Hot Tank Rooms contained two hot tanks for collection of liquids drained from the Laboratory Hot Cells located on the main floor of the building. The drainage system was used only once during 1963 to 1964 to drain approximately a quart of radioactive liquid from the hot cells.

Personnel at ANL-W trained Merrick and Radian International personnel for the project. Specific training classes included Radiation Worker II, respirator, General Employee training, Lockout/Tagout, Confined Space, General Lead and Asbestos training, Crane Operator Training, Analytical Lab Facility Specific Training, and Chemical Hygiene Training. ALARA review was also held.

Radian and Merrick personnel performed the following activities in order to prepare the CLPA and Hot Tank Areas for use and occupancy. Personnel removed major components from the main floor and basement, installed a lifting frame to remove the tanks in the basement area, removed cooling water lines on main floor, handled and removed wastes, decontaminated the main floor and basement, and painted decontaminated areas.

Contaminants of concern associated with the above D&D project at ANL-W include LLRW (nonprocessable, combustible, compactible), TRU mixed waste (HEPA filter from Hot Cell Transfer System), hydraulic oil, and LLMW (hazardous / expired chemicals). *Although both Merrick and Radian submitted moderately high estimated total doses for the project (13.4 person-rem and 18.5 person-rem, respectively), the actual total dose attributed to the project was significantly lower. ANL-W reported 19 Radian employees and 2 ANL-W HPTs had a total dose of 2.73 person-rem. The maximally exposed individual received 466 mrem. Average exposure was 130 mrem per person. Five personnel were contaminated at different times during the job of which only one was reportable to DOE. Maximum personnel contamination was 6,700 dpm beta-gamma and the maximum non-uniform skin dose that resulted from personnel contamination was 3.9 mRad.* ⁽¹⁷²⁾

The above tasks are classified as past **De tasks** performed by MED: 11-75 workers (approximately 21 workers at all times) at ANL-W. Associated regulatory drivers include CERCLA, and RCRA.

11.0 Identification of Past, Present, and Future Remediation Worker Task Technologies at the INEEL Site

11.1 Introduction

Technology management at INEEL is an important component in facilitating clean-up goals at the site. Coordination and advancement of technological developments and demonstrations are needed to address and solve specific environmental needs. Technology management works to improve the site-wide baseline technologies with other players involved in project direction, sub-contractor operations, Argonne National Laboratory-West (ANL-W), site planning, and integration. It also provides identification, acquisition, and dissemination of technology applications. Technologies are developed from both the private and public sectors, and are centered on the following focus areas: 1) Subsurface Contaminants, 2) Decontamination & Decommissioning (D&D), 3) Mixed Waste Characterization, Treatment, and Disposal, and 4) Spent Nuclear Fuels.

Selected INEEL technologies in this section and Table 13.3: Past, Present, and Future Remediation Worker Technologies at INEEL on pages 299 through 316 are grouped according to remediation worker task (i.e. CW, HW, De, and Di Task). Thirty-three technologies were selected according to one or more of the following: 1) the technology indicated potential hazards to the remediation worker, 2) the technology was highly publicized at the site, or 3) the technology provided insight into remediation worker activities at the site. Each selected technology is: 1) described according to INEEL site technology needs, current practices and technical description, 2) categorized according to the number of workers using the technology related to a given task (i.e.: LOW: <11, MED: 11-75, HIGH: >75), and 3) described as either deployed/past/present (already approved and routinely used at the site) or demonstrated/proposed (approved for testing purposes but not yet approved for routine use). Also included in the description are the advantages and disadvantages of each technology, with emphasis on the benefits and hazards to site workers utilizing the technology.

A comprehensive list of INEEL technologies is presented in Exhibit 12.23: All Past, Present, and Future Remediation Worker Technologies Deployed and/or Demonstrated at the INEEL Site on pages 284 through 287. The technologies in this exhibit were selected from the following sources: 1) the Focus Area Technology Summaries collectively called the Rainbow Series ^(173, 174, 175, 176, 177, 178, 179), 2) the INEEL Site Technology Coordination Group (STCG) website [<http://www.inel.gov/environment/stcg/>], and 3) the Office of Science and Technology, Technology Management System website [<http://ost.em.doe.gov/>]

DOE recognized that technological limitation would impede progress. In 1989, DOE's Office of Environmental Management (EM) established the Office of Technology Development, which is now called the Office of Science and Technology (OST). This office manages and directs targeted basic research and focused, solution-oriented technology development programs. OST appointed a team at INEEL known as the Site Technology Coordination Group (STCG) to list primary technology needs. The INEEL STCG works directly with existing organizational structures and is designed to enhance and modify the existing structures as needed to meet INEEL EM technology requirements.

11.2 CW Task Technologies

Technology 1: Excel Modular Scaffold ^(180, 181, 182, 183)

Scaffolding is a necessary tool in Decontamination and Decommissioning (D&D) for performing work in areas which are not accessible to a person on the ground. Tube and clamp scaffolding was commonly used by laborers at INEEL, but was time-consuming and labor-intensive to erect. The Excel Modular Scaffold is a components system, developed in 1991, by Bartlett, Inc. of Plymouth, Massachusetts. This past/present D&D maintenance technology is a positive locking system scaffold which does not require the use of hand tools. Horizontal bearers are attached to cups on vertical supports by means of a spring-loaded, positive locking trigger mechanism. The number of workers associated with this technology falls within the LOW: <11 range (total 2 for set-up). ⁽¹⁸⁴⁾

Advantages to this technology include: **1)** more efficient operation (the scaffolding does not require any tools for set-up, allowing for a faster set-up and take-down time), and **2)** reduced exposure risk due to greater efficiency (less time in radiation areas: 15-20 minutes vs. almost 60-70 minutes for conventional scaffolding). Noted disadvantages include: **1)** in tight or confined areas, the spacing of the cups may make the scaffolding less versatile, and **2)** more difficult to decontaminate after use in asbestos areas because fibers settle in the cups.

This system has been demonstrated at numerous locations throughout the United States in the 90's. INEEL deployment occurred during non-radioactive maintenance activities for RCTs to survey SNF casks at Test Reactor Area (TRA) in August of 1998. It continues to be used for D&D maintenance activities at other INEEL areas. The Central Facilities Area (CFA) Sewage Treatment Plant (Building 691) used this technology for D&D in April of 1999.

Technology 2: Improved HEPA Filters-Flexible/Rigid Containment Barriers ^(185, 186)

This current LLRW treatment and characterization technology is being evaluated for use in packaging waste to ship to WIPP. Some radioactive waste forms are shipped in sealed 55-gallon drums that are fitted with High Efficiency Particulate Air (HEPA) drum vent filters in the lids to vent H₂ that might have been generated by radiolytic decomposition of hydrogenous materials. The amount of waste that can be shipped in each drum is severely limited unless the plastic barriers inside the drums are also vented. The filters must be adequate enough to prevent the buildup of the H₂ inside the drum from reaching an explosive level. The improved HEPA filter is a flexible sheet (polypropylene filter) that can be adapted to a wide variety of applications wherein the filters are flexibly bonded to a barrier material. They have many uses such as radioactive waste processing, HVAC filter change out, vapor or grit blasting, asbestos cleanup, etc. The flexible bag filters can be used to increase packaging efficiency inside the 55 gallon drums by increasing the hydrogen diffusivity across the internal packaging layers of the drums. They can also help eliminate air voids inside the sealed packages. The number of workers is dependent on and driven by the specific function and/or application the filters have upon its end purpose. ⁽¹⁸⁷⁾

Advantages to this technology include: 1) significant cost savings, 2) improved operational reliability and safety, 3) by venting gas, filters would help increase waste loading in drum by 20%, 4) total waste volume reduction, and 5) size and filtering capacity of the filters and barriers produced by this technology are easily modified to suit specific operational needs. One noted disadvantage is that the filter/barrier application needs to be tailored to the specific application in the same way that plastic bags are not all of the same materials and sizes. ⁽¹⁸⁷⁾

The HEPA filters technology was developed by INEEL for ANL-W waste transfer glove bags in 1993, and its demonstration (initial use) occurred at ANL-W in 1994. Deployment occurred at ANL-West's Hot Fuel Examination Facility (HFEF) Waste Characterization area in 1994, and the technology has been used at ANL-W since then at the TRU Waste Characterization Chamber Gloveboxes. The filters were used in conjunction with glove bags and glove boxes to drum out plutonium contaminated waste into 55-gallon drums.

Technology 3: In Situ Beta Detector ^(188, 189)

Conventional methods for subsurface sampling require drilling and core retrieval, and/or pumping and containerizing of groundwater. With these methods, there is typically less than 100% recovery of the core, so there are data gaps. Also, sampling groundwater may require deployment of pumps and containerizing potentially hazardous groundwater. The In Situ Beta Detector is an alternative to these conventional methods. This past/present characterization and retrieval technology is used to locate and quantify subsurface radionuclide contamination in the vadose zone and groundwater. Specifically, the analyses are gross beta, strontium-90 and uranium-238. In situ measurements allow the entire length of a borehole to be assessed for beta-emitting contamination. Also, the in situ measurements can be duplicated and repeated to help understand radionuclide migration. Conventional methods would require the drilling and coring of additional holes to determine the movement of contamination. The number of workers associated with this technology falls within the LOW: <11 range. ⁽¹⁹⁰⁾

Advantages of in situ measurements include: **1)** reduction or elimination of waste material generated with conventional sampling methods, **2)** reduced analytical costs, **3)** near real-time data analysis, and **4)** reduced exposure of personnel to potentially radioactive contamination. and **5)** repeat measurements along the entire length of the borehole. No disadvantages were documented for this technology.

Development of the In Situ Beta Detector occurred at the INEEL, Test Reactor Area (TRA) in 1995. In 1997, it was demonstrated at the Test Reactor Area (TRA) Perch Well and Test Area North (TAN) Injection Well. These demonstrations occurred 20 feet below water surface. The deployment of this technology also occurred in 1997 at the Auxiliary Reactor Area 1-Chemical Evaporation Pond, and again in 1998 at the Central Facilities Area (CFA) Drain Field.

Technology 4: In Situ Stabilization (Grouting) ^(191, 192, 193)

In Situ Stabilization, a current Mixed Waste (MW) treatment technology, was developed to encase contaminants in grout in order to prevent their escape into the surrounding environment. This past/present technology involves injecting a hardening agent into the area of environmental concern. It can be used on contaminated soils and buried debris, including materials containing hazardous, radioactive, and transuranic waste. Grout can halt migration of contaminants stored in shallow burial pits. It creates an area that is impervious to water migration. Grouting waste in place is considered either a permanent solution or a first step to safer and easier excavation. The number of workers associated with this technology falls within the LOW: <11 range (9 total production crew). ^(194, 195)

Advantages of this technology include: **1)** potential long-term stabilization of wastes (the system can immobilize contaminants without removal, decrease permeability, reduce leaching, and provide physical stabilization for improved cap performance, **2)** reduces risk and costs associated with waste removal (i.e. dust control), and **3)** barrier walls allow retrieval of specific hot spots from within a waste area and impede contaminant migration. No disadvantages was documented for this technology. ⁽¹⁹⁵⁾

The In Situ Stabilization grouting method was developed by the INEEL, Environmental Technologies Group between 1994-1995. INEEL completed field demonstrations from 1994 through 1997 at the Cold Test Pit (1994-1996) and the Acid Test Pit (1997). A CERCLA Treatability Study was completed in 1997 at an INEEL mixed waste site. Deployment occurred later that same year (1997) at the Subsurface Disposal Area Acid Pit.

Technology 5: Light Duty Utility Arm (LDUA) ^(196, 197, 198, 199)

Previous tank inspection technologies at INEEL consisted of “tool-on-a-stick” approaches, limiting direct assessment to surfaces and residues immediately below a limited number of tank access risers. An alternative to these approaches is the Light Duty Utility Arm (LDUA), a past/present characterization and retrieval technology. The LDUA is a mobile, multi-axis positioning-manipulator system that uses a robotic arm to deploy different sensors and light-duty waste analysis tools (referred to as end effectors) into hazardous environments such as tanks containing highly radioactive waste (HLW/Mixed Waste). It will be remotely operated and used for in situ examinations of underground waste storage tanks, allowing assessment of in-tank structures and sampling of residue within a 10 foot radius of the tank riser axis. The tools and sensors are deployed off-axis from a tank-access riser and can use existing openings in tank domes for entry. This system will evaluate structural integrity, characterize waste, and perform small-scale retrieval operations. The number of workers needed to operate this technology falls within the MEDIUM: 11-75 range (15 total for set-up and operation). ⁽²⁰⁰⁾

Advantages associated with this technology include: 1) remote operation of system reduces contamination and exposures to remediation workers and increases safety, and 2) allows on-demand analysis, thereby improving waste sample data. One noted disadvantage is that the LDUA system is expensive to implement.

SPAR Space Systems developed this technology. Four LDUA robotic systems were developed from 1994-1997 based on design specifications by INEEL (and other DOE sites). The system was demonstrated at the Idaho Nuclear Technology Engineering Center (INTEC) Fuel Processing Restoration Facility in 1998. The INEEL LDUA Robotic System was deployed for assessment of INTEC Tank WM-188 in February 1999.

Technology 6: Maverick (Petroleum Tank Inspection Device) ^(201, 202, 203, 204)

Maverick is a robotic tank inspection system for service in aboveground storage tanks. This past maintenance and retrieval technology is a robot “wall crawler” that can be submerged into chemicals or refined petroleum products to inspect the interior of the tanks without draining the tank. The robot is a remote-controlled, purged and pressurized inspection platform. It uses ultrasonic signals and an internal camera to map and correlate metal thickness data, and has an onboard video system to record inspections. Maverick can inspect tank wall integrity for any minor corrosion and test seams for signs of degraded welds. The number of workers needed for this technology falls within the LOW: <11 range (3 total). ⁽²⁰⁵⁾

An advantage to this technology is that the device is more efficient and cost effective than conventional methods. However, one noted disadvantage is that the robotic technology is not geared to inspect tanks with mixed wastes. ⁽²⁰⁵⁾

This technology was developed by INEEL’s Remote, Robotics and Automated Systems group from 1995-1997, and is licensed to Solex Environmental Systems of Houston, Texas. It has been demonstrated on numerous occasions at outside facilities (other than INEEL) between 1996 and 1998. It was deployed in 1998 for commercial utilization by Colonial Pipeline oil storage facilities in Atlanta, GA and Francisville, LA.

Technology 7: Transuranic Extraction/Strontium Extraction (TRUEX/SREX) ^(206, 207)

Approximately 1.8 million gallons of highly radioactive, acidic liquid waste (HLW/Mixed Waste) are stored at INEEL. The recommended method for treating this waste is to separate the radionuclides from the waste so that most of the waste, mainly inert materials, can be disposed of as low-level waste (LLRW). The transuranic extraction (TRUEX) and strontium extraction (SREX) systems have been developed to remove the strontium and transuranic elements from this waste. The TRUEX process uses a complexing agent solvent to pull transuranic elements away from inert materials in the waste. The SREX process is similar to TRUEX except it removes strontium. By removing these elements, the acidic waste can be disposed of as low-level waste (LLW). Without the TRUEX/SREX pre-treatment, all of the waste must be disposed of as high level waste (HLW). The number of workers associated with this technology falls within the MEDIUM: 11-75 range. ⁽²⁰⁸⁾

An advantage to this technology is that the treatment and disposal of low-level waste is less expensive than the treatment and disposal of high level waste. There were no disadvantages documented with this technology.

The complexing agents used in this process were developed by ANL's Chemical Separations Science Group. The TRUEX/SREX effort developed a flowsheet for simultaneous countercurrent solvent extraction of TRU elements (1996-1997) and radioactive strontium-90 (1997). TRUEX/SREX extractions were demonstrated using 2 inch centrifugal contactors and sodium-bearing wastes from INEEL Tank ICPP-183. Demonstrations were performed in a shielded hot cell in the INEEL Remote Analytical Laboratory. In 1996, tests demonstrated that TRUEX separation reduced the TRU activity in Tank 183 wastes one hundred times less than the NRC limit for non-TRU Class A LLW. Data from SREX demonstrations show that the process will be able to achieve the specified low-level waste criteria (0.04 curies per cubic meter).

Technology 8: Stored Waste Examination Pilot Plant (SWEPP) Technologies ^(209, 210, 211, 212, 213, 214, 215)

Remediation workers (primarily SWEPP operators) at INEEL's Radioactive Waste Management Complex's SWEPP facility utilize the following technology systems to measure waste drum content from Rocky Flats Plant and other DOE sites:

1) SWEPP Passive/active Neutron (PAN) Drum Assay System - This is a high sensitivity nondestructive assay system used to measure the transuranic waste content of 55-gallon waste drums. The system is capable of operating in both an active and passive mode. The unit provides information to measure Plutonium-239/240, thus estimating total plutonium mass. ⁽²⁰⁹⁾

2) Gamma Ray Spectrometer System (SGRS) - This is a high-resolution passive spectrometer system capable of performing nondestructive assays to identify very low activity levels of uranium and transuranic materials stored in 55-gallon waste drums. The system records gamma rays emitted from the drum, generates a gamma ray spectrum, and processes the resultant information. ⁽²¹⁰⁾

3) Real Time Radioscopic (RTR) System - This system allows an X-ray image of an object under examination to be displayed on a video monitor at the same time the examination takes place (in other words, "real time"). It provides the capability to identify and characterize radioactive or hazardous waste without breaching the 55-gallon drum and provides digital video recording capabilities. ⁽²¹¹⁾

4) Drum Vent System (DVS) - This system is designed to vent, install a filter, and collect a gas sample from 55-gallon drums containing TRU contaminated waste material. The gas sample is analyzed on-line for volatile organic compounds (VOCs) and hydrogen. The venting containment is designed to contain the release of any contamination and to contain an explosion in the unlikely event that a drum would explode during venting and filter insertion. DVS gathers the information on each drum analyzed and adds it to the Transuranic Reporting, Inventory, and Processing System (TRIPS) database. ⁽²¹²⁾

The number of SWEPP workers falls within the MEDIUM: 11-75 range. ⁽²¹⁶⁾

Advantages to these technologies include: **1)** systems provide required characterization data non-intrusively, thereby reducing the potential for contamination release to the environment, and **2)** reduces worker exposure due to non-intrusive examination. One noted disadvantage is that drum handling is not automated between systems and therefore requires that the drums be transported between systems using fork trucks. This increases the potential for drums to be dropped, thereby causing a potential contamination release to the environment. ⁽²¹⁶⁾

Technology 9: Gamma Spectroscopy Logging System (GSLS) (217, 218, 219, 220, 221, 222)

Historically, information regarding the vertical extent of contaminant migration through the vadose zone has been obtained through drilling and core retrieval, and/or pumping and containerizing of groundwater. The Gamma Spectroscopy Logging System (GSLS) is an alternative to these conventional methods. This current technology was developed to aid in routine monitoring and site characterization processes. Rather than collecting and preserving samples for laboratory monitoring, it made it possible to take the laboratory to the sample. It is a portable, self-contained field system equipped for logging any borehole with a 4.0 inch diameter or larger, and is capable of reaching a depth of approximately 760 feet below ground surface. It allows the entire length of the borehole to be assessed for gamma-emitting isotopes. The technique is based on high-resolution gamma spectroscopy with high-purity germanium detectors (HPGe) coupled to associated electronics and a personal computer. The software is specific for system control movements for the tool, data acquisition and analysis. The number of workers needed to operate this technology falls within the LOW: <11 range. ⁽¹⁹⁰⁾

Advantages associated with this technology include: **1)** allows repeat measurements in same well or bore hole, **2)** analytical costs are reduced (eliminates sample preparation, shipping, chain-of-custody and associated costs), **3)** increases accuracy through using near real time monitoring and results, and **4)** with no samples taken, exposure is eliminated and minimal waste is generated. One noted disadvantage of this technology is that there are maintenance costs associated with it.

GSLS was developed in part by Greenspan Inc. of Houston, Texas. This technology was demonstrated in 1994 as part of RWMC's Aquifer Pumping and Infiltration Test (APIT). Deployment occurred from 1996-1999 at three Test Area North (TAN) Technical Support Facility (TSF) wells.

Technology 10: Personal Ice Cooling System (PICS) Coolsuit ^(223, 224, 225, 226)

Many D&D activities are performed in hot weather and require personal protective equipment (PPE) for protection from contamination, but limits the body's ability to cool itself. Such conditions require cool-down breaks of 30 minutes or half of stay time. The Personal Ice Cooling System (PICS) Coolsuit is a self-contained core body temperature control system that uses ordinary ice as a coolant. A small battery-powered pump circulates chilled water from a bottle with ice through tubing incorporated into a durable full body garment. The adjustable pump allows the worker to control his own temperature based upon work load. Water is frozen in bottles that are worn outside/inside of anti-Cs in a sealed, insulated bag, with a circulating pump attached to a support harness system. The number of workers associated with the use of this current maintenance technology falls within the LOW: <11 range (1-2 total). However, workers may need help in donning/doffing the suit. ⁽²²⁷⁾

Advantages associated with this technology include: 1) increases stay times in contaminated work zones, 2) reduces cost as a result of longer stay times and fewer work stoppages, 3) decreases the number of PPEs used, and 4) ensures a safer body temperature. One noted disadvantage is that the backpack unit is worn outside of the suit, making it hard to keep the suit clean and decontaminated. ⁽²²⁷⁾

This technology was developed commercially by Delta Temax, Inc., of Canada. A large-scale demonstration was conducted at the Fernald DOE site at Building 68 during routine D&D work (August-September 1997). The system was deployed at the INEEL Test Area North (TAN) Preparation Facility in June 1999. Currently, 90 PICS cool suits are in use throughout numerous DOE facilities, of which INEEL will use 15-20 systems.

Technology 11: Internal Duct Characterization System (IDCS) ^(228, 229, 230, 231)

The ventilation duct work systems of contaminated facilities are likely to contain materials of concern and require proper characterization to complete DOE remediation efforts. Most of the duct work is inaccessible because it is buried underground, encased in concrete, or runs through hot cells. While remotely operated visual inspection systems are available, limitations occur in areas such as maneuverability and incorporation of characterization sensors. The Internal Duct Characterization System is a past/present remotely operated vehicle system that has the capability to maneuver through duct work systems as small as 6 inches in diameter, travel up to 250 feet through multiple fittings and branches, and visually inspect the interior condition of ducts. The system uses a color video camera, an integrated radiation sensor to characterize radiological contamination inside the duct work, and directional sensors necessary to produce as-built mapping of the duct work. The robot and tether are constructed to allow liquid decontamination upon retrieval. The number of workers needed to operate this technology falls within the LOW: <11 range.

Advantages to this technology include: 1) reduces costs of D&D activities by allowing duct work to be handled appropriately, rather than treating all work as contaminated, 2) reduces the amount of secondary waste generated since uncontaminated duct work will not need to be decontaminated, 3) reduces worker health risk by identifying contamination prior to exposure, and 4) increased maneuverability allows characterization of duct work that otherwise was not possible. No disadvantages were documented for this technology.

The IDCS was developed by Inukton Services, Ltd. in 1995, and demonstration and deployment took place later the same year. Demonstration occurred at the Oak Ridge National Laboratory Robotics Technology Assessment Facility, and deployment occurred at the INEEL Liquid Effluent Treatment and Disposal Facility.

Technology 12: Utilivac Vacuum Excavation System ^(232, 233, 234)

The INTEC Tank Farm needed to install 8-inch diameter anodes 20 feet below the surface. The Conventional method for digging holes at DOE facilities was to use standard large hole excavation methods. However, the soil is typically contaminated and unknown structures or lines could exist. The Utilivac Vacuum Excavation system is a current alternative HLW remediation technology used to dig very small diameter holes in soil. High pressure air is directed through an air lance nozzle to breakup soil, and a vacuum tube is used to retrieve the soil into a 55-gallon drum. The number of workers needed to operate this technology falls within the LOW: <11 range.

Advantages to this technology include: **1)** quicker than conventional methods (the activity was completed in one week compared to the anticipated two months using the standard excavation method), **2)** reduces radiological risk and waste generation due to the smaller amount of soil being excavated, **3)** reduces costs (\$237K for standard excavation vs. \$30K for Utilivac), and **4)** prevents damage to underground structures. No disadvantages were documented for this technology.

The Utilivac System was commercially developed by the Utiliscope Corporation of Glen Allen, VA. This technology was demonstrated and deployed at INEEL's INTEC high level waste (HLW) Tank Farm in November of 1998.

Technology 13: Crossflow Filtration ^(235, 236)

Underground storage tanks throughout DOE facilities are used to process and store hazardous and radioactive mixed waste. Collectively, these tanks hold over 90 million gallons of high-level (HLW) and low-level radioactive waste (LLRW) in the form of sludge, saltcake, and supernatant liquid. Solid-liquid separation technologies are required for a variety of these tank waste remediation activities to remove solids and sludges from liquids. Conventional dead-end filtration methods operate with the feed (slurry) flow in the same direction as the permeate flow. Crossflow filtration is a proposed solid-liquid separation technology which is an alternative to the conventional method. This method recirculates the slurry and thereby maintains a high velocity of flow parallel, or crossflow, to the media surface. This minimizes particle build-up on the filter. The number of workers associated with this technology falls within the LOW: <11 range.

Advantages to this technology include: **1)** can handle a wide-variety of waste types and concentrate slurries to very high solids content, **2)** can be operated continuously and maintained remotely (doesn't require frequent change-out), **3)** cost comparisons performed at Hanford estimated a \$268 million advantage over dead-end filtration, and **4)** significantly reduces the amount of caustic, water, and other chemicals necessary for pretreatment. There were no disadvantages documented with this technology.

This technology was developed by Savannah River Technical Center in 1995. Bench-scale demonstrations have occurred at various DOE sites including Oak Ridge National Laboratory (1996), Hanford (1996), and INTEC. A full-scale demonstration using actual waste occurred at Oak Ridge in 1998. This technology has yet to be deployed.

Technology 14: Reduced Access Characterization Subsystem (RACS) ^(237, 238, 239, 240)

Ongoing characterization at DOE facilities is being performed by having a radiation control technicians (RCT) manually monitor radiation levels with a hand-held instrument. While this method is effective for small, hard to reach areas, larger buildings (i.e. 300+ acre K-25 facility at ORNL) are better suited to automated floor characterization systems. The reduced access characterization system (RACS) is a proposed characterization technology to be used in areas where entry by a RCT is not acceptable. It consists of a robot (14.5" x 11.0" x 12.0") and a homing/repeater beacon, and uses ultrasonic sensors for wall following and homing activities, infrared sensors and bump sensors for collision avoidance, and a radiation detector for gathering data. The system is capable of getting within 1" of a wall. The number of workers needed to operate this technology falls within the LOW: <11 range.

Advantages to this technology include: 1) characterization in larger areas can be done more quickly than manual methods, 2) data obtained will be more detailed and accurate than manual methods and can be integrated into an overall facility map, and 3) removes RCTs from potentially hazardous areas and reduce worker exposure by identifying areas that pose risks. No disadvantages were documented for this technology.

The RACS technology was developed in 1995 by INEEL Remote, Robotic, and Automated Systems, in conjunction with IS Robotics. Demonstration occurred a year later in 1996 at the Oak Ridge National Laboratory Robotics and Process Systems Division. This technology has not yet been deployed.

Technology 15: Biodecontamination of Concrete ^(241, 242, 243, 244)

As an alternative to the current decontamination baseline technologies, current efforts are being focused on engineering and applying a system to provide bacteria and nutrients to concrete surfaces, thereby resulting in a safer and more cost efficient manner of decontaminating large concrete surfaces. Biodecontamination uses naturally occurring microbes to degrade concrete for removal of radionuclide surface material. It applies microbes and nutrients, maintains microbial activity, and removes surface material for waste disposal. This proposed LLRW treatment technology process is passive in that it essentially leaves the bacteria to actively degrade the cement matrix until the concrete surface material is loosened for easy removal to a desired depth. The process takes 6-18 months for completion, depending on depth and extent of contamination. The number of workers needed for this technology falls within the LOW: <11 range. ⁽²⁴⁵⁾

Advantages to this technology include: **1)** lower costs (estimated at 0.3% to 5.0% of costs for traditional physical methods), **2)** reduced waste volumes (production of secondary and mixed wastes is greatly reduced as well), **3)** reduced risk of environmental release, and **4)** reduced worker exposures. No disadvantages were documented for this technology.

A Biodecontamination of Concrete demonstration occurred in INEEL's EBR-I Subpile room in FY 1997. After 14 months, the EBR-I demonstration showed a removal of contaminants by the bacteria of up to 8 millimeters. This technology was also demonstrated on a warehouse concrete floor at the Central Facilities Area (CFA) Building 674B in FY 1998. It has yet to be deployed at INEEL.

Technology 16: Advanced Tensiometer ^(246, 247, 248, 249, 250)

Conventional tensiometers can measure soil/water potential, but maximum installation depths of about 7 meters and low accuracy have prevented its use in other disciplines. The new advanced tensiometer operates on the same principles as the conventional tensiometer. The device's ceramic cup is filled with water and placed in contact with soil or rock in the vadose zone. As the water is drawn from the cup into the soil, a vacuum forms in the cup. When the system reaches equilibrium, changes in the vacuum indicate changes in the soil moisture. A pressure transducer measures the partial vacuum, and a data logger records the measurement. Tensiometers are deployed by lowering them into a borehole and then bringing it into contact with the subsurface soil. Multiple instruments placed at various locations and depths assist hydrologists in estimating fluid movement between land surface and the water table. The advanced tensiometer has overcome the depth limitation of conventional tensiometers and is largely unaffected by changes in ambient temperatures. Installations can reach up to depths of 100 feet below land surface, with continuous operation of about 3 years. The number of workers associated with this technology falls within the LOW: <11 range (3 total).⁽²⁵¹⁾

Advantages of this technology include: **1)** deeper installations than conventional tensiometers (30 to 60 meters vs. approximately 7 meters), **2)** improved precision and stability due to protection from ambient weather changes, **3)** minimal maintenance (no moving parts), **4)** lower noise to signal ratio, and **5)** electronic components are serviceable from land surface. One noted disadvantage is that it requires a borehole into the soil to install. Environmental Monitoring Science Program's "push technology" (punch a dry steel tube with tensiometer inside into soil) has associated hazardous chemical and/or radiological contamination concerns.^(251, 252)

This technology was developed by INEEL Integrated Earth Science (1990-present) and is licensed to In Situ, Inc., a commercial vendor. INEEL demonstrated the tensiometer in 1998 at the RWMC Research Facility in Idaho Falls, Idaho. This technology has not yet been deployed at INEEL.

Technology 17: Planar In Situ Vitrification (ISV) ^(253, 254, 255)

In Situ Vitrification (ISV) is a proposed thermal treatment process for remediating contaminated soil, sediment, sludge, mill tailings, and other earthen materials containing hazardous/radioactive contaminants. It has a high tolerance for debris (i.e.:wood, scrap metal, concrete, boulders, asphalt, plastics, tires or vegetation) that might be in the treatment area. It can simultaneously treat wastes with high concentrations of both organic and inorganic (heavy metal) contaminants. It destroys most organic and some inorganic compounds by thermally induced decomposition (pyrolysis) in the oxygen-depleted environment in and around the melt zone. Pyrolyzed compounds are broken down to their elemental components (carbon, hydrogen, chlorine, etc.). Volatile components travel to the surface of the melt where nearly all are oxidized; any remaining volatile components are treated by the off-gas treatment system. Contaminants that remain in the molten soil (typically metal oxides) are incorporated into the nonleachable vitrified product. Typical soils undergo a 25-50 percent volume reduction. The process works by melting soil in place using electricity applied between graphite electrodes. After the melt is fully established, the melt zone grows steadily downward and outward through the contaminated media. The number of workers associated with this technology falls within the LOW: <11 range. ⁽²⁵⁶⁾

Advantages associated with this technology include: 1) attainment of deeper and/or narrower melts, 2) can be used for special applications involving a high concentration of gas-generating materials, 3) vaporization/removal from the treatment zone followed by removal and/or thermal destruction by the off-gas treatment system, and 4) immobilization with residual vitrified product (surpassing TCLP requirements). Disadvantages of this process include: 1) treatment depth over 20 feet requires special provisions, 2) total organic content over 10% weight may impact processing rate, 3) media must be acceptable for joule-heated melting, and 4) sealed containers of liquids, gases, or gas-generating materials require special provisions.

Planar In Situ Vitrification (ISV) technology was developed by Geosafe Corporation of Richland, Washington. Geosafe conducted a full scale demonstration with simulated waste under INEEL supervision in April 1998. This technology has yet to be deployed.

11.3 HW Task Technologies

Technology 18: Lead Brick Volumetric Radioassay ⁽²⁵⁷⁾

The Lead Brick Volumetric Radioassay is a system used to analyze lead bricks for contaminants. It uses gamma-ray spectrometric screening to survey every brick and all sides of the brick for both surface and internal contamination. The number of workers needed to operate this technology falls within the LOW: <11 range.

An advantage to this technology is that it saves time and money by performing near real time analysis. One noted disadvantage is that the technology is limited to analyzing objects only in rectangular shape. However, future developments could involve analyzing shapes other than rectangles.

The Lead Brick Volumetric Radioassay was developed at INEEL From 1993-1995. The technology was demonstrated at INEEL in a limited 40,000 lb. testing during 1995. Deployment occurred at INEEL's Waste Reduction Operations Center (WROC) in 1996.

Technology 19: Phytoremediation ⁽²⁵⁸⁾

Phytoremediation, a present and proposed In Situ soil remediation and treatment technology, is a process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment. The process may be used for the remediation of metals, pesticides, solvents, explosives, crude oil and landfill leachates. Selected plants are planted and harvested at waste sites, then sampled, packaged, and transported to an incinerator. Then the incinerated wastes are transported to a landfill for final disposal. Currently, trees are being studied to determine whether they can remove organic contaminants from ground water, translocate and transpire, and possibly metabolize the waste to carbon dioxide or plant tissue. The number of workers needed for this technology falls within the LOW: <11 range. ⁽²⁵⁹⁾

Advantages to this technology include: 1) applicable to remediate metals, pesticides, solvents, explosives, crude oil, poly-aromatic hydrocarbons, landfill leachates, and 2) remediation cost/acre of lead contaminated soil to a depth of 50 centimeters is far less than excavating and/or land filling the same soil volume. Noted disadvantages include: 1) treatment zone depth is determined by plants used in phytoremediation (most cases, limited to shallow soils), 2) high concentrations of hazardous materials are toxic to plants, 3) involves same mass transfer limitations as other biotreatments, 4) may be seasonal, depending on location, 5) transfers contamination across media such as soil to air, 6) not effective for strongly sorbed (PCBs) and weakly sorbed contaminants, and 7) products may be mobilized into ground water or bioaccumulated in animals.

The Superfund Innovative Technology Evaluation (SITE) Program is currently attempting to demonstrate and evaluate the efficacy and cost of this technology at sites in Oregon, Utah, Texas, and Ohio. This technology began at ANL-W in May 1999 and will be used at five waste sites.

Technology 20: Warthog (Excavator Mounted System) ^(260, 261, 262, 263, 264)

Warthog is a proposed characterization/retrieval technology for hazardous waste (HW) at landfills and excavation sites. It is a specialized track based platform to which a variety of on-site, remotely operated radiation sensors can be attached. The system is used to investigate an area of contamination by scanning the surface for changing chemical, radiological, and physical conditions in the subsurface. The sensors relay data to a control station through radio frequency links. The technology reduces exposures to workers by eliminating the standard practice of excavation with continued monitoring and sampling to determine the concentration and extent of contamination. It allows site personnel to modify excavation plans to increase worker safety and reduce the mixing of contaminated and uncontaminated soils. The number of workers needed to operate this technology falls within the LOW: <11 range (1-2). ⁽²⁶⁵⁾

Advantages to this technology include: 1) provides continuous, real-time monitoring and analysis of hazards, resulting in more thorough data, improved accuracy, and immediate results, 2) Reduces PPE and reduces worker risk by removing workers from “unknown” contaminant environments, 3) performs in situ, bulk measurements of large soil volumes, avoiding biases caused by small scale heterogeneity in the contaminant plume, 4) adaptable for site specific requirements, and 5) more portable than conventional methods (weighing 200 pounds, and fits in the back of a pickup truck). There were no disadvantages documented with this technology. ⁽²⁶⁵⁾

This technology was developed by INEEL’s Environmental Remediation Technologies group (1995-1997), with funding from the Subsurface Contaminants Focus Area. It was demonstrated at the Miamisburg Environmental Management Program (MEMP) in August 1995. Deployment occurred at the MEMP Miami -Erie Canal in August 1998. It has yet to be deployed at INEEL.

Technology 21: In Situ Sampler (ISS) ^(266, 267, 268)

Trichloroethylene (TCE) contamination in groundwater is difficult and expensive to detect. Historically, a packer system was used to obtain groundwater samples in a well, and the TCE concentration was determined through off-site laboratory analysis. It provided only an average concentration in a well, not a vertical profile. The In Situ Sampler (ISS) allows researchers to collect information on the vertical distribution of TCE contaminants in groundwater. It is about one inch in diameter and 36 inches long with semi-permeable sample tube internally, which absorbs TCE from the groundwater. Several of these samplers can be lowered into the well and a vapor sample can be collected after removing the unit from the well. The sample will then be analyzed onsite to determine TCE concentrations. The number of workers associated with this technology falls within the LOW: <11 range (1-2). ⁽²⁶⁹⁾

Advantages to this technology include: **1)** less monitoring equipment is needed, **2)** no purge water, **3)** quickly obtained analytical results, and **4)** reduces costs (no shipping or laboratory costs, and eliminates purged-water disposal costs). One noted disadvantage is that ISS can detect but not quantify amounts of contamination for other hydrocarbons (chloroform, carbon tetrachloride, perchloroethylene, etc.). The technology and calibration curve are not yet developed. ⁽²⁶⁹⁾

Lockheed Martin Idaho Technologies and TSI Incorporated (private business) jointly developed the In Situ Sampler in 1996. A demonstration was conducted at INEEL's Test Area North (TAN) groundwater well #32 in 1996, and was later deployed at the same site in 1997. The technology was also deployed in 1998 at TAN groundwater well #40.

Technology 22: Combination Well (Inside-Out Well) ^(270, 271, 272, 273, 274)

The conventional design for combination groundwater and gas sampling wells place the gas sampling tubing inside the well casing, and sampling ports penetrate the casing at various depths. This physically interferes with the placement of groundwater pumps and samplers within the well, and usually requires an inner casing. The Inside-Out Well is a current LLRW/HW characterization and sampling technology that accommodates simultaneous gas and groundwater sampling in the same borehole. The “inside-out” well is designed so that the gas sampling tubing and ports are attached on the exterior of the well casing. Thus, groundwater and soil sampling do not interfere with each other, so the well can be used simultaneously for monitoring and remediation purposes, allowing direct comparison of data. It provides a means for simpler and less expensive sampling than conventional techniques by eliminating costly problems and streamlined implementation. The number of workers needed to operate this technology falls within LOW: <11 range. ⁽²⁷⁵⁾

Advantages to this technology include: 1) estimated cost savings of \$30,000 per well when compared to drilling new wells, 2) effective in angled boreholes to reach areas of interests without drilling through the waste site itself, 3) groundwater and soil gas sampling activities do not interfere with each other, so the well can be used simultaneously for monitoring and remediation purposes, allowing direct comparison of data, 4) assembled easily in the field before the casing is placed in the borehole, and 5) precise gas port depths are known, which reduces the potential for grouting over the ports after the casing is set. No disadvantages were documented for this technology.

This technology was developed by INEEL Integrated Earth Science in 1995. It was demonstrated initially at INEEL’s Radioactive Waste Management Complex (RWMC) in the same year. The technology was deployed later in 1995 at INEEL’s RWMC and at Test Area North (TAN) in 1997. It has also been deployed at outside sites. It is currently being used to monitor volatile organic compounds at Sandia National Laboratory and Los Alamos National Laboratory (1995-present).

Technology 23: Enhanced In Situ Bioremediation (ISB) (276, 277, 278, 279, 280)

The U.S. Department of Energy (DOE) has more than 2,500 plumes of chlorinated hydrocarbon contamination on its sites and more than 50 records of decision have identified remediation needs for chlorinated solvents in groundwater. Historically, the “pump and treat” method has been the conventional method used for groundwater treating, but it is rather inefficient. It is a 30 year, multimillion dollar process. There is a need to establish a more cost effective alternative. Enhanced In Situ Bioremediation is one such alternative. This current treatment process increases the degradation of contaminants in the subsurface by the indigenous microorganisms present in the soil through manipulating substrates or nutrients necessary for microbial growth, and altering the flow of groundwater, thereby preventing the migration of contaminants outside the treatment area. The number of workers associated with this technology falls within the LOW: <11 range. ⁽²⁸¹⁾

Advantages to this technology include: **1)** accelerated degradation of trichloroethylene (TCE) compared to “pump and treat” method, **2)** reduced worker risk (contaminated water is never pumped above ground where the risk of worker exposure exists), **3)** decreased waste management costs (no generation of secondary waste streams), and **4)** ISB actually destroys the contaminants rather than simply transferring them to another medium (i.e.: air, granulated activated carbon). One noted disadvantage is that the bioremediation application is site specific requiring thorough evaluation prior to design and deployment.

Researchers at INEEL began studying in 1996 whether chemical-eating bacteria would be able to cleanup a plume of contaminated groundwater at INEEL’s Test Area North (TAN). The Enhanced In Situ Bioremediation (ISB) technology was initiated August 1998 following approval of use of existing re-injection wells for introduction of sodium lactate. Deployment occurred at INEEL’s Test Area North (TAN) in January 1999.

Technology 24: Rapid Geophysical Surveyor (RGS) ^(282, 283, 284, 285, 286)

Closely spaced data are required to adequately characterize complex buried waste areas found in Department of Energy (DOE) Sites. Conventional magnetic field surveys, which consisted of handheld instrumentation, were typically conducted with 2 to 4 meters between data points. The Rapid Geophysical Surveyor (RGS) is a current alternative characterization technology which will collect data with less than 0.2 meters between stations, and do so at brisk walking speeds. The RGS is a measurement system that automates the collection of high spatial resolution geophysical data. The system measures and associates dense sets of magnetic data. It is a manually-maneuvered vehicle that carries cesium total field magnetometers, a data logger, and data storage hardware and software. It employs a wheel that serves as a distance measuring device as the vehicle is pushed along the surface. The data are then displayed as a contour map showing the location of the buried metal. The RGS is used for magnetic mapping of the subsurface and locating buried ferrous objects such as 55-gallon steel drums, underground storage tanks, and buried hazardous and radioactive waste. The number of workers needed to operate this technology falls within the LOW: <11 range (1-2). ⁽²⁸⁷⁾

Advantages to this technology include: **1)** lowers the cost of the survey through significantly higher productivity (quicker data collection and interpretation when compared to conventional methods), **2)** increases density of magnetic field data for enhanced images (50,000 data points per acre using RGS compared to 1,000 points per acre with conventional method), **3)** system is very portable so there are no significant mobilization costs, and **4)** allows for a non-intrusive characterization of the subsurface. No disadvantages were documented for this technology.

The RGS was developed by INEEL Environmental Remediation Technologies (1992-1993) with funding from the Buried Waste Integrated Demonstration, and was licensed to Sage Earth Science in 1995. This technology was demonstrated at INEEL's Waste Management, Subsurface Disposal Area in 1992 and later at INEEL's Un-Exploded Ordnance (UXO) Site Characterization in 1996. INEEL deployment occurred in 1995 at the Central Facilities Area (CFA) Waste Area Group (WAG) 4 geophysical characterization. Currently, there are over 100 identified deployments for the Department of Energy (DOE), Department of Defense (DOD), Environmental Protection Agency (EPA), and other federal and private agencies.

Technology 25: Segmented Gate System (SGS) ^(288, 289, 290, 291)

The Integrated Data Report (1994) estimated that 73 million cubic yards of radioactively-contaminated soils are present at DOE sites across the U.S. Historically, excavation has been the method most widely used for cleanup at these sites. This involved transportation and disposal of significant volumes of uncontaminated soils, thereby raising cleanup times and costs. The Segmented Gate System (SGS) is a current characterization technology that mechanically separates radioactively-contaminated soils from clean soils using sodium iodide detectors on a conveyor belt system. Based on the sensor readings, a computer-controlled sorter separates the soil by inserting the appropriate gate into the stream of soil falling off the end of the conveyor. Contaminated soil is channeled through a diversion gate by conveyor and ultimately packaged and transported for disposal. Through sorting the radioactively contaminated soil into a clean stream and a contaminated stream, the volume of waste to be packaged, transported, and disposed of is reduced, enabling large cost savings. Recovery of clean soil varies from 50-99 percent depending upon type of soil and contamination. The number of workers needed to operate this technology falls within the LOW: <11 range. ⁽²⁹²⁾

Advantages to this technology include: **1)** can reduce cost (based upon the volume of waste treated), **2)** no chemicals or other additives are used, **3)** generation of secondary waste is limited to PPE and decontamination rinse water, and **4)** system physically surveys the entire volume of soil to be processed. Disadvantages of this technology include: **1)** system is not well suited to sort soil contaminated with more than two radionuclides with different gamma energies, and **2)** oversize rocks and cobble (greater than 2") cannot be processed without pre-crushing.

This technology was developed by Thermo Nutech. The SGS was successfully demonstrated at several DOE sites, including the Savannah River Site (1995), Los Alamos National Laboratory (1996), and Sandia National Laboratory (1997 and 1998). The SGS technology was deployed at INEEL's Auxiliary Reactor Area - 23 (ARA-23) site during June 1999.

Technology 26: Cooperative Telerobotic Retrieval System ^(293, 294, 295)

A need exists to selectively retrieve “risk-driven” hazard items from buried waste sites. The Cooperative Telerobotic Retrieval System is a proposed technology which will allow removal of those suspected hazardous items from a buried waste site while maintaining the integrity of the containers in which the suspect items are stored or disposed. The system consists of a robotically controlled gantry crane, two robotic manipulators, a 5-ton hoist, and a vacuum system. In tandem, the manipulators and the vacuum system can selectively remove soils and debris from around an item, and retrieve that item. The number of workers needed to operate this technology falls within the LOW: <11 range.

Advantages to this technology include: **1)** removes workers from hazardous environments, improving worker safety, **2)** reduces the need for personal protective equipment (PPE) in hazardous environments, and **3)** cost savings will be achieved from the aforementioned advantages. No disadvantages were documented for this technology.

This technology was developed by INEEL Remote, Robotic, and Automated Systems from 1993 to 1996. Industry participation has also been prevalent. Participants from this sector include American Crane and Equipment (gantry crane), Cinetrix Inc. & Shilling Development (control system), and Concepts Engineering Group (sundering/vacuum system). A buried waste integrated demonstration occurred in 1995 at a simulated waste pit. The technology has not yet been deployed at INEEL.

Technology 27: Bioremediation of Explosive Contaminated Soils ^(296, 297, 298)

Before inception of INEEL, the Army and Navy conducted aerial bombing practice, naval artillery testing, and other explosives testing and disposal at the site. While thousands of unexploded ordnance devices and tons of TNT-contaminated soil have been removed over the years, many chunks of TNT and acres of contaminated soil remain. Bioremediation is a proposed method for treating these areas. Large sized fragments (larger than 2mm) of TNT are pretreated with acetone. The acetone breaks down the explosive chunks so that they can be added to the compost process. Microorganisms in the compost feed on the TNT and reduce the ingredients to Nitrogen rich soil. While acetone is considered a hazardous chemical, the composting also destroys the acetone. The number of workers associated with this technology falls within the LOW: <10 range.

Advantages to this technology include: **1)** low cost (most of the ingredients for the compost are free or close to free), and **2)** able to treat soils with large chunks of TNT. There were no disadvantages documented with this technology.

This technology was developed by the INEEL Biotechnologies department in 1997. Demonstration occurred at INEEL in November of 1998 at an Experimental Field Station. This technology is not yet deployed.

11.4 De Task Technologies

Technology 28: Remote Underwater Characterization System (RUCS) ^(299, 300, 301, 302)

The conventional method for characterization and inspection of water cooled and moderated nuclear reactors and fuel storage pools has been the use of radiation detectors and underwater cameras mounted on long poles, or stationary cameras with pan and tilt features mounted along the sides of the underwater facility. A need has developed for a more mobile method of performing close-up inspection and radiation measurement in confined spaces underwater. The Remote Underwater Characterization System (RUCS) is a current HLW/MW characterization, sampling, and retrieval technology consisting of a small, remotely operated submersible vehicle system. It is designed to perform tasks such as small parts retrieval and sampling. The system provides visual and gamma radiation characterization, even in confined or limited spaces. Included on the system are underwater lights, a front color camera, a rear black & white camera, and a GM tube radiation detector. RUCS operates by a 125' neutrally buoyant tether and is capable of submerging to depths of 100 feet. The number of workers needed to operate this technology falls within the LOW: <11 range (1-2 to operate system). ⁽³⁰³⁾

Advantages to this technology include: 1) inexpensive when compared to others systems of similar capability, 2) small size allows simpler operation in tight access areas or where maneuvering is limited, 3) system is able to reach depths unattainable by conventional methods (up to 100 feet), 4) reduces number of workers needed to suit up in the area, thereby reducing exposure and saving labor, and 5) measures radiation levels up to 50% higher than conventional methods due to its ability to "fly" right up to objects. One noted disadvantage is that RUCS is not superior in all instances. The baseline approach provided slightly higher quality video, and could access inside of pipes and get some radiation data that RUCS could not.

The submersible vehicle was developed at Inuktun Services Ltd., British Columbia, Canada. The enhancements, including sensors and instrumentation, were developed by DOE's Robotics Technology Development Program at INEEL. The RUCS was demonstrated and deployed as part of the INEEL Large Scale Demonstration Project. It occurred in a canal between two defueled test reactors at INEEL's TRA-660 Facility in August of 1998. Its primary use was to visually survey the canal, its contents, and to gather radiological characterization data on the reactors, equipment located on the floor of the canal.

Technology 29: Soft-Sided Container (304, 305, 306, 307)

Decontamination and Decommissioning (D&D) at INEEL generates significant quantities of low-level waste (LLW). Historically, this waste was packaged and disposed of in rigid wood (2x4x8 ft.) and metal boxes (4x3x8 ft.), costing \$566 and \$750 per box respectively. Disposal containers that are more volumetrically efficient, cost effective, and easier to use are needed. The soft sided container (7x8x5 ft.) is a current technology that provides an alternative to these boxes. It is a large waste bag made of woven polypropylene material with integrated nylon lifting straps. The packaging system includes a 25-mil woven outer polypropylene fabric shell with a 2-mil water resistant coating and a 45-mil double layer polypropylene inner liner. The outer shell is equipped with 18 lifting straps, a loading frame to support the container while being filled, and a lifting frame that can be attached to a crane or hoist to raise it onto a transport vehicle. A forklift can move the empty loading frame and spreader bar. Each container costs \$380, has a capacity of 260 ft.³, and holds up to 24,000 lbs. The number of workers associated with this technology falls within the LOW: <11 range (3 total for setup/filling of container).⁽³⁰⁸⁾

Advantages to this technology include: 1) has three times greater capacity than conventional boxes (1 bag vs. 3 or 4 boxes), 2) greater cost savings over the conventional wood and metal boxes (\$380 vs. \$566 and \$750), resulting in savings of about \$1,800 in container cost per bag (vs. filling 3 or 4 boxes), 3) easier to load and accepts larger debris, and 4) reduces void spaces and landfill subsidence. Documented disadvantages with this technology include: 1) waste sizing and preparation for the containers is the same as for baseline boxes, 2) there is a one-time cost of \$7,000 for the loading frame and lifting/spreader bar, and 3) in cases where puncture is a risk, protruding objects must be cut prior to loading.

The Soft-Sided Container was developed by Transport Plastics, Inc. through direct consultation with INEEL Waste Management. Demonstration occurred in 1997 for the packaging of low-level waste soil and debris. The INEEL Waste Management organization demonstrated the packaging of low-level waste soil and debris in November of 1997. In February of 1998, full scale demonstration occurred at INTEC. Initial deployment at INEEL occurred in 1998 during the D&D of the Central Facilities Area (CFA) Old Sewage Treatment Facility. It was also deployed in February of 1999 at INEEL's Auxiliary Reactor Area-1 (ARA-1) and Naval Reactors Facility.

Technology 30: Pipe Explorer ^(309, 310, 311, 312, 313)

Radiological surveys of pipes are normally accomplished by passing a hand-held sampling instrument over the exterior surface of a pipe. Access to the entire exterior surface of the pipe over its full length is required for a complete survey. However, access is frequently restricted, and the process difficult, time consuming, and potentially hazardous. Also, the current instrumentation is not capable of detecting threshold surface contamination values. The Pipe Explorer is a proposed LLMW characterization system. It is a remotely operated survey system that integrates gamma, beta, and alpha radiation detectors and video cameras with a inverting membrane deployment method that utilizes a long, plastic tube to tow the instruments through the pipes. It is capable of negotiating bends (90°) and limited obstructions (rocks, oil, and other debris) that obstruct up to half of the pipe's cross sectional area, and can travel horizontally and vertically. The detectors have the sensitivity to make low-level measurements inside of pipes. The system will be capable of conducting surveys in pipe diameters of 0.05 m (2 in.) and greater, and lengths of up to 500 feet. The number of workers needed to operate this technology falls within the LOW: <11 range (10 total required for production scale deployment runs). ⁽³¹⁴⁾

Advantages to this technology include: **1)** obtains radiological data over the entire length of the pipe, **2)** surveys locations not accessible with existing technology, **3)** reduces personnel exposure, time, and cost, and **4)** reduces cross contamination of data. No disadvantages were documented for this technology.

This technology was developed by Science & Engineering Associates, Inc. An adaption of the SEAMIST borehole instrumentation technology was implemented in 1993. Demonstration occurred at INEEL's Chemical Processing Plant in July of 1994. This included deployment of a beta radiation detector, video survey, and a pipe locating beacon. This technology is not yet deployed.

11.5 Di Task Technologies

Technology 31: Bulk Concrete Waste Disposal System ^(315, 316, 317, 318)

Historically, large contaminated concrete structures were managed by reducing the concrete to rubble, and placing it in wooden or metal boxes for disposal at the Radioactive Waste Management Complex (RWMC). This method is labor intensive, and the boxes are not volumetrically efficient because they were not 100% filled. The box itself could account for up to 60% of the volume once placed into the disposal pit. The Bulk Concrete Waste Disposal System is a current alternative method to manage the D&D and eventual disposal of large contaminated concrete structures (LLRW). This method consists of remotely cutting the concrete into slabs, wrapping the slabs in plastic (i.e., Herculite), and directly disposing of the slabs in the RWMC Disposal Pit. The number of workers needed to operate this technology falls within the LOW: <11 range (1-2 total). ⁽³¹⁹⁾

Advantages to this technology include: 1) reduces waste container costs, 2) reduces waste volume in the disposal pit, and 3) reduces worker exposure to radiological contamination through remote operation. One noted disadvantage is that the process requires more time (estimation for slabbing concrete is two (2) times the amount of time to rubblize the concrete).

The Waste Management organization developed a process to cut concrete into manageable slabs in 1983, but this was not using a remote cutting procedure. The remote cutting procedure, along with the rest of the process, was developed without any demonstration. The Bulk Concrete Waste Disposal System was deployed at the old hot cell facility at Auxiliary Reactor Area I (ARA-1) in 1998.

Technology 32: Oxy-Gasoline Torch (325, 326, 327, 328, 329)

Many DOE facilities undergoing D&D contain large amounts of carbon steel equipment and piping that must be cut for disposal. Historically, acetylene torches have been used for cutting large pipes, equipment, and other structures made of carbon steel. More efficient and cost effective methods are needed to reduce maintenance and surveillance costs, as well as impact the environment and workers. The oxy-gasoline torch is a current alternative dismantlement technology that can be used as a direct replacement for the acetylene torch. Fueled by gasoline, the oxy-gasoline torch will cut or segment larger pipes, equipment, or structural components in a facility. It consists of a 3-gallon fuel tank with safety valves, a gasoline supply hose, and a cutting torch head. A built in hand pump or external source of compressed air pressurize the tank and deliver the gas (in vapor form) to the head of the torch, where it mixes with oxygen (supplied from conventional bottles) in the tip. The number of workers needed to operate this technology falls within LOW: <11 range (1-2).⁽³³⁰⁾

Advantages to this technology include: **1)** cuts faster and cleaner with less slag (on a 2 inch thick steel plate, 13 minutes for oxy-gasoline torch vs. 27 minutes for acetylene torch), **2)** significant fuel savings (uses fuel that is less expensive; equivalent cuts can be made with \$3.00 of gasoline compared to approximately \$50.00 of acetylene), **3)** accelerates schedule and reduces work and radiation exposure time, **4)** more portable (gasoline tank weighs 30 pounds compared to 250 pound acetylene tank), and **5)** oxy-gas torch keeps the gasoline liquid away from the tip, keeping the torch head cool and eliminating backlash. No disadvantages were documented with this technology.

The oxy-gasoline torch was developed by Petrogen International, LTD. of San Leandro, California. Demonstration of this technology occurred at the Fernald (FEMP), Plant 1, in 1997. Deployment occurred at the INEEL Central Facilities Area (CFA) Sewage Treatment Plant Building 691 in July of 1998. It was also deployed at INEEL throughout 1999 at the TAN 620 Initial Engine Test Facility (April), Auxiliary Reactor Area (June), and TRA Filter Pits (September).

Technology 33: Dual Arm Work Platform (DAWP) ^(320, 321, 322, 323)

A platform was needed for deployment of commercial manipulator arms for telerobotic disassembly of the ANL-E CP-5 Research Reactor. Historically, disassembly was done through manual dismantlement techniques using standard hand-held tools or operation of a single robotic arm. The Dual Arm Work Platform (DAWP) is a current maintenance and retrieval technology that provides for cooperative operation of a pair of manipulator arms. It was designed for use in teleoperation, telerobotic, and robotic modes to perform a variety of D&D tasks, including reactor vessel dismantlement. The system consists of two 6-degree-of-freedom (DOF) Schilling hydraulic manipulators arms, mounted on a 5-DOF hydraulic positioning base containing lights, cameras, and dismantlement tools. All functions of the DAWP are performed by an operator located in a control room approximately 70 feet from the reactor through 175 feet of tether, which supplies the hydraulics, power, and control signals to the platform base. DAWP is positioned using a forklift or crane, and is readily decontaminated. Equipped with a circular saw, the DAWP can cut large sections of a reactor, then pass it along for size-reduction/waste packaging. The number of workers needed to operate this technology falls within the LOW: <11 range (1-3 total). ⁽³²⁴⁾

Advantages to this technology include: **1)** can be mounted on deployment devices such as Rosie-C, overhead cranes, telescoping booms, and remote vehicles, **2)** remote operation removes workers from high-radiation environments, and **3)** accepts a variety of tooling configurations including oxy-gasoline cutting torch, router, reciprocating saw, electrical impact hammer. Documented disadvantages include: **1)** careful tether management needed during movement of DAWP, **2)** manipulator arms require high maintenance (primarily due to use of water-glycol hydraulic fluid), and **3)** expensive to implement. ⁽³²⁴⁾

The DAWP was a joint development effort between INEEL and Oak Ridge National Laboratory (ORNL) between 1996 and 1997. Demonstration occurred in 1997 at the Argonne National Laboratory East (ANL-E) Chicago Pile (CP-5) Research Reactor Facility during a Large Scale Demonstration Project. The technology was deployed as part of the ANL-E, CP-5 Research Reactor Facility D&D Program in 1998.

Technology 34: BROKK (TM) Demolition Robot ^(331, 332, 333, 334, 335)

During the D&D process, the removal of contaminated concrete or other facility dismantlement can have potential for high exposure rates and injury to workers. Historically, manual tools (i.e. jackhammer) would be used to perform the work. Remote systems are needed to keep workers away from demolition areas and ensure worker safety. The BROKK robot is a remotely operated, electrically driven demolition system that can replace these manual tools. The current dismantlement system consists of a revolving table mounted on a tractor-like base. Extending from the table is a hydraulic arm, to which a variety of tools (hammers, scabblers, grapples, buckets, shears, etc.) can be attached to perform the work. The Brokk robot can be operated by a worker 200 feet away (using a tether) or 400 feet away (using a remote control with a television monitor). The machine can be operated up to a 90 degree gradient. Waste rubble concrete (lead/LLMW) was removed and loaded into shipping containers for disposal. The number of workers needed to operate this technology falls within the LOW: < 11 range (1-2 operators). ⁽³³⁶⁾

Advantages to this technology include: **1)** faster and more efficient excavation (during demonstration, the system completed work in 16 days that was projected to take 6 months to complete with manual tools) reduces cost, schedule, and worker exposure, **2)** remote operation allows operators to be positioned a safe distance from high radiation areas and falling debris, **3)** electrically powered motor reduces exhaust fumes in containment areas, **4)** can perform a wide range of tasks due to different tools/end effectors, and **5)** usage reduces noise levels and eliminates repetitive motion injuries to workers from jack hammers. No disadvantages were documented for this technology. ⁽³³⁶⁾

The BROKK demolition robot was manufactured by Holmhed Systems AB of Skelleftea, Sweden and is supplied by Duane Equipment Corp. Demonstration of this technology occurred at the Argonne National Laboratory - East Janus reactor in August and September 1997 as part of a D&D project. Deployment at INEEL occurred in May of 1999 at the Central Facilities Area (CFA) Security Training Facility.

Exhibit 12.1: Total Number of OCAW Remediation Workers at INEEL from 1989 through 1998 ⁽⁵⁶⁾

Job Classification	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Analyst A	2	3	6	7	7	7	7	7	7	7
Apprentices	8	10	12	14	15	15	17	18	18	18
Carpenter Finish	12	15	16	16	17	17	17	17	17	17
Clothing Issue Technicians	2	2	2	3	4	5	5	5	5	5
Custodian	21	25	28	29	29	29	32	32	32	41
Decontamination Technicians	3	4	6	6	6	6	6	6	6	6
Electrician 1-C	29	39	49	54	57	57	57	60	61	61
Equipment Operator	14	17	22	22	24	24	24	24	24	24
Fuel Storage - Senior Operator	12	18	29	32	32	32	32	32	32	32
Heavy Equipment Operator	28	35	36	36	38	38	38	38	38	38
HLW Operations - Operator	2	2	2	2	2	2	2	2	2	2
HLW Operations - Senior Operator	41	46	51	51	51	51	51	51	51	51
Instrument Technician	21	24	32	36	39	39	39	39	40	40
Instrument Technician Special	11	11	11	11	11	11	11	11	11	11
Insulator 1-C	0	0	0	2	2	2	2	2	2	2
Laborer	17	21	26	31	34	34	42	63	64	73
Lineman	9	9	9	9	9	9	9	9	9	9
Locksmith 1-C	3	3	3	3	3	3	3	3	3	3
Machinist 1-C	7	7	7	8	8	8	8	8	10	12
Machinist Specialist	1	1	1	1	1	1	1	1	1	1
Mechanic 1-C	28	31	33	39	42	42	42	42	43	43
Operation - Senior Operator	10	17	22	24	26	26	26	26	26	26
Operator	0	0	2	2	2	2	2	2	2	2

Exhibit 12.1 (continued): Total Number of OCAW Remediation Workers at INEEL from 1989 through 1998 ⁽⁵⁶⁾

Job Classification	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Painter 1-C	9	11	13	13	13	13	13	13	13	13
Painter 2-C	1	1	1	1	1	1	1	1	1	1
Pipefitter 1-C	28	31	38	40	40	40	40	40	41	41
Power Dispatcher	4	4	4	4	4	4	4	4	4	4
Radiation Control Technicians	55	82	94	100	101	101	101	102	106	106
Service Disposal Operator	2	2	2	2	2	2	2	2	2	2
Sheetmetal Mechanic 1-C	1	1	1	1	2	2	2	2	2	2
SWEPP - Senior Operator	4	4	4	6	7	7	7	7	7	7
Tool Crib Attendant	6	6	6	6	6	6	6	6	6	6
Utility Operators - Senior Operator	22	25	31	33	33	33	33	33	33	33
Vehicle Repair Specialist	22	22	24	24	24	24	24	24	24	24
Waste Handling Technician I	3	4	4	4	4	4	4	4	4	4
Waste Handling Technician II	1	3	4	4	4	4	4	4	4	4
Welder 1-C	19	19	20	20	21	21	21	21	21	22
WERF - Senior Operators	12	13	15	15	15	15	15	15	15	15
TOTALS	470	568	666	711	736	737	750	776	787	808

Job Classifications not Included: Senior Printers (+5 years), Printer II (+2 years), Telephone Operator, Part Time Telephone Operator, Chef, First Cook (over 12 months), Production Cook, Cooks, Griddle Cook, Mail Clerk (labeler), Mail Clerk 1-C (over 18 months), Mail Clerk (6-18 months), Master Photographer, Senior Photographer, Photographer, Microfilmer, Senior Occupational Health Nurses (RN, EMT), Part Time Senior Occupational Nurse, LPN Examining Tech A, Senior Industrial X-Ray Technologist

Exhibit 12.2: Total Number of LMITCO Remediation Workers at INEEL from 1994 through 1998 ⁽⁵⁷⁾

Job Classification	1994	1995	1996	1997	1998
Analyst A	9	8	9	8	8
Analyst B	3	2	1	0	0
Carpenter 1/C	0	5	17	16	16
Carpenter 2/C	0	0	1	0	0
Carpenter Apprentice	0	0	2	2	2
Carpenter Finish	20	11	0	0	0
Custodian	50	36	38	36	43
Decon Tech	2	0	0	0	0
Electrician 1/C	94	64	64	68	61
Electrician 2/C	0	0	3	0	0
Electrician Helper	1	0	0	0	0
Electrician Apprentice	4	3	6	4	4
Equipment Operator (EO)	26	24	26	28	23
Experi Machinist 1/C	7	5	0	0	0
Experi Machinist Apprentice	1	1	0	0	0
Fitter 1/C	57	41	42	42	41
Fitter 2/C	1	1	0	0	0
Fitter Apprentice	1	1	0	1	1
Heavy Equipment Operator (HEO)	31	21	28	28	34
Instrument 1/C	70	43	39	39	40
Instrument 2/C	0	0	1	2	0
Instrument Apprentice	0	0	1	1	1
Instrument Specialist	0	9	12	11	11
Insulator 1/C	7	4	4	4	3
Insulator Apprentice	0	0	0	1	0
Laborer	75	82	90	162	81
Locksmith 1/C	4	3	3	3	2
LSRAO	0	0	9	9	9
Machinist 1/C	6	2	9	10	14
Machinist Specialist	0	1	1	1	1
Mechanic 1/C	52	44	43	45	44
Mechanic 2/C	1	0	0	0	0
Mechanic Apprentice	2	0	0	1	1
Operator	20	14	12	6	2
Operator Helper	2	4	0	0	0
Operator SWEPP Apprentice	0	0	4	6	6
Operator WERF Apprentice	0	3	4	5	2
Painter 1/C	13	13	13	13	13
Painter 2/C	2	1	2	1	1
Painter Apprentice	1	0	1	1	1
Power Dispatcher	4	4	4	4	5
RCT	133	67	115	112	109
Senior Decon Technician	4	6	6	6	6

Exhibit 12.2 (continued): Total Number of LMITCO Remediation Workers at INEEL from 1994 through 1998 ⁽⁵⁷⁾

Job Classification	1994	1995	1996	1997	1998
Senior Operator	181	164	158	155	157
Sheet Metal Mech 1/C	3	2	2	2	2
Service Disposal Operator	3	2	2	2	2
Tool Crib Attendant	4	4	4	6	6
Waste Handler Technician	7	4	5	5	8
Welder 1/C	24	20	23	22	22
Welder 2/C	0	0	1	1	0
TOTALS	925	719	805	869	782

Exhibit 12.3: Total Number of ANL-W Remediation Workers at INEEL from 1990 through 1999 ⁽⁵⁸⁾

Job Classification	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Carpenter	2	2	2	3	3	3	3	3	3	3
Custodian	5	7	7	7	13	13	12	13	12	12
Engineering Technician	11	11	11	11	12	13	14	14	14	14
Equipment Operator/ Materials Handling	0	4	5	6	6	6	6	6	6	6
Health Physics Technician	18	23	26	32	36	36	33	32	32	30
Heavy Equipment Operator	3	4	4	4	4	4	4	4	4	4
I&C Technician	19	21	23	23	24	24	24	24	24	24
Laborer	4	4	4	4	4	4	4	4	4	4
Maintenance Specialist	34	40	41	44	49	49	48	50	50	48
Mechanical Technician	0	0	0	0	0	0	0	0	0	0
Nuclear Facility Operator	49	54	56	57	68	68	68	68	70	71
Operations Specialist	9	11	11	11	11	11	11	11	11	11
Plumber	0	0	0	0	1	1	1	1	1	1
Reactor Operator	4	4	4	4	4	4	4	4	4	4
Science Technician	1	1	2	2	2	3	3	3	3	3
Welder	1	1	1	1	1	1	1	1	1	1
TOTALS	160	187	197	209	238	240	236	238	239	236

Exhibit 12.4: LMITCO and ANL-W Nonexempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
LMITCO	Computer Operations Technician	Monitors and operates electronic digital computers to process business, scientific, engineering, or other data according to operating instructions. Set control switches, ensures that correct peripheral equipment is utilized and moves switches to clear system and operate the equipment. Selects and loads input and output units with materials such as tapes, punched cards, and print out forms. Observes equipment and control panels for operation messages or error indicators, reacting appropriately to the messages, and reporting errors or machine malfunctions to a senior operator or supervisor. Operates peripheral equipment to perform such operations as card-to-tape, tape-to-printer, and tape-to-card.
LMITCO	Computer Hardware / Software Support Technician	Provides technician support to diagnose and resolve equipment problems for computers and peripherals at the desktop and enterprise levels. Connects, installs, tests, upgrades, and maintains - including preventive maintenance on enterprise peripherals - hardware, software and network hardware, and software components. Repair and maintain equipment while minimizing customer down time. Support the telecommunications systems by assembling, evaluating and testing proposed networking components, and upgrading the backbone networks to new releases of firmware.
LMITCO	Construction Inspection Technician	Witnesses and /or performs civil, structural, electrical, mechanical, or nondestructive inspections of construction projects. Maintains drawings and specifications to reflect as-built condition of construction projects. Provides surveillance of construction work in progress and inspects equipment and supplies to ensure compliance with quality / design requirements. Inputs data for compilation of monthly estimates of work completed by subcontractors for verification of pay estimates. Maintains logs of daily construction activity. Reviews plans and specifications for future construction projects. Provides input on design reviews, inspection planning, and pre-design investigations.
LMITCO	Drafter	Plans, lays out, prepares, and revises engineering drawings manually or by using computer-aided design equipment in one or more areas of specialization, e.g., architectural, structural, civil, mechanical or electrical drafting working from notes, sketches or general instruction. Makes required mathematical calculations. Prepares specifications for parts, assembly, and installation. May contribute design modification ideas to improve the quality of the product of facilitate construction / fabrication.

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
LMITCO	Electro/Mechanical Technician	Fabricates, modifies, assembles, calibrates, adjusts, tests and/or maintains developmental electronic, electro/mechanical, mechanical and/or optical devices, instruments, systems or processes. Sets up and operates test equipment to evaluate the performance of prototypical devices, analyzes test data, and recommends changes or modifications to improve performance. Installs, troubleshoots, and maintains new equipment. Compiles and completes documentation of development and / or test processes. May participate in equipment and/or test design.
LMITCO	Environmental Field Technician	Performs a variety of tasks in support of the environmental or hazardous waste professional staff which may include sample collection, log information, perform testing procedures on soil, water, wastewater, air drilling operations, and support etc.
LMITCO	Experimental Power Reactor Operator (EPRO)	Surveys and monitors reactor, plant, and experiment systems and logs instrument reading to detect changes and maintain historical records. Collects, records, calculates, and interprets reactor and experiment chemistry and operational data. Maintains reactor, plant, and/or experiment instruments, controls, safety systems, and components. Analyzes malfunctions and advises supervisor on system operation. Performs reactor start-up, shutdown, power reduction recoveries, power changes, balancing manipulations, and experimental tests using reactor controls. Performs laboratory chemical determinations for reactor, plant, and/or experiments. Changes fuel components and control rods during shutdown. Assembles, changes, and tests the experiment loop, instrumentation, coolant systems, and safety controls. Reviews and updates required procedures / documentation. Performs functional and pre-critical checks.
LMITCO	Facility Operations or Hazardous Waste Technician	Performs duties to ensure proper operation and preventative maintenance of various facility systems such as propane, heating/ventilation, electrical, etc. Performs technical tasks to support laboratory-testing programs. Provides assistance on various experiments, sets up and operates a variety of equipment such as small hand mechanics tools, electronic gear and inspection equipment. Consults with manufacturers, vendors, and engineers, regarding problems needing coordination.
LMITCO	Field Service Technician	Installs, modifies, troubleshoots, diagnoses problems, and performs on-site preventive and corrective maintenance of electronic, electro/mechanical, and mechanical equipment, e.g., communications devices or systems, alarms and surveillance devices, personal computers, and peripheral equipment. Prepares reports and/or records on inspection and repair activities. Assists in updating systems drawing documentation and development of design modifications.
LMITCO	Health Physics Technician	Performs routine and special radiological control surveys of areas, materials, and personnel. Monitors shipments, disposal, and/or storage of radioactive materials. Calculates amount of time personnel may be safely exposed to radiation. Calibrates and maintains adequate inventories of portable and/or fixed radiation monitoring and personnel protective equipment. Reviews design, procurement, and/or work authorization documents for accuracy and completeness with respect to safety requirements. Identifies potential problem areas and applies necessary corrective measures. Performs material / fabrication / installation inspections to verify safety requirements are met. Performs safety inspections of work in progress, including industrial hygiene and fire protection considerations. May recommend possible work stoppage if deemed necessary for safety purposes. May act as primary safety representative when assigned to back shifts.

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
LMITCO	Help Desk Technician	Provide technical software and hardware knowledge to support desktop operating systems (shrink wrap), enterprise systems software, e.g., E-mail, EIS applications, network configuration and communication problem resolution and effective use of application features and functions. Identifies and coordinates problem resolution between hardware, software, and networking. Refer corrective actions to repair technicians as appropriate. Coordinate with software developer for resolution of application abnormalities and problem resolution or product enhancement. Provide direction to end-user on process enhancements available through hardware/software applications, network access requirements, computer registration, software upgrades, etc.
LMITCO	Industrial Safety and Health Technician	Assist in safety and health activities to evaluate and control environmental hazards. Test noise and air levels, maintain and calibrate instruments, administer hearing tests, and monitor emergency action plans. May assist in the investigation of accidents and preparation of accident reports.
LMITCO	Instrumentation / Calibration Technician	Calibrates, adjusts, evaluates, modifies, and repairs electrical, physical, and dimensional measurement standards and measuring / test equipment in order to assure accuracy and traceability to national standards, physical constants, ratio-type devices, or consensus standards. Sets up and develops measurement systems to provide calibration of new / unique instruments and devices. Troubleshoots faulty circuits and repairs as necessary to ensure control and consistency of measurements processes.
LMITCO	Laboratory Technician	In support of scientists and engineers, performs a variety of laboratory duties including housekeeping functions, purchase and maintenance of chemical and equipment inventories; assembly, modification, operation, and dismantling of test apparatuses; preparation of reagents and solutions; operations of diagnostic equipment; recording and analysis of test data. Complies and completes documentation on test / inspection plans, procedures, and results. May participate in experiment design.
LMITCO	Maintenance Technician (SMC Facility Only)	Performs technical tasks to support manufacturing and facility equipment, corrective and predictive maintenance, calibration, testing and fabrication. Consults with engineering, work planners, and operations personnel on required equipment and maintenance issues.
LMITCO	Manufacturing Technician	Performs technical tasks to support the manufacture of a product. Provides assistance on various experiments, sets up and operates a variety of equipment such as small hand or mechanics tools, electronic gear and inspection equipment. Consults with engineers or operations personnel regarding production problems.
LMITCO	Material Handling Technician (SMC Facility Only)	Performs tasks related to inventory control, acquisition, material handling, packaging, shipping, tool crib and spare parts management. Works with classified material, parts, and special nuclear material. Truck and forklift operation may be involved.
LMITCO	Network Technician	Installs, maintains, modifies, tests, and repairs computer systems and information networks. Prepare project time and cost estimates, design, analyze, test, modify, document, and maintain complex network based systems. Ensures system security is maintained.

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
LMITCO	PC Operations Technician	Utilizes a personal computer to create and maintain databases. Collects data for input, manipulates data, reduces collected data where necessary, and produces graphs, charts, reports, etc. May do programming within the confines of software language.
LMITCO	Quality Inspection Technician	Performs material / fabrication / installation / in-service inspections, tests, calibration, and surveillance services to ensure adherence to quality standards. Performs visual and mechanical magnetic particle, eddy current, radiographic examination, and ultrasonic testing. Compares electronic, electro/mechanical, and mechanical measuring adjustments, alignment, and calibrations to specified tolerances. Assists with unusual measurement problems. Designs new or modifies existing fixtures and inspection processes. Reviews materials and equipment received or fabricated against purchase/design specifications to ensure acceptability.
LMITCO	Research and Development Technician	Fabricates, assembles, calibrates, adjusts, and tests proto-type or one-of-a-kind electronic, electro / mechanical, mechanical and/or optical devices, instruments, systems or processes. Set up and operates test equipment to evaluate the performance of prototypical devices, analyzes test data, and recommends changes or modifications to improve performance. Installs, troubleshoots, and maintains new equipment. Compiles and completes documentation of development and/or test processes. May participate in equipment and/or test design.
LMITCO	Waste Operations Technician	Perform tasks related to on-site treatment, storage, packaging, transport, or disposal of hazardous materials. Complete measurements and tests to ensure status of material, and to ensure compliance with established policies and standards. ⁽⁷⁶⁹⁾
LMITCO	Work Order Tracking and Scheduling	Receives work orders and enters into tracking/scheduling database. Tracks status. Initiates work orders in accordance with established maintenance schedule. Closes out work orders, checks quality of work orders, and processes material requisitions.
ANL-W	Reactor Operator	Perform maintenance, repair and modifications to TREAT and NRAD reactor equipment and associated mechanical and electrical systems. Assemble, disassemble, and operate experiments and associated support equipment. Operate and perform maintenance on the M.F. Physics A-711 neutron generator. Handle and survey fissile material, by established rules, in various forms and quantities and perform neutron radiography. Operate TREAT reactor systems for standby operations and emergency situations and operate controls and systems of the NRAD reactor. Assist staff in designing and implementing solutions to problems and improve procedures to accomplish TREAT's mission. Maintain and improve essential knowledge level. Operate overhead bridge cranes and rigging to handle critical loads. ⁽³³⁸⁾
ANL-W	Engineering Technician	Provide software and hardware support for the operation, calibration, troubleshooting, and maintenance for the computer systems, networks and peripheral equipment. Interface with scientific and engineering staff personnel in troubleshooting and maintaining associated facility systems and equipment. Analyze requirements for and develop software for computerized control of equipment and/or data processing. Author qualification plans and related testing documentation for process equipment and facility operations equipment. Install, execute and troubleshoot various software packages to assure proper function. Recommend spare parts requirements and assure availability of adequate spares for computer equipment. ⁽³³⁹⁾

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
ANL-W	Laborer	Maintain facilities, yards and grounds in a clean, safe and pleasing condition by performing duties primarily involving physical labor. Performs furniture, equipment and material moves. Hauls dry waste containers for various facilities to disposal dumpsters. Performs yardwork such as cutting grass, shoveling, sweeping and hosing of sidewalks, roads, facility entrances, roofs, etc. Hauls scrap lumber, trash and scrap metal to dump areas. Cleans ditches, fence lines and grounds of weeds and debris. Performs snow removal operations. Performs decontamination work. Participates in training / retraining programs required by ANL-W requirements. ⁽³⁴⁰⁾
ANL-W	Maintenance Mechanic (Yardman)	Maintains yards and grounds. Troubleshoots and repairs yard and lawn power equipment. ⁽³⁴¹⁾
ANL-W	Chief Technician	Schedules and coordinates the daily activities of Technicians to maintain Site Radiation Safety Standards and to support facility production schedules. Evaluates and interprets data collected from monitoring equipment to assure a radiological hazard-free work environment and to detect any abnormal trend indicating a developing problem. Provide on-the job training for upgrading, qualification and re-qualification of Health Physics Technicians, both within his facility and from other facilities. This training can run from classroom type to practical hands-on experience. Interfaces with Facility Management in review of procedures, work packages and/or equipment modifications to assure proper radiological controls; thus, assuring that the facility will be in compliance with Rad Protection requirements. Review all work activities to assure application of ALARA principles for every project and track individual exposures of facility personnel to help distribute dose and prevent any overexposure. Functions as safety observer, reporting potential problems to both Facility Management and Safety to provide a safe work environment to all employees. Takes action to assure the proper application, location and operability of all radiological monitoring and counting equipment. Assist the facility to obtain new or upgraded equipment to meet upcoming needs. Provides additional manpower coverage where needed. Provides oversight of RFS activities. ⁽³⁴²⁾
ANL-W	Health Physics Technician III or IV	Performs routine radiation and contamination surveys and evaluates data with minimal instruction from Senior Technician or Chief. Provides job coverage and surveillance, completes Radiation Work Permit requirements with minimal input from Senior or Chief Technician. Employees ALARA practices in all efforts. Maintains qualifications to use all radiological control monitoring equipment (portable and fixed) and may assist Technician II in proper application of same. Maintains knowledge of applicable facility systems that may impact radiological conditions, i.e., ventilation, emergency power distribution and radioactive waste. Conducts incoming and outgoing surveys of radioactive shipments and transport vehicles. Surveys and inspects radioactive material for proper interim storage or disposal. Maintains qualifications to assume radiological control responsibilities during back shift or weekends. ^(343,344)

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
ANL-W	Health Physics Technician Senior	Completes and evaluates all facility routine surveillance data and makes recommendations. Reviews facility procedures and work packages to assure inclusion of appropriate radiological controls in compliance with sound ALARA principles. Maintain expertise in use and operational explanation of all radiological control monitoring equipment. Evaluates job impact on operational facility systems, i.e., ventilation, power distribution and radioactive waste collection (liquid and solid). Provides training on systems for less qualified Technicians. Provides radiological evaluation for handling of radioactive material on and off-site. Cognizant of DOT Regulations and requirements for shipping and receiving radioactive materials. Maintain qualification to assume overall Site radiological control responsibilities during back shift or weekends and administer First Aid or CPR. Acts as Facility Chief Technician in the absence of assigned Chief and provides assistance in evaluations of industrial safety, industrial hygiene and fire safety. ⁽³⁴⁵⁾
ANL-W	Engineering Technician II	Assist in employee sampling program, which includes (but is not limited to) the following parameters: asbestos, solvents, metals, noise. Assist in ANL-W site-wide asbestos identification program. Perform calibration on industrial hygiene monitoring equipment. Maintain required documentation and reports. ⁽³⁴⁶⁾
ANL-W	Equipment Operator	Loads and secures shipping containers for hazardous materials, both radioactive and non-radioactive, and operates vehicle to deliver shipments in a safe and timely manner complying with all applicable laws and regulations. Operates cars, pickups, trucks, dump trucks with or without snow plow and semis to transport material and equipment to locations on and off the INEEL and for snow removal. Operates other materials handling equipment, e.g., bridge cranes, forklifts, mobile cranes to 15-ton rating with supervision from Materials Services Supervisor or Heavy Equipment Operator (HEO) to load, unload, and move material and equipment at ANL-W. Assists the Rigger or HEO in the inspection of objects to determine weight and the center of gravity for rigging method and route of movement. Assists in the selection of and attachment of rigging tackle to minimize the likelihood of damage to items or injury to personnel. Assists with training other employees in ANL-W driving assignments. Participates in training / retaining programs required. Performs other duties as directed by supervisor such as transport materials on and off the INEEL site. ⁽³⁴⁷⁾
ANL-W	Equipment Operator	Operate the ANL-W van as required to provide evening transportation for employees; transporting visitors and dignitaries to and from the site; providing pick up and delivery of supplies and materials both on and off-site. Operates cars, pickups, trucks, and forklifts to 10 ton, etc. to load, unload, and distribute material to locations on and off-site. Participates in training programs offered by Supply Department. Participates in training / retraining programs required by ANL-W requirements. Assists in annual and special physical inventories directed by Material Controller. Performs other duties as directed by supervisor. ⁽³⁴⁸⁾

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
ANL-W	Material Handler	Assists controller in shipping and receiving operations which includes: Receives incoming shipment (unloading freight, checking material against freight bills for count and damage, preparing damage inspection reports if necessary, checking material against purchase order and operates a computer terminal for data entry and retrieval. Assists Shipping/Receiving Controller in shipping operations as required. Escorts trucks. Assists in maintaining the shipping receiving areas in a neat and orderly manner. Operates cars, pickups, trucks up to and including 5-ton rating), and forklifts to 10 ton, etc. to load, unload, and distribute material to locations on and off the INEEL. Participates in training programs offered by Supply Department. Participates in training / retraining programs required by ANL-W requirements. Assists in annual and special physical inventories directed by Material Controller. Performs other duties as directed by supervisor. ⁽³⁴⁹⁾
ANL-W	Instrument and Control Technician III	Calibrates facility instrument systems. Pursues qualification as an Instrument & Control Technician IV. Troubleshoots and repairs malfunctioning equipment in the facilities as requested by the maintenance supervisor. Participates in the technician training / retraining program required by DOE Orders and ANL requirements. This includes selected management training, guided self-study, and oral and written examinations. Perform routine preventative maintenance or other similar duties as requested by maintenance supervisor. Performs preparation, installation, inspection, and checkout work for changes to facility systems. Fabricates instrument systems, including panel layouts. ⁽³⁵⁰⁾
ANL-W	Instrument and Control Technician Senior	Preventative maintenance and calibration of electronic, pneumatic, radiation, and NRAD instruments. Maintenance and troubleshooting of element examination, facility controls, and hot-cell remote handling equipment. Fabricate, checkout, and qualify new and/or updated controls. Train and qualify in specific procedures for normal and emergency operations of the facility, systems, and equipment. Interface with scientific and engineering staff personnel associated with experiment handling, experimental devices, and facility systems and equipment. ⁽³⁵¹⁾
ANL-W	Engineering Technician Senior	Prepares engineering evaluations of proposed Engineering Task Authorization (ETAs). Prepares detailed designs, including drawings, sketches, specifications and procurement documents for approved ETA proposals. Performs engineering analysis (load studies, short circuit analysis, system coordination studies, system instrumentation and control studies etc.) Of electrical systems, processes and equipment controlled, operated and/or maintained by Maintenance, to determine operating characteristics, requirements and parameters. Provide technical input and review maintenance procedures and facility changes for the systems equipment and processes that come under the purview of Maintenance. Recommend plant equipment upgrades and, where required, serves as the Responsible Engineer for facility changes. Provide day-to-day engineering and evaluations to Maintenance management and supervisors. Provide consultation services to other ANL-W engineering groups, management and organizations on the technical requirements of equipment, systems and their operations to meet current codes, standards, requirements and practices. ⁽³⁵²⁾

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
ANL-W	Chief Technician II - Chemistry Section (CS)	Coordinates and supervises the daily activities of the EBR-II Chemistry Section. This includes, but is not limited to, reviewing time cards, scheduling vacation and sick leave coverage, selecting prospective new hires, recommending disciplinary action, and completing personnel evaluations with minimum direction from the Manager, EBR-II Operations. Provides liaison between support groups and the EBR-II Chemistry Section for maintenance and other services. Maintains chemical and other material stocks for routine chemistry operations. Continually updates personal knowledge EBR-II chemistry systems, plant and procedural changes and their effects on plant chemistry, emergency procedures, radiation safety and control, health and safety, and the EBR-II Technical Specifications; and documents this effort by re-qualifying annually or biennially, as required, in each area. Maintains qualification as a Hazardous Materials Technician. Assists in troubleshooting plant-chemistry systems, components, and methods. Assists in checkout of new chemistry systems and procedures. Performs duties of chemistry technician as required. Continuously stays current with plant operating conditions, maintenance activities, and chemistry systems operations through daily log review and frequent tours of the plant. Ensures that the Manager, EBR-II operations is informed of specific plant changes or problems with chemistry systems. Assists in preparing and implementing operating and experimental procedures, data logs, and training material, and in on-the-job training of EBR-II Chemistry Technicians and plant operators. ⁽³⁵³⁾
ANL-W	Nuclear Facility Operator II, III, IV, or Senior	Operates and performs some maintenance on facility equipment / systems to meet facility mission and operational requirements during both normal and abnormal operation and maintenance. Facility equipment / systems may include overhead handling systems, remote handling equipment, shielded systems, remote examination equipment and remotely operated, maintenance and administrative procedures. Operation includes evaluation of operating and production data for acceptability and taking actions in response to out-of-specification or out-of-limit conditions. Maintain accurate records of facility operation, equipment performance, production and experimental data in data logs, logbooks, process work sheets or other data packages as required by facility programs and administrative procedures. Qualify in general facility operation and designated specialized areas of facility operation. After qualification in one or more areas is achieved, maintain qualification through biennial examinations. For all qualified areas, assist operator trainees by giving oral checkouts on qualification topics; supervise operator trainees during on-the-job training activities and performance of practical factors. As requested, review and provide operational input to proposed procedures and procedural revisions and proposed modifications to facility systems / equipment. ^(354, 355, 356, 357)

Exhibit 12.4 (continued): LMITCO and ANL-W Non-exempt Technician Disciplines ⁽³³⁷⁾

Company	Job Title	Description
ANL-W	Operations Specialist	Performs routine maintenance on utility systems and facility support equipment such as mechanical, hydraulic, pneumatic, steam, compressed gases, compressors, fans, generators, pumps, mobile and stationary gasoline and diesel engines, potable and fire protection water systems, and industrial, sanitary and contaminated (radioactive) waste systems. Troubleshoots and repairs malfunctioning utility and site facility equipment as requested by Utilities Supervisor. Responds to ANL-W site facilities during emergency and off-normal situation. Troubleshoots problems involving utility and facility support equipment. Takes necessary corrective action to return systems / equipment to normal operating condition. Operates utility systems and site facility equipment in assigned areas of responsibility. Maintains, adjusts, and repairs utility systems and facility support equipment controls and control systems in assigned area of responsibility. Makes emergency repairs and adjustments to electrical systems and controls. Makes minor adjustments and repairs to refrigeration systems. Operates auxiliary steam boilers for short periods of time in emergencies. Directs the conduct of work in accordance with procedures and/or direction from the Utilities Supervisor. ⁽³⁵⁹⁾

Exhibit 12.5: LMITCO Parent Job Family Structures: 1999 Non-exempt Groups ⁽³⁵⁹⁾

Job Family	Purpose of Family	Duties
Engineering / Laboratory Technician	This family is designed for positions assisting engineers or scientists in either an electro/mechanical setting or in a laboratory setting.	1. Fabricate, modify, assemble, calibrate, adjust, test, maintain electronic, electro/mechanical, mechanical, optical devices, instruments, systems, processes. 2. Set up/operate test equipment to evaluate the performance of prototypical devices, analyze test data, and recommend modifications. 3. Purchase and maintain chemical equipment inventories, prepare reagents and solutions, record and analyze test data.
Experimental Power Reactor Operator (EPRO)	This specialized family is designed for positions specific to the Advanced test Reactor (ATR) in performing routine reactor, plant, and/or experimental reactor operator work.	1. Train for next high level of certification and/or position. 2. Collect, record, calculate, and interpret reactor, experiment chemistry and operational data. 3. Perform reactor startup, shutdown, power reduction recoveries, power changes, balancing manipulations, and experimental tests utilizing reactor controls. 4. Review and update required procedures / documentation. 5. Survey and monitor reactor, plant, and/or experiment systems and log instrument readings to detect changes and maintain historical records.
Field Service Technician	This family is designed for positions performing mechanical or electrical technician duties in the field in support of operational activities, experiments, sampling, etc. It also includes those positions that provide technician support to diagnose and resolve equipment problems for computers and peripherals at the desktop and enterprise levels.	1. Design, install, modify, troubleshoot, diagnose problems, and perform onsite preventative and corrective maintenance on electrical equipment such as communication devices, systems, alarms, personal computers, radios, drill rigs, sampling systems etc. 2. Connect, install, test, upgrade, maintain computer hardware, and software components. 3. Report on inspection and repair activities. 4. Develop design modifications.

Exhibit 12.5: LMITCO Parent Job Family Structures: 1999 Non-exempt Groups ⁽³⁵⁹⁾

Job Family	Purpose of Family	Duties
Operations Technician	This family is designed for positions that require a working knowledge of an operational process, e.g. hazardous waste handling, shipping, receiving and storing, specialized equipment storage and maintenance, preventative and corrective maintenance planning and scheduling support. Incumbents in this family may do some data /administrative work.	1. Inspect, stock, and maintain specialized equipment such as Anti-Cs and Self Contained Breathing Apparatus. 2. Support warehousing activities such as receipt, inspection, staging, storage, and dispensing of non-hazardous and hazardous materials and inventories. Operates equipment in support of these activities (i.e. fork lift, flatbed truck, etc.) May be trained in hoisting and rigging techniques and hazardous materials. 3. Perform maintenance walk downs, receive and review work packages for completeness. May provide direction and clarification to crafts in support of the planning and scheduling functions. Able to integrate material/vendor/craft support, procurement actions, quality assurance reviews and program operational requirements. 4. Operate specialized process equipment, cranes, wall-mount manipulators, and overhead and master slave manipulators to support remote and physical handling of radioactive and hazardous fuels, materials or equipment. 5. Support waste processing activities by operating specialized equipment to inspect and identify waste types. May disposition LLMW by characterization of the waste, identifying its physical description and radiological composition, and coordination of the waste disposal process.
Quality Assurance / Construction Inspection Technician	This family is designed for positions in-service inspections and tests, and/or surveillance services for an organization and may include the nondestructive inspection of construction projects with the review of drawing, equipment, and supplies in accordance with a project plan.	1. Witness or perform civil, structural, electrical, mechanical, or nondestructive inspections of construction projects. 2. Review materials and equipment received or fabricated against purchase/design specifications to ensure acceptability. 3. Review plans and specifications for future construction projects, provide input on design reviews, inspection, planning, and pre-design investigations. 4. Perform in-service inspections, tests, and surveillance services to ensure adherence to quality standards.

Exhibit 12.6: Total Number of OCAW Remediation Workers at INEEL by Facility Area in 1998 ⁽⁵⁶⁾

Job Classification	TAN (WMTO)	TRA	INTEC	CFA	PBF/WROC (WERF)	EBR-I	RWMC (WMF)	NRF	ANL-W	SITEWIDE	IDAHO FALLS (IRC/WCB/IF)	TOTALS
Analyst A	0	0	7	0	0	0	0	0	0	0	0	7
Apprentices	1	1	2	5	1	0	8	0	0	0	0	18
Carpenter Finish	1	1	4	8	0	0	2	0	0	0	1	17
Clothing Issue Technicians	0	0	5	0	0	0	0	0	0	0	0	5
Custodian	0	5	13	14	2	0	3	0	0	4	0	41
Decontamination Technicians	0	0	6	0	0	0	0	0	0	0	0	6
Electrician 1-C	4	11	15	23	2	0	4	0	0	0	2	61
Equipment Operator	0	0	6	9	3	0	5	0	0	0	1	24
Fuel Storage - Senior Operator	0	0	32	0	0	0	0	0	0	0	0	32
Heavy Equipment Operator	2	2	5	14	5	0	9	0	0	0	1	38
HLW Operations - Operator	0	0	2	0	0	0	0	0	0	0	0	2
HLW Operations - Senior Operator	0	0	51	0	0	0	0	0	0	0	0	51
Instrument Technician	2	8	24	2	2	0	2	0	0	0	0	40
Instrument Technician Special	0	2	8	0	1	0	0	0	0	0	0	11
Insulator 1-C	0	0	4	0	0	0	0	0	0	0	0	4
Laborer	5	4	2	51	1	0	9	0	0	0	2	74
Lineman	0	0	0	9	0	0	0	0	0	0	0	9
Locksmith 1-C	0	0	0	2	0	0	0	0	0	0	1	3
Machinist 1-C	0	7	4	1	0	0	0	0	0	0	0	12
Machinist Specialist	0	0	1	0	0	0	0	0	0	0	0	1
Mechanic 1-C	4	7	12	12	1	0	5	0	0	0	2	43
Operation - Senior Operator	0	26	0	0	0	0	0	0	0	0	0	26
Operator	0	2	0	0	0	0	0	0	0	0	0	2

Exhibit 12.6 (continued): Total Number of OCAW Remediation Workers at INEEL by Facility Area in 1998 ⁽⁵⁶⁾

Job Classification	TAN (WMT0)	TRA	INTEC	CFA	PBFWROC (WERF)	EBR-I	RWMC (WMF)	NRF	ANL-W	SITEWIDE	IDAHO FALLS (IRC/WCB/IF)	TOTALS
Painter 1-C	1	1	1	7	1	0	2	0	0	0	0	13
Painter 2-C	0	0	0	1	0	0	0	0	0	0	0	1
Pipefitter 1-C	3	7	12	17	0	0	1	0	0	0	1	41
Power Dispatcher	0	0	1	3	0	0	0	0	0	0	0	4
Radiation Control Technicians	3	19	50	12	7	0	13	0	0	0	2	106
Service Disposal Operator	0	0	0	2	0	0	0	0	0	0	0	2
Sheetmetal Mechanic 1-C	0	0	0	2	0	0	0	0	0	0	0	2
SWEPP - Senior Operator	0	0	0	0	0	0	7	0	0	0	0	7
Tool Crib Attendant	1	2	1	1	0	0	1	0	0	0	0	6
Utility Operators - Senior Operator	7	0	26	0	0	0	0	0	0	0	0	33
Vehicle Repair Specialist	0	0	0	24	0	0	0	0	0	0	0	24
Waste Handling Technician I	0	0	4	0	0	0	0	0	0	0	0	4
Waste Handling Technician II	0	0	4	0	0	0	0	0	0	0	0	4
Welder 1-C	2	4	8	8	0	0	0	0	0	0	0	22
WERF - Senior Operators	0	0	0	0	15	0	0	0	0	0	0	15
TOTALS	36	109	310	227	41	0	71	0	0	4	13	811

Job Classifications not included: Senior Printers (+5 years), Printer II (+2 years), Telephone Operator, Part Time Telephone Operator, Chef, First Cook (over 12 months), Production Cook, Cooks, Griddle Cook, Mail Clerk (labeler), Mail Clerk 1-C (over 18 months), Mail Clerk (6-18 months), Master Photographer, Senior Photographer, Photographer, Microfilmer, Senior Occupational Health Nurses (RN, EMT), Part Time Senior Occupational Nurse, LPN Examining Tech A, Senior Industrial X-Ray Technologist

Exhibit 12.7: Total Number of LMITCO Remediation Workers at INEEL by Facility Area in 1998 ⁽⁵⁷⁾

Job Classification	TAN (WMT0)	TRA	INTEC	CFA	PBF/WROC (WERF)	EBR-I	RWMC (WMF)	NRF	ANL-W	SITEWIDE	IDAHO FALLS (IRC/WCB/IF)	TOTALS
Analyst A	0	2	6	0	0	0	0	0	0	0	0	8
Analyst B	0	0	0	0	0	0	0	0	0	0	0	0
Carpenter 1/C	1	1	3	8	0	0	2	0	0	0	1	16
Carpenter 2/C	0	0	0	0	0	0	0	0	0	0	0	0
Carpenter Appr	0	0	2	0	0	0	0	0	0	0	0	2
Carpenter Finish	0	0	0	0	0	0	0	0	0	0	0	0
Custodian	0	6	13	19	2	0	3	0	0	0	0	43
Decon Tech	0	0	0	0	0	0	0	0	0	0	0	0
Electrician 1/C	3	13	16	21	2	0	4	0	0	0	2	61
Electrician 2/C	0	0	0	0	0	0	0	0	0	0	0	0
Electrician Helper	0	0	0	0	0	0	0	0	0	0	0	0
Electrician Appr	0	1	2	1	0	0	0	0	0	0	0	4
Equipment Operator (EO)	0	0	4	10	2	0	6	0	0	0	1	23
Experi Machinist 1/C	0	0	0	0	0	0	0	0	0	0	0	0
Experi Machinist Appr	0	0	0	0	0	0	0	0	0	0	0	0
Fitter 1/C	3	7	12	17	0	0	1	0	0	0	1	41
Fitter 2/C	0	0	0	0	0	0	0	0	0	0	0	0
Fitter Appr	0	0	0	1	0	0	0	0	0	0	0	1
Heavy Equipment Operator (HEO)	2	3	5	11	5	0	7	0	0	0	1	34
Instrument 1/C	1	8	24	2	2	0	3	0	0	0	0	40
Instrument 2/C	0	0	0	0	0	0	0	0	0	0	0	0
Instrument Appr	0	0	0	0	0	0	1	0	0	0	0	1
Instrument Specialist	0	2	8	0	1	0	0	0	0	0	0	11
Insulator 1/C	0	0	3	0	0	0	0	0	0	0	0	3
Insulator Appr	0	0	0	0	0	0	0	0	0	0	0	0
Laborer	4	5	3	53	1	0	13	0	0	0	2	81
Locksmith 1/C	0	0	0	1	0	0	0	0	0	0	1	2
LSRAO	0	9	0	0	0	0	0	0	0	0	0	9
Machinist 1/C	0	8	4	2	0	0	0	0	0	0	0	14

Exhibit 12.7 (continued): Total Number of LMITCO Remediation Workers at INEEL by Facility Area in 1998 ⁽⁵⁷⁾

Job Classification	TAN (WMT0)	TRA	INTEC	CFA	PBF/WROC (WERF)	EBR-I	RWMC (WMF)	NRF	ANL-W	SITEWIDE	IDAHO FALLS (IRC/WCB/IF)	TOTALS
Machinist Specialist	0	0	1	0	0	0	0	0	0	0	0	1
Mechanic 1/C	4	9	11	13	1	0	4	0	0	0	2	44
Mechanic 2/C	0	0	0	0	0	0	0	0	0	0	0	0
Mechanic Appr	0	0	0	1	0	0	0	0	0	0	0	1
Operator	0	1	1	0	0	0	0	0	0	0	0	2
Operator Helper	0	0	0	0	0	0	0	0	0	0	0	0
Operator SWEPP Appr	0	0	0	0	0	0	6	0	0	0	0	6
Operator WERF Appr	0	0	0	0	2	0	0	0	0	0	0	2
Painter 1/C	1	1	1	7	1	0	2	0	0	0	0	13
Painter 2/C	0	0	0	1	0	0	0	0	0	0	0	1
Painter Appr	0	0	0	1	0	0	0	0	0	0	0	1
Power Dispatcher	0	0	0	5	0	0	0	0	0	0	0	5
RCT	4	22	47	8	11	0	16	0	0	0	1	109
Senior Decon Tech	0	0	6	0	0	0	0	0	0	0	0	6
Senior Operator	6	19	111	0	13	0	8	0	0	0	0	157
Sheet Metal Mech 1/C	0	0	0	2	0	0	0	0	0	0	0	2
Service Disposal Operator	0	0	1	1	0	0	0	0	0	0	0	2
Tool Crib Attendant	1	2	0	1	0	0	1	0	0	0	1	6
Waste Handler Tech	0	0	8	0	0	0	0	0	0	0	0	8
Welder 1/C	2	4	8	8	0	0	0	0	0	0	0	22
Welder 2/C	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	32	123	300	194	43	0	77	0	0	0	13	782

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

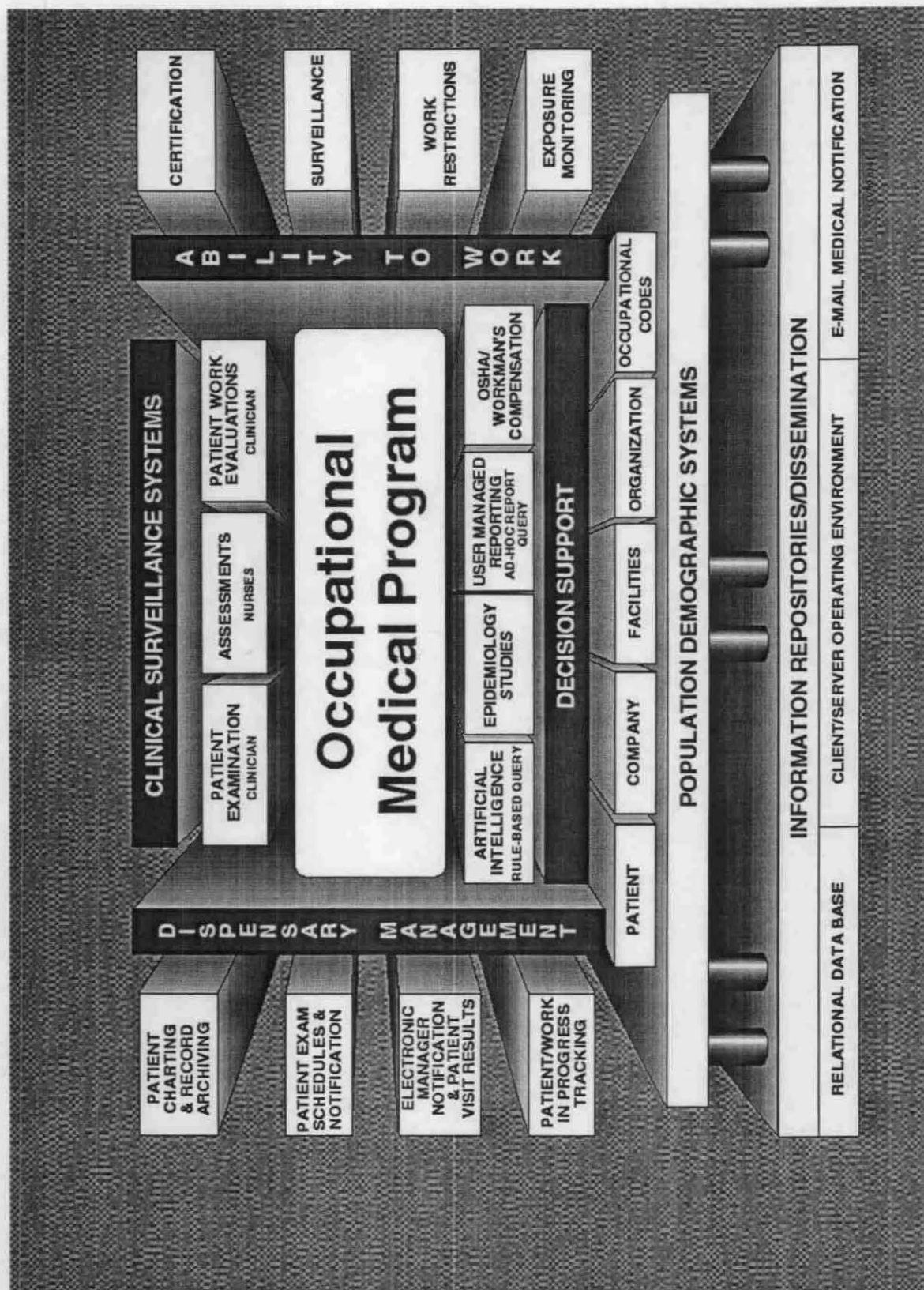


Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Employee Visit	
Actions Empl Miscellaneous PIP WIP Summary Window Help	
Employee Search Criteria	
S Num: ZZZZZ	SSN: [] [] [] [] [] []
Exam Information	
Last Exam: 01-01-2000	Exam Type: C
Next Exam: 01-01-2001	Next Type: C
Employee Information	
Name: MGR . UNKNOWN	Age: 70 Sex: F
SSN: ZZZ-ZZ-ZZZZ	Status: T Full/Part: F Service: F Facility: []
Phone Num: -	Mail Stop: [] Occ. Code: TEMPORARY OCCUPATION CODE
Employee Dates	
Birth Date: 01-01-1930	INEL Start Date: [] Hire Date: 10-01-1999
Term Date: 09-30-1990	
Employee Manager	
Name: [] []	Phone: [] [] Mail Stop: []
Employee Org	
Org Id: 9999	Company: BECHTEL BWXT IDAHO, LLC
Employee Visit Information	
☒ Visit Type: EVAL-MED	
☒ Dispensary:	
☒ Open Injury Illness Event(s): YES	

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Schedule Physical Examination

Actions Window Help

Patient

Name: **M** UNKNOWN S Num: ZZZZZ

Birth Date: 01-01-1930 Age: 70

Examination Dates

Last 01-01-2000 Type: C

Current 02 - 08 - 2000 Type:

Projected - - Type:

Voluntary/Mandatory: M

Active Certifications

HOISTING AND RIGGING WORKER
FORKLIFT OPERATOR-PROFESSIONAL

Active Surveillances

LASER OPERATOR

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Assign/Update Employee Certifications Codes

Actions Cert List Summary Elect Note Window Help

Patient

Name: M UNKNOWN

Examiner User-Id

Description	Examiner	Begin Date	End Date
HOISTING AND RIGGING WORKER		11 02 1995	
FORKLIFT OPERATOR-PROFESSIONAL	CRE	12 19 1996	

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Assign/Update Employee Surveillance Codes
Actions Sury List Summary Elect Note Window Help

Patient
Name: **M** UNKNOWN

Examiner User-Id

Description
LASER OPERATOR

Examiner Begin Date End Date
CRE 08 21 1997

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Patient In Progress

Action Imm/Dies Vitely Lab Vision Summr Wip Sched exam Empl Visit Window Help

Dispensary

[64] WCB II [BACKUP] [Y]

Patient Name	S Num	Date	Start	Close	Visit Type	Ex-ID
EMPLOYEE, NON-INEEL	XXXXXX	10/29	11:55		EVAL-MED	
EMPLOYEE, NON-INEEL	XXXXXX	10/29	11:55		EVAL-MED	

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Nurse Immunization/Injection
Action Reaction List-Immun/Inj/Route/Site Window Help

Patient
Name: N EMPLOYEE S Num: XXXXXX Event: 151045

☒ Medication Name

Nurse User-Id

Reaction Noted

Dose Amount

Side of Body

Route

Site

Medicine Mfg.

Lot Control Number

History

Date Given 02-08-2000 (MM-DD-YYYY)

Expiration Date

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEL OMP - Nurses Patient Desensitization					
Action Window Help					
Patient Information					
Name	N	EMPLOYEE	S Num	XXXXXX	
Nurse UserID for this entry					
Previous Desensitizations					
Date Given	Extract	Expiration	Dose Amount	Dilution	Arm React
09-13-1999	32 BIT GEN	10-10-1999	.4CC	.3	L N
Current Desensitizations					
Extract	Expiration	Dose Amount	Dilution	Arm	Reaction

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Nurse Vitals
Action Blood Pressure Medication Allergies Vision Soap W/P P/P Window Help

Patient
Name: N EMPLOYEE S Num: XXXXXX

Nurse User-Id: Visit #: 151045

Vitals
Hght (IN) 68 Wght (LB) Temp (F) BP L/R A/L Cuff
R/R Pulse A/R R/I

Medications ☒ **Allergies** ☒
NO KNOWN ALLERGIES

Immunizations
09-13-99 FLU VACCINE
09-30-98 DT

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - In-House Lab
Action Window Help

Patient Information

Name	N	EMPLOYEE	S Num	XXXXXX
------	---	----------	-------	--------

Nurse Userld

Blood Glucose Strep Culture ☐ PAP ☒ Stool's Positive N/A /6

Urinalysis

Color	YELLOW/AMBER	Occult Blood	NEGATIVE
Appearance	CLEAR	Ph	
Glucose	NEGATIVE	Protein	NEGATIVE
Bilirubin	NEGATIVE	Urobilinogen	
Ketone	NEGATIVE	Nitrite	NEGATIVE
Spec. Gravity		Leukocytes	NEGATIVE

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Vision	
Action Window Help	
Patient Information	
Name N	EMPLOYEE S Num XXXXXX
General Information	
Examination Date	Nurse Used ☐ Glasses ☐ Contacts ☐
Depth Perc ☐ /9	Color Vision ☐ /8 Visual Field
Tonometry	
Right Eye Avg. MM Hg	Left Eye Avg. MM Hg
Far Vision 20/XXX	
Uncorrected	Corrected
Both	Both
Right	Right
Left	Left
Near Vision 14/XXX	
Uncorrected	Corrected
Both	Both
Right	Right
Left	Left

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Physical Exam									
Actions History Physical Certifications Surveillances W/P Summary Window Help									
Patient									
Name: M	UNKNOWN	S Num: ZZZZZ	Age: 70	Sex: F					
Birth Date: 01-01-30	Facility:	Job Desc: TEMPORARY OCCUPATION C							
Vitals									
Vitals Date: 03-15-1999	Pulse:	Weight: 200	Temp:						
Blood Pressure Date: 03-15-1999	Blood Pressure: 130/80	[Select 'Summary' to view history data]							
Medications: Y	Allergies: Y								
Active Certifications									
HOISTING AND RIGGING WORKER									
FORKLIFT OPERATOR-PROFESSIONAL									
Active Surveillances									
LASER OPERATOR									
Active Restrictions									
C NO HEAT STRESS									
C NO RESPIRATOR TRAINING OR USE									
Visit #: 159913									
P P									

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Patient Habits and Diseases			
Patient			
Name:	M	UNKNOWN	Sex: F
S Num:	ZZZZZ	Birth Date:	01-01-1930 Age: 70
Past Surgical Procedures:	TEST 12/3 NONE		
Past Medical Illnesses/Events:	NONE		
Significant Past Injuries:	NONE		
Industrial Exposures:	NONE		
Travel History of Significance:	NONE		
Family History:	RETEST		
Examiner ID: INELOMP		Cancel	Refresh

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Patient Habits and Diseases

Patient

Name:	M	UNKNOWN	Sex:	F	
S Num:	ZZZZZ	Birth Date:	01-01-1930	Age:	70

Cigarettes -	Packs/Day:	0	Pack Years:	0	Year Quit:	
Oral Tobacco -	Cans/Wk:	0	Years Used:	0	Year Quit:	
Alcohol -	Drinks/Wk:	0			Year Quit:	
Caffeine -	Cups Equivalent/Day:	0				

Discussed disease prevention with patient (Y/N): ☐

PAP, MAMMOGRAMS, BREAST, WEIGHT, EXERCISE, HOBBIES, SLEEP, STRESS, EYE/DENTAL EXAMS, SKIN AND BACK CARE, HEARING PROTECTION, HOME SAFETY, SEAT BELTS

Examiner ID: INELOMP

Systems History Cancel Refresh

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Patient Habits and Diseases

Patient

Name:	M	UNKNOWN	Sex:	F	
S Num:	ZZZZZ	Birth Date:	01-01-1930	Age:	70

Review of Systems:

NEGATIVE: HEENT, INTEGUMENT, PULMONARY, CARDIOVASCULAR, GI, GU, M/S, NEURO, REPRODUCTIVE

Additional Comments:

Examiner ID: INELOMP

Exam Habits Exit Refresh Summary

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Nurse Soap [Icons]

Action List Mechanisms Additional Text PIP W/P Window Help

Current Visit #: 159913 Injury Ill #: 0

Patient Name: M UNKNOWN S Num: ZZZZZ

EVENT DATE: [] [] [] [] [] [] [] [] [] []

Possible Work Related (Y/N): [] Nurse User Id: [] Date: []

☐ Employee has missed more than 40 hours of work for this injury/illness.

Subjective: []

Objective: []

Assessment: []

Plan: OMP EXAMINER EVALUATION []

Additional text entered for event: NO ☐ No further followup

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

INEEL OMP - Chronic Problem ICD9/Restrictions
Actions Active ICD9 Restrictions Summary Elect Note Window Help

Current Visit #: 159913

Patient
Name: M UNKNOWN S Num: ZZZZ

Examiner User-Id: INELOMP

Diagnosis:

Visit #: 159913
☒ ICD9:
☒ Active ICD9: X Year Noted: 2000 Resolved:

Restrictions
Type P/T Description

Type	P/T	Description

Exhibit 12.8: INEEL Occupational Medical Program, the Occupational Medical Surveillance System (OMSS)

Task INEL OMP - Patient Chart Summary

Actions Problems Eval Hist/Phy Lab Exposure Misc Chart C/S/R E-Note Images Window Help

Patient

Name: M UNKNOWN S Num: ZZZZ

Temporary Problems

FASDASD
JDSFLKFJSLKD;JF
TEST DOE MAILING
TEST 12/23

Chronic Problems

TEST
TEST TEST
TEST 8/21 AGAIN SECOND VISIT
TEST 09/16

Exhibit 12.9: INEEL Site Radiological Performance Indicators for 1997 as Reported by the DOE Office of Oversight ⁽⁸⁹⁾

Performance Indicator	INEEL
Number of Radiation Worker (RW) - RW I/RW II	856/1832
Number of Personnel Issued Routine Dosimeters	4500
Number of Personnel with Measurable Exposure (EDE)	850
Cumulative Person-Rem (TEDE)	85
Site Administrative Control Levels (ACL) (millirem)	1500
Number of Worker exposures > ACL	0
Number of Administrative Overexposures > ACL	0
Highest Individual Dose	1108
Number of Internal Exposures (> 100 mrem)	0
Intakes > 100 mrem found by Routine Bioassay Sampling	0
Highest Dose Work Group (HDWG) on Site	Operations Personnel
ALARA Measures Taken for HDWG (Yes/No)	Yes
Number of General/Specific RWPs	589/1021
Percent Collective Dose Attributable to Specific RWPs	70%
Reduction of Contaminated Areas (size)	7%
Number of Personnel Skin Contaminations Reported	13
Number of Airborne Radioactivity Alarms/Total Number of Continuous Air Monitors	1/227
Number of Lost Accountable Sources/Number of Accountable Sources	2/1418
Radiological Releases (> limits) to the Environment	0
Number of Contamination Spreads Outside Contamination Areas/ Radiological Boundary Areas	10
Number of Radiological Occurrences Reported	44

Exhibit 12.10: INEEL Occupational Radiation Exposure Summary Data 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
IDAHO SITE	Pipe Fitter	1	240.70	806	469	58.19%	194,007	414	193,939	18	247,933	68,721
IDAHO SITE	Health Technicians	2	151.45	589	427	72.50%	89,203	209	87,950	1,208	104,871	14,638
IDAHO SITE	Radiation Monitors/Techs.	3	118.36	952	467	49.05%	112,679	241	110,539	1,289	142,852	13,224
IDAHO SITE	Health Physicist	4	97.17	484	218	45.04%	47,028	216	45,911	1,057	57,336	2,987
IDAHO SITE	Welders and Solderers	5	92.27	304	142	46.71%	28,049	198	27,879	0	33,071	13,886
IDAHO SITE	Operators, Plant/ System/Utili	6	84.01	3,433	1,735	50.54%	288,392	166	287,552	307	370,224	117,547
IDAHO SITE	Handlers/Laborers/Helpers	7	78.47	1,088	505	46.42%	85,373	169	74,540	656	96,461	36,182
IDAHO SITE	Groundskeepers	8	70.90	59	36	61.02%	4,183	116	4,168	15	5,465	1,237
IDAHO SITE	Misc. Transport	9	65.20	10	6	60.00%	652	109	652	0	652	21
IDAHO SITE	Mechanics/Repairers	10	64.26	1,047	478	45.65%	67,282	141	66,756	424	107,486	40,878
IDAHO SITE	Engineering Technicians	11	57.24	630	151	23.97%	36,061	239	35,342	719	56,275	27,684
IDAHO SITE	Equipment Operators	12	52.13	589	334	56.71%	30,704	92	30,079	582	33,447	4,390
IDAHO SITE	Machinists	13	46.80	495	169	34.14%	23,166	137	22,581	497	27,359	10,039
IDAHO SITE	Electricians	14	46.53	978	398	40.70%	45,511	114	45,413	98	62,536	13,872
IDAHO SITE	Misc. Precision/Product.	15	46.01	84	24	28.57%	3,865	161	3,847	18	5,333	2,140
IDAHO SITE	Miscellaneous	16	42.24	1,119	290	25.92%	47,271	163	44,257	541	49,190	6,498
IDAHO SITE	Carpenters	17	41.00	306	133	43.46%	12,546	94	11,869	0	20,480	5,413
IDAHO SITE	Sheet Metal Workers	18	40.20	71	34	47.89%	2,854	84	2,806	48	3,887	1,470

Collective TEDE = person-mrem

Average Measurable TEDE = mrem

Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

Exhibit 12.10: INEEL Occupational Radiation Exposure Summary Data 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
IDAHO SITE	Painters	19	39.88	225	87	38.67%	8,973	103	8,960	0	12,935	2,105
IDAHO SITE	Technicians	20	37.01	1,205	342	28.38%	44,601	130	42,532	2,022	62,063	31,671
IDAHO SITE	Masons	21	35.75	12	3	25.00%	429	143	429	0	575	0
IDAHO SITE	Unknown	22	24.64	23,242	2,576	11.08%	572,766	222	1,565,953	13,889	2,511,008	72,912
IDAHO SITE	Misc. Repair/Construction	23	22.87	1,653	327	19.78%	37,805	116	37,197	67	46,860	13,566
IDAHO SITE	Janitors	24	18.79	695	123	17.70%	13,057	106	12,886	129	15,742	2,343
IDAHO SITE	Misc. Technicians	25	16.71	2,662	637	23.93%	44,472	70	42,369	1,292	229,873	285,561
IDAHO SITE	Misc. Service	26	13.29	539	82	15.21%	7,163	87	7,137	26	8,293	956
IDAHO SITE	Machine Setup/Operators	27	10.28	90	23	25.56%	925	40	866	59	1,682	1,684
IDAHO SITE	Science Technicians	28	9.57	576	136	23.61%	5,514	41	5,217	269	7,825	32,501
IDAHO SITE	Firefighters	29	8.06	520	160	30.77%	4,192	26	4,177	15	4,565	407
IDAHO SITE	Misc. Professional	30	6.03	4,245	384	9.05%	25,587	67	24,449	735	30,057	8,483
IDAHO SITE	Scientist	31	5.44	2,210	303	13.71%	12,028	40	9,763	2,157	17,977	38,450
IDAHO SITE	Truck Drivers	32	5.37	272	23	8.46%	1,460	63	1,442	18	1,681	367
IDAHO SITE	Engineer	33	5.37	10,722	908	8.47%	57,538	63	54,850	2,389	75,472	15,940
IDAHO SITE	Security Guards	34	5.14	2,461	412	16.74%	12,651	31	12,527	124	16,413	3,347
IDAHO SITE	Manager - Administrator	35	4.68	6,530	537	8.22%	30,540	57	29,932	407	46,154	12,926
IDAHO SITE	Admin. Support and Clerical	36	3.26	4,199	226	5.38%	13,672	60	12,973	273	17,567	4,074

Collective TEDE = person-mrem

Average Measurable TEDE = mrem

Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

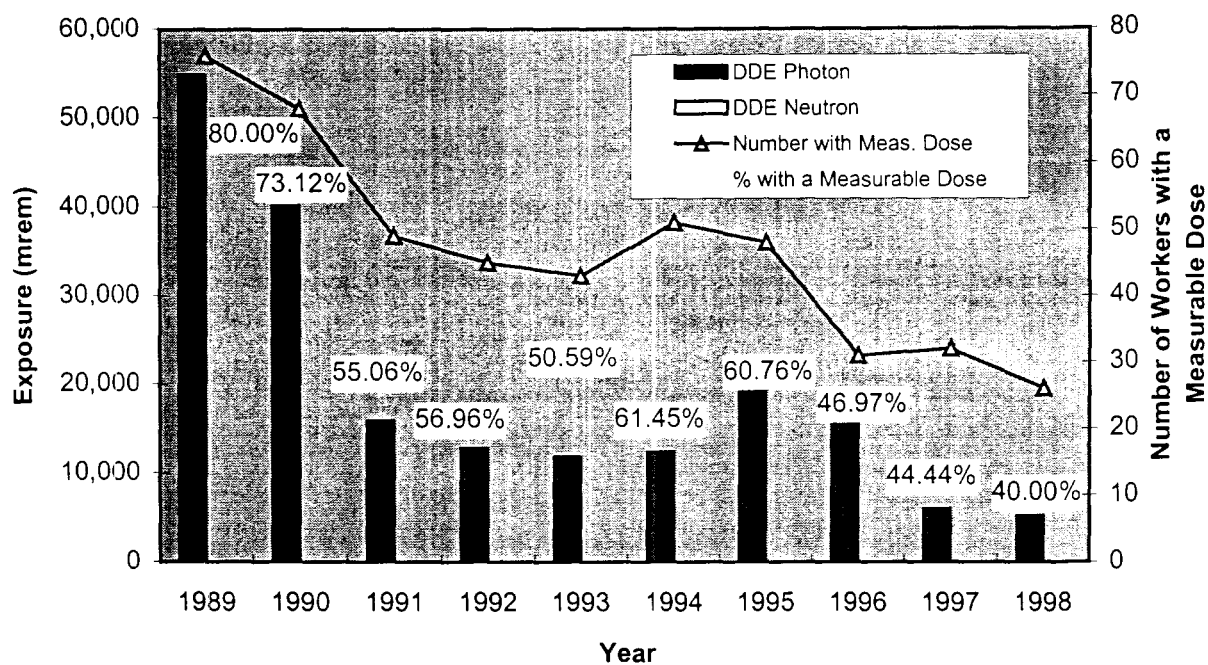
Exhibit 12.10: INEEL Occupational Radiation Exposure Summary Data, 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
IDAHO SITE	Pilots	37	3.13	24	6	25.00%	75	13	75	0	113	0
IDAHO SITE	Bus Drivers	38	1.94	185	13	7.03%	359	28	359	0	447	117
IDAHO SITE	Doctors and Nurses	39	1.91	140	9	6.43%	267	30	267	0	469	40
IDAHO SITE	Food Service Employees	40	0.75	214	8	3.74%	160	20	160	0	299	10
IDAHO SITE	Sales	41	0.48	21	1	4.76%	10	10	10	0	10	10
IDAHO SITE	Miners/Drillers	42	0.00	10	0	0.00%	0	0	0	0	0	0

Collective TEDE = person-mrem
Average Measurable TEDE = mrem
Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

Exhibit 12.11 A: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Pipefitters and Health Technicians

INEEL Site Pipefitters (Exposure Rank 1)



INEEL Health Technicians (Exposure Rank 2)

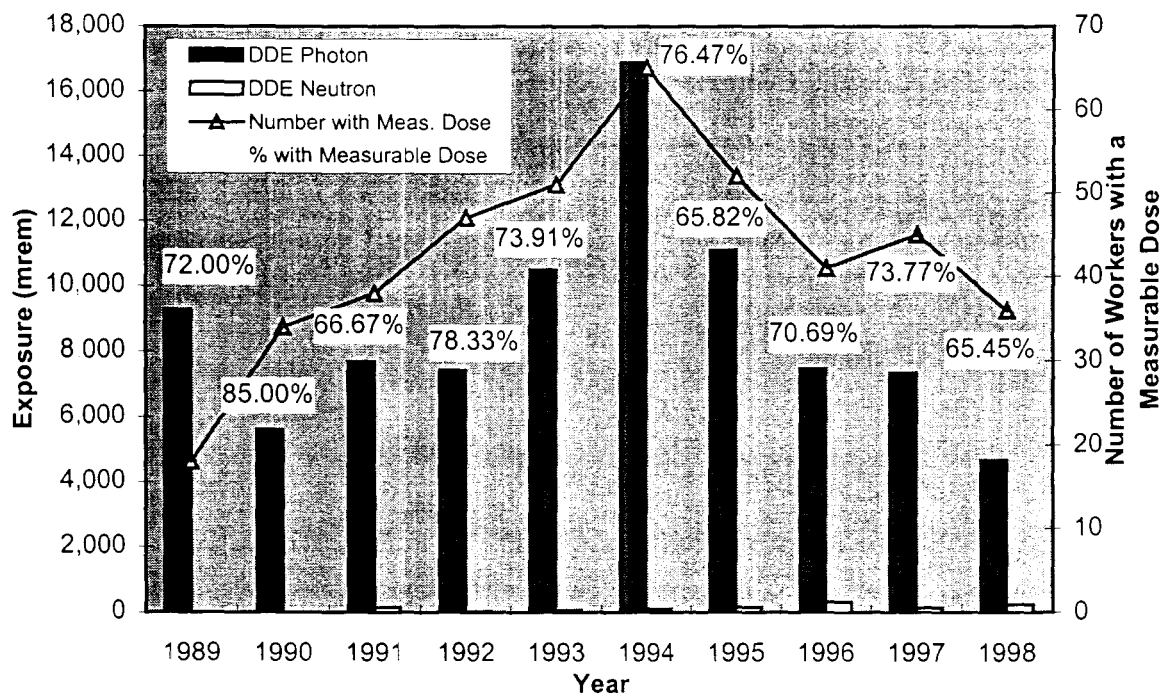
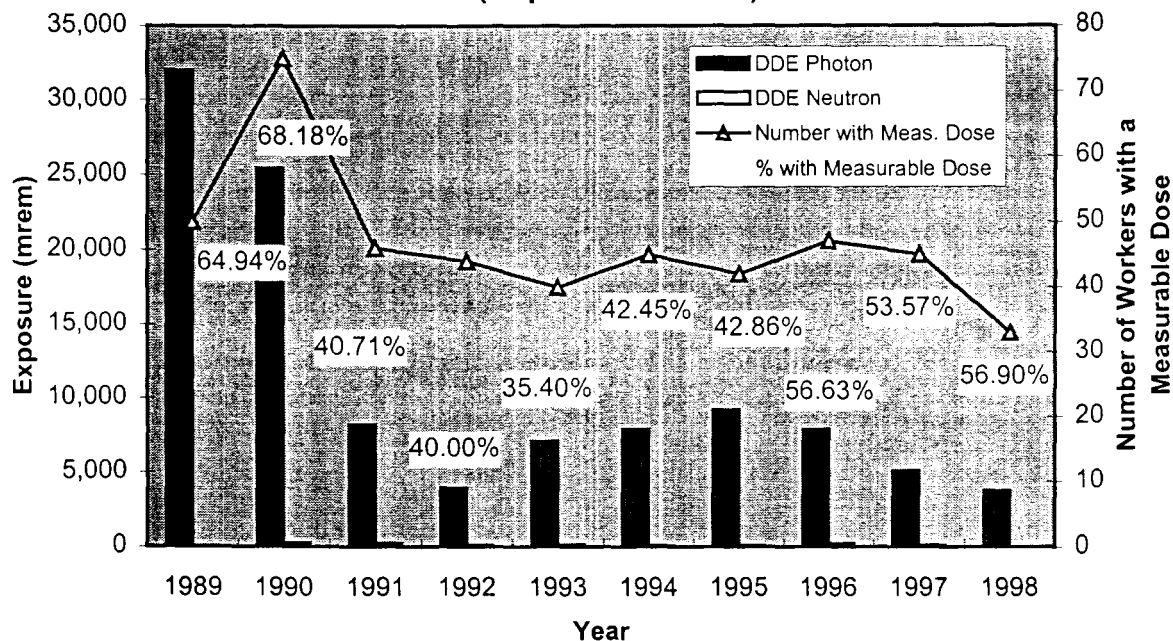


Exhibit 12.11 B: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Radiation Monitors / Technicians and Health Physicists

INEEL Radiation Monitors / Technicians (Exposure Rank 3)



INEEL Health Physicists (Exposure Rank 4)

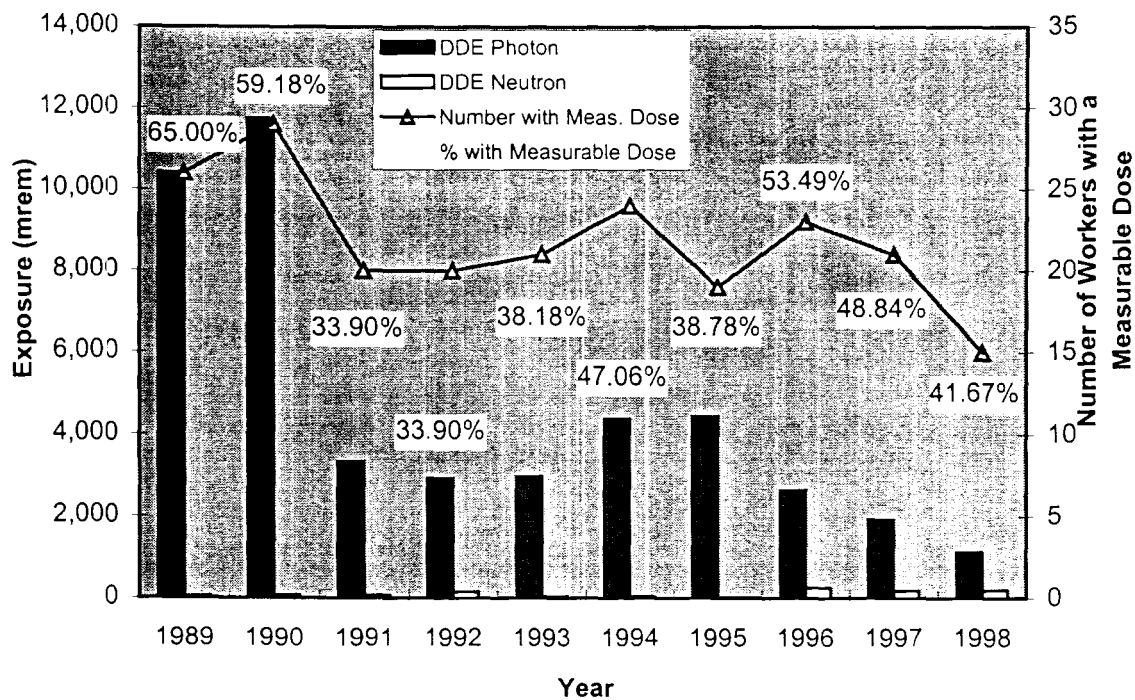


Exhibit 12.11 C: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Welders and Operators, Plant / System / Utilities

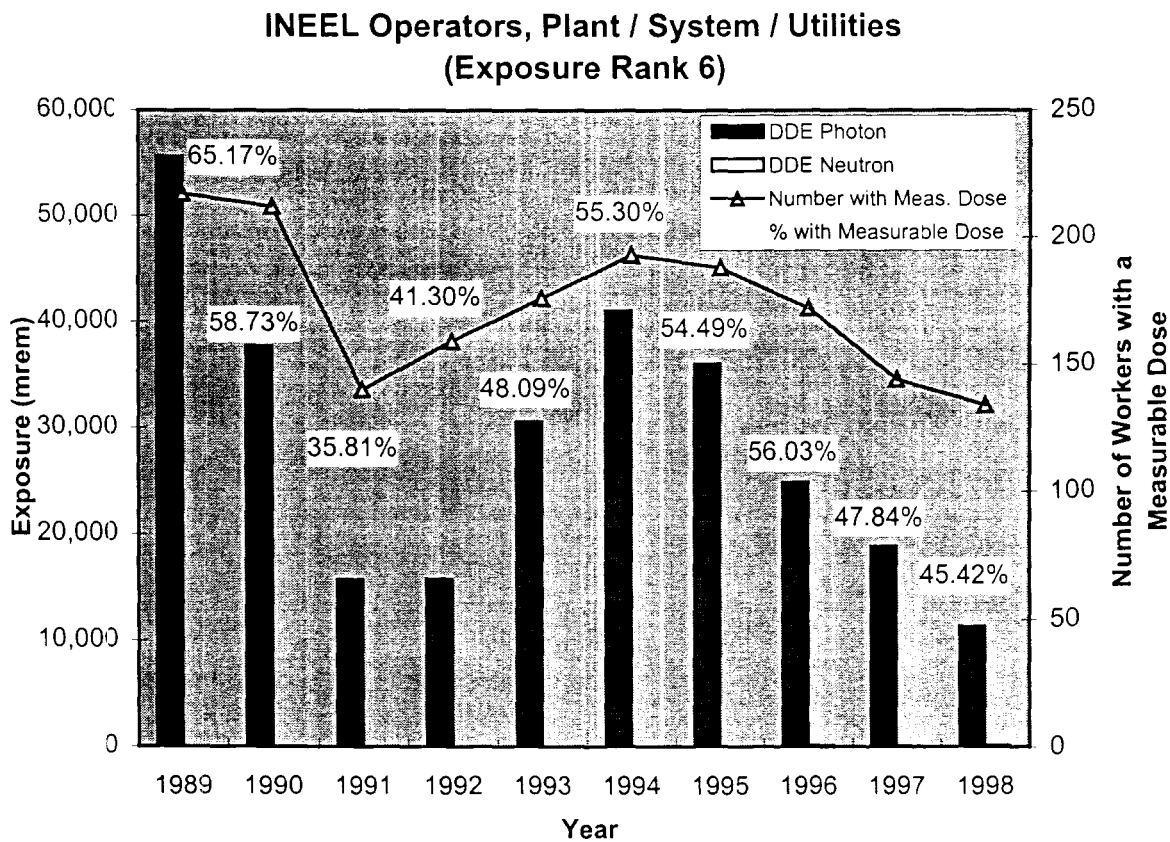
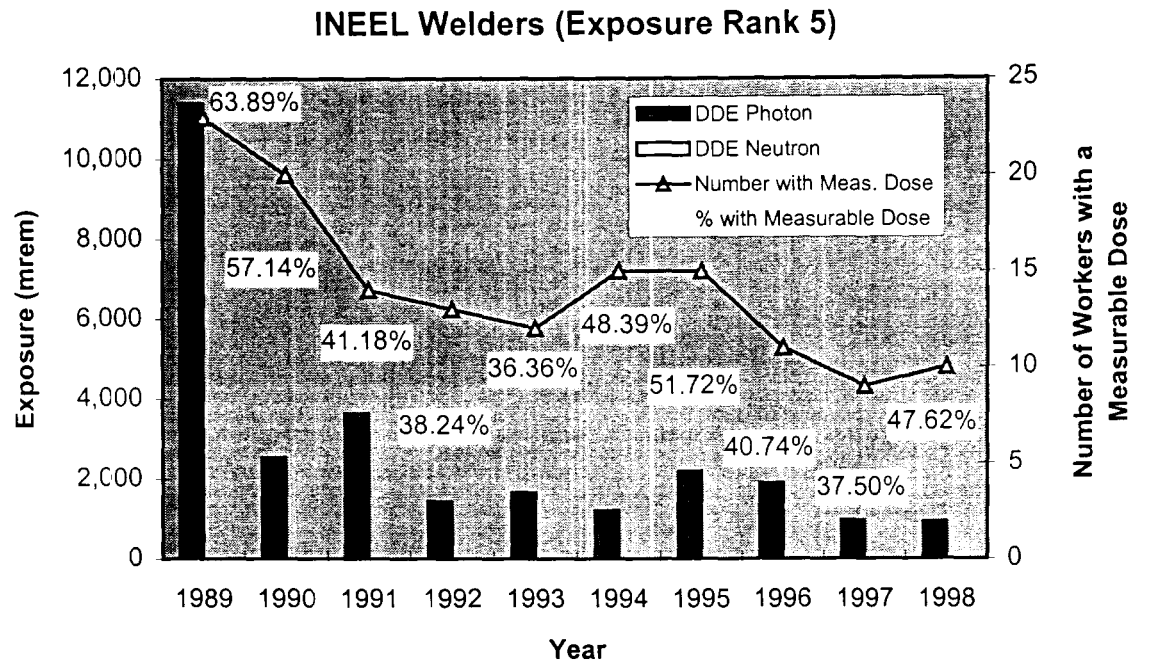
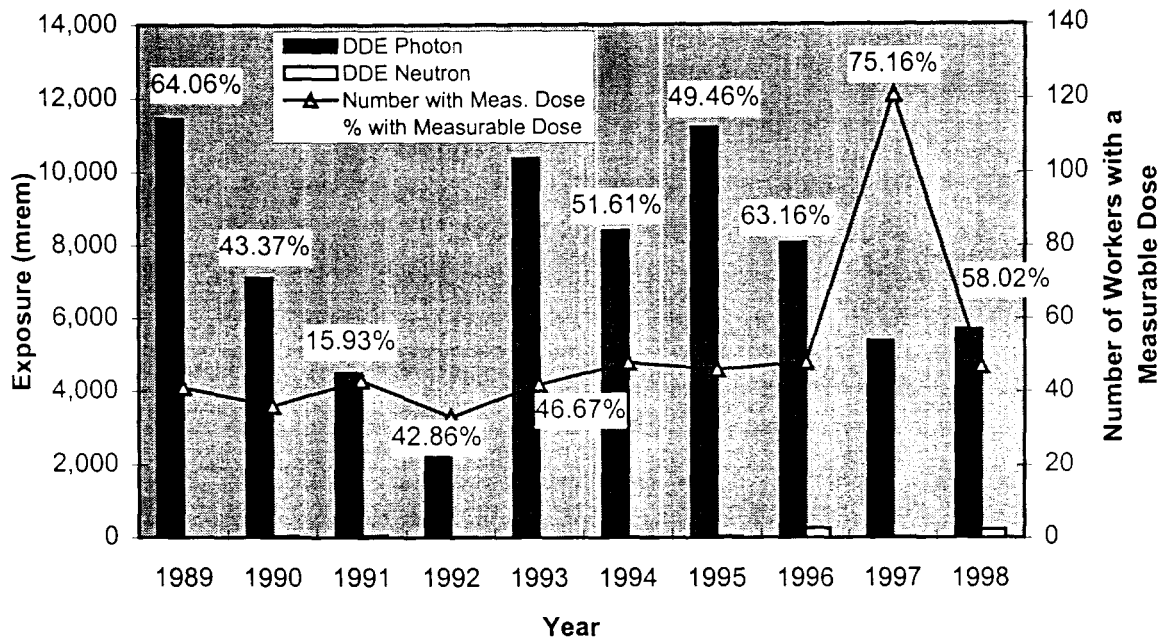


Exhibit 12.11 D: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site
Handlers / Laborers / Helpers and Groundskeepers

INEEL Handlers / Laborers / Helpers (Exposure Rank 7)



INEEL Groundskeepers (Exposure Rank 8)

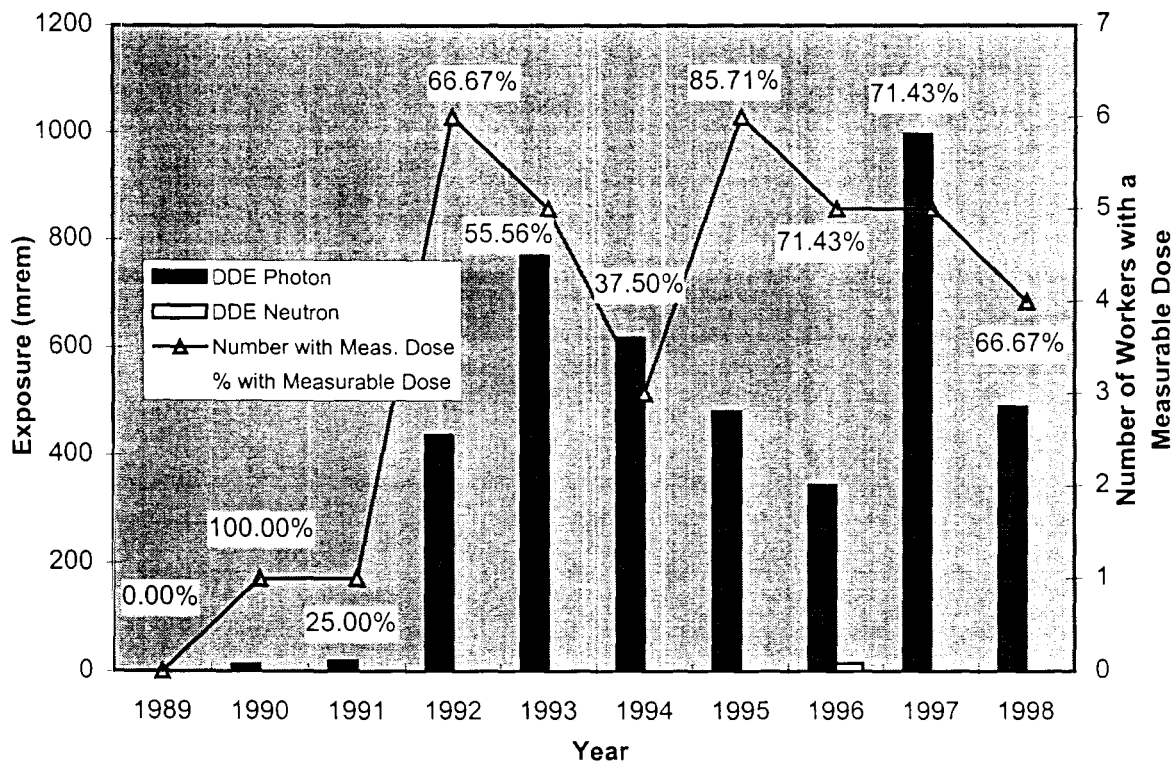
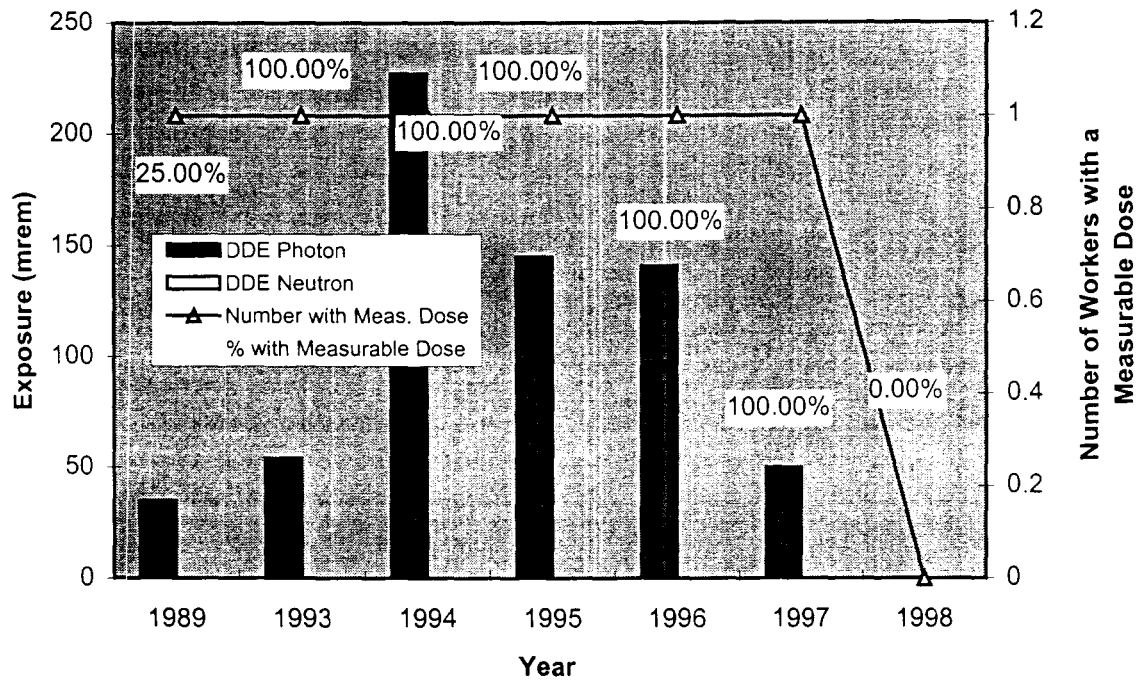


Exhibit 12.11 E: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Misc. Transport and Mechanics / Repairers

INEEL Misc. Transport (Exposure Rank 9)



INEEL Mechanics / Repairers (Exposure Rank 10)

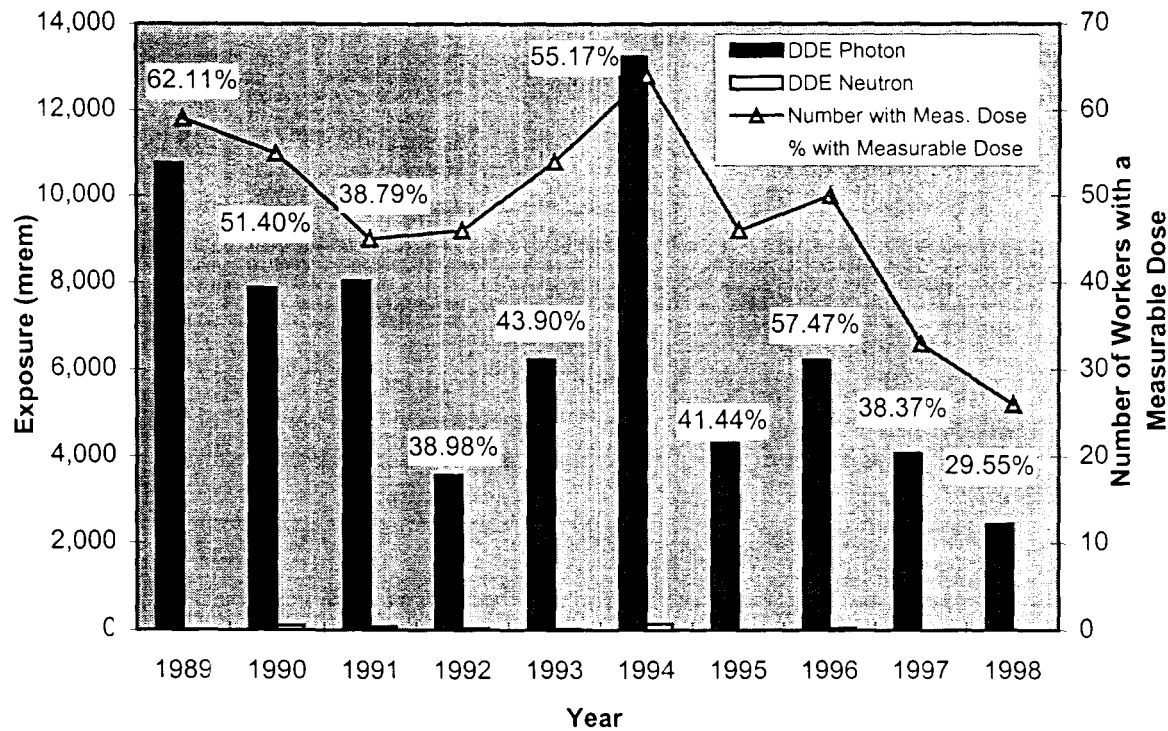


Exhibit 12.11 F: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Engineering Technicians and Equipment Operators

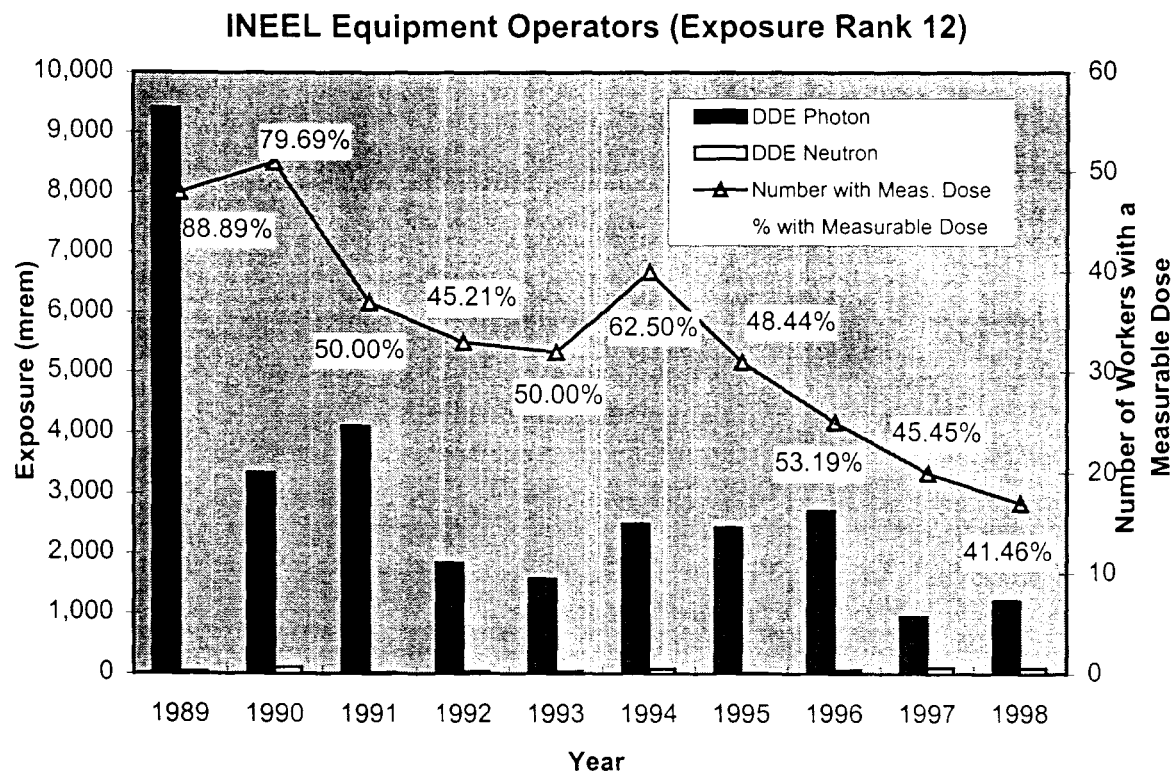
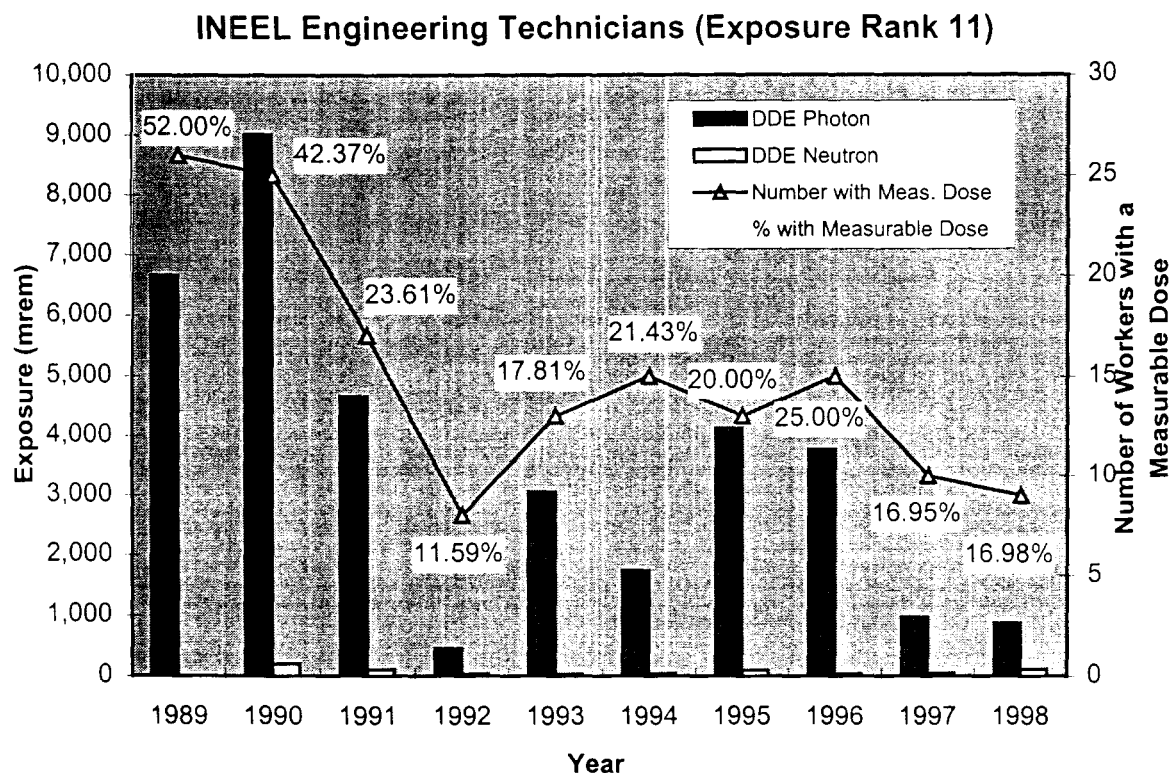
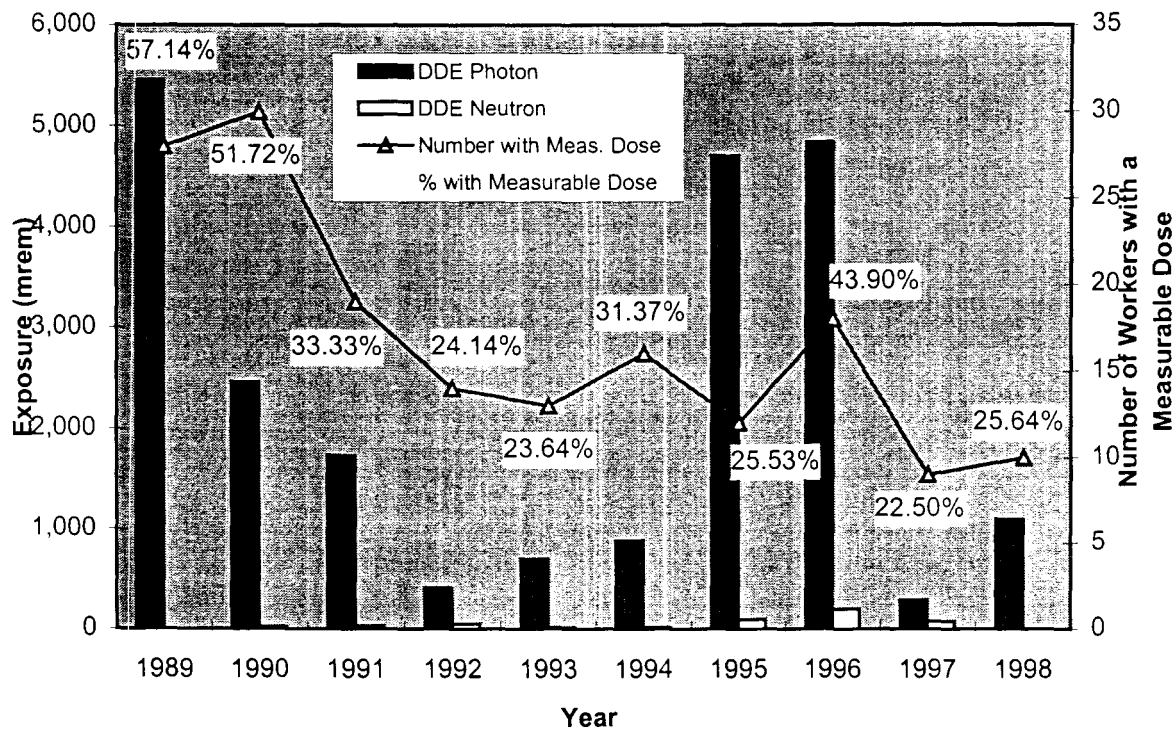


Exhibit 12.11 G: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for INEEL Site Machinists and Electricians

INEEL Machinists (Exposure Rank 13)



INEEL Electricians (Exposure Rank 14)

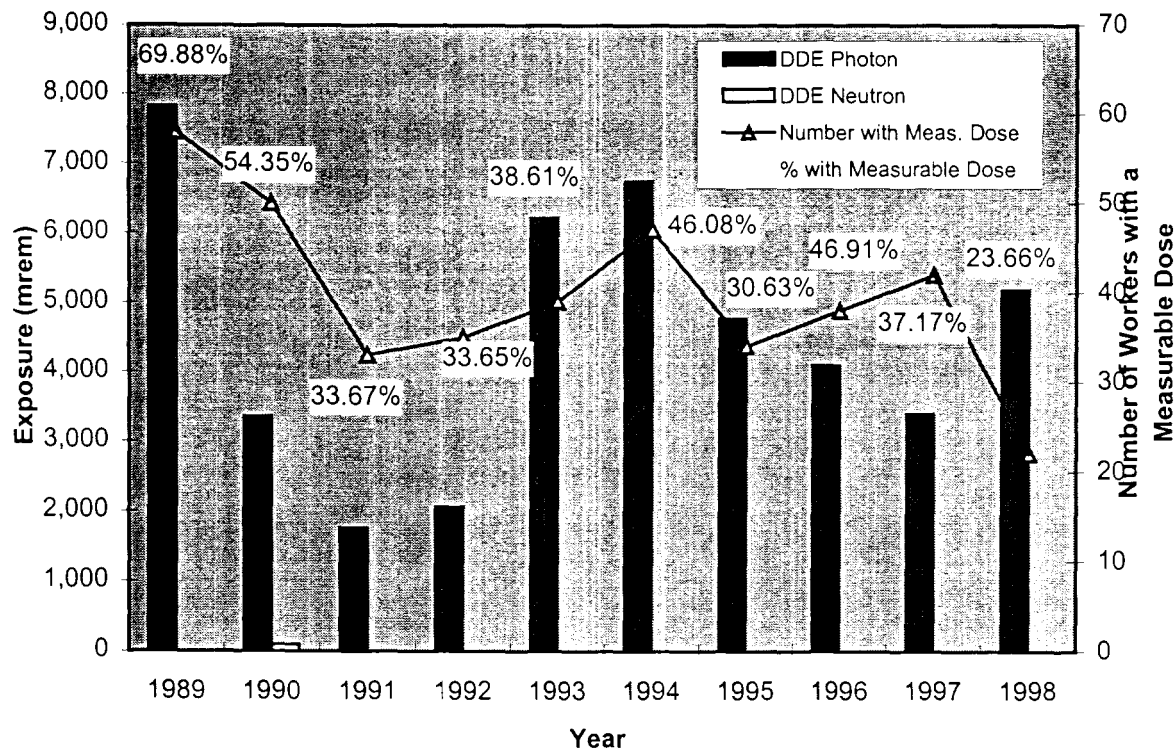


Exhibit 12.11 H: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for IINEEL Site Misc. Precision / Production

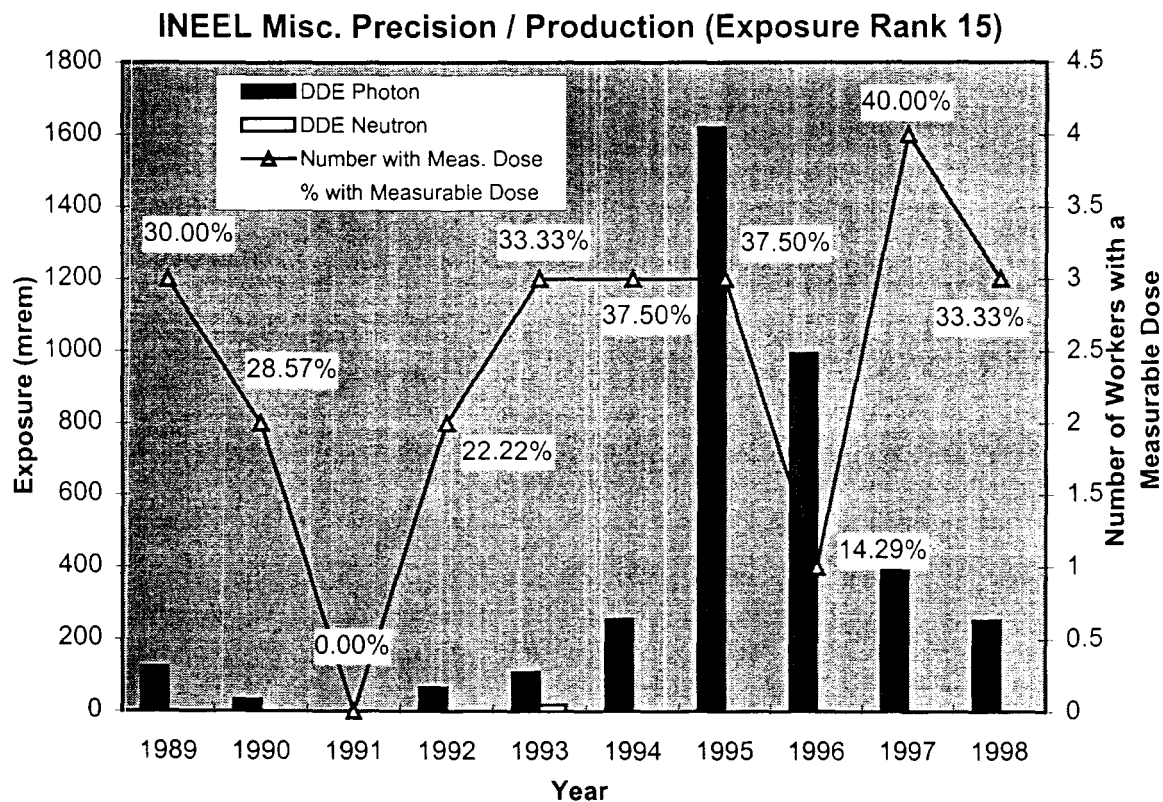


Exhibit 12.12 : ANL-W Occupational Radiation Exposure Summary Data 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
ARGONNE NAT. LAB. WEST	Health Technicians	1	173.00	18	14	77.78%	3,114	222	3,099	15	4,484	1,274
ARGONNE NAT. LAB. WEST	Radiation Monitors/Techs.	2	113.12	239	184	76.99%	27,036	147	27,006	30	45,941	7,612
ARGONNE NAT. LAB. WEST	Misc. Service	3	88.23	13	7	53.85%	1,147	164	1,147	0	1,633	63
ARGONNE NAT. LAB. WEST	Unknown	4	78.56	25	24	96.00%	1,964	82	1,964	0	7,364	1,720
ARGONNE NAT. LAB. WEST	Misc. Repair/Construction	5	74.55	20	16	80.00%	1,491	93	1,491	0	2,135	1,867
ARGONNE NAT. LAB. WEST	Health Physicist	6	73.52	46	30	65.22%	3,382	113	3,359	23	6,459	1,495
ARGONNE NAT. LAB. WEST	Operators, Plant/ System/Utili	7	72.00	497	277	55.73%	35,784	129	35,769	15	41,054	7,103
ARGONNE NAT. LAB. WEST	Mechanics/Repairers	8	63.52	143	77	53.85%	9,084	118	9,084	0	10,579	2,736
ARGONNE NAT. LAB. WEST	Engineering Technicians	9	61.49	336	158	47.02%	20,661	131	20,278	383	31,373	18,198
ARGONNE NAT. LAB. WEST	Science Technicians	10	56.30	30	21	70.00%	1,689	80	1,670	19	2,567	3,422
ARGONNE NAT. LAB. WEST	Janitors	11	48.50	196	113	57.65%	9,506	84	9,482	24	12,867	10,891
ARGONNE NAT. LAB. WEST	Technicians	12	47.00	666	288	43.24%	31,299	109	29,901	1,222	50,577	20,564
ARGONNE NAT. LAB. WEST	Misc. Technicians	13	34.19	206	73	35.44%	7,043	96	7,043	0	10,968	3,125
ARGONNE NAT. LAB. WEST	Truck Drivers	14	30.95	21	13	61.90%	650	50	650	0	730	48

Collective TEDE = person-mrem

Average Measurable TEDE = mrem

Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

Exhibit 12.12 : ANL-W Occupational Radiation Exposure Summary from 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
ARGONNE NAT. LAB. WEST	Electricians	15	27.44	155	79	50.97%	4,253	54	4,228	25	5,310	641
ARGONNE NAT. LAB. WEST	Welders and Solderers	16	26.89	18	7	38.89%	484	69	484	0	484	99
ARGONNE NAT. LAB. WEST	Carpenters	17	21.57	14	9	64.29%	302	34	302	0	343	124
ARGONNE NAT. LAB. WEST	Painters	18	20.82	11	4	36.36%	229	57	229	0	229	0
ARGONNE NAT. LAB. WEST	Misc. Professional	19	20.72	288	58	20.14%	5,966	103	5,966	0	7,628	3,413
ARGONNE NAT. LAB. WEST	Handlers/Laborers/Helpers	20	17.42	168	59	35.12%	2,926	50	2,909	17	3,417	454
ARGONNE NAT. LAB. WEST	Miscellaneous	21	17.09	437	93	21.28%	7,467	80	7,440	27	15,881	6,044
ARGONNE NAT. LAB. WEST	Security Guards	22	16.92	250	86	34.40%	4,230	49	3,671	559	5,061	662
ARGONNE NAT. LAB. WEST	Machinists	23	14.84	56	12	21.43%	831	69	831	0	1,451	180
ARGONNE NAT. LAB. WEST	Manager - Administrator	24	9.66	123	19	15.45%	1,188	63	1,188	0	1,479	386
ARGONNE NAT. LAB. WEST	Scientist	25	8.62	143	20	13.99%	1,232	62	1,232	0	2,694	1,731
ARGONNE NAT. LAB. WEST	Engineer	26	6.35	1,000	137	13.70%	6,345	46	6,275	0	8,409	884
ARGONNE NAT. LAB. WEST	Admin. Support and Clerical	27	4.18	1,456	124	8.52%	6,091	49	5,475	616	7,160	3,957
ARGONNE NAT. LAB. WEST	Machine Setup/Operators	28	2.14	7	1	14.29%	15	15	15	0	15	0

Collective TEDE = person-mrem

Average Measurable TEDE = mrem

Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

Exhibit 12.12 : ANL-W Occupational Radiation Exposure Summary Data 1986 through 1998 in Order of Decreasing Exposure Risk

Site	Occupation	Rank	Exposure Risk	Total Number Monitored	Number with Meas. Dose	% with Measurable Dose	Total Collective Dose (TEDE)	Average Meas. Dose (TEDE)	DDE Photon	DDE Neutron	SDE-WB (Skin)	SDE-ME (Extremity)
ARGONNE NAT. LAB. WEST	Food Service Employees	29	0.52	29	1	3.45%	15	15	15	0	51	0
ARGONNE NAT. LAB. WEST	Misc. Precision/Production	30	0.38	8	1	12.50%	3	3	3	0	3	0
ARGONNE NAT. LAB. WEST	Doctors and Nurses	31	0.00	21	0	0.00%	0	0	0	0	0	0
ARGONNE NAT. LAB. WEST	Sales	32	0.00	2	0	0.00%	0	0	0	0	0	0
ARGONNE NAT. LAB. WEST	Sheet Metal Workers	33	0.00	7	0	0.00%	0	0	0	0	0	0

Collective TEDE = person-mrem
Average Measurable TEDE = mrem
Exposure Risk = Collective TEDE / Total Number Monitored (mrem)

Exhibit 12.13 A: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Health Technicians and Radiation Monitors / Technicians

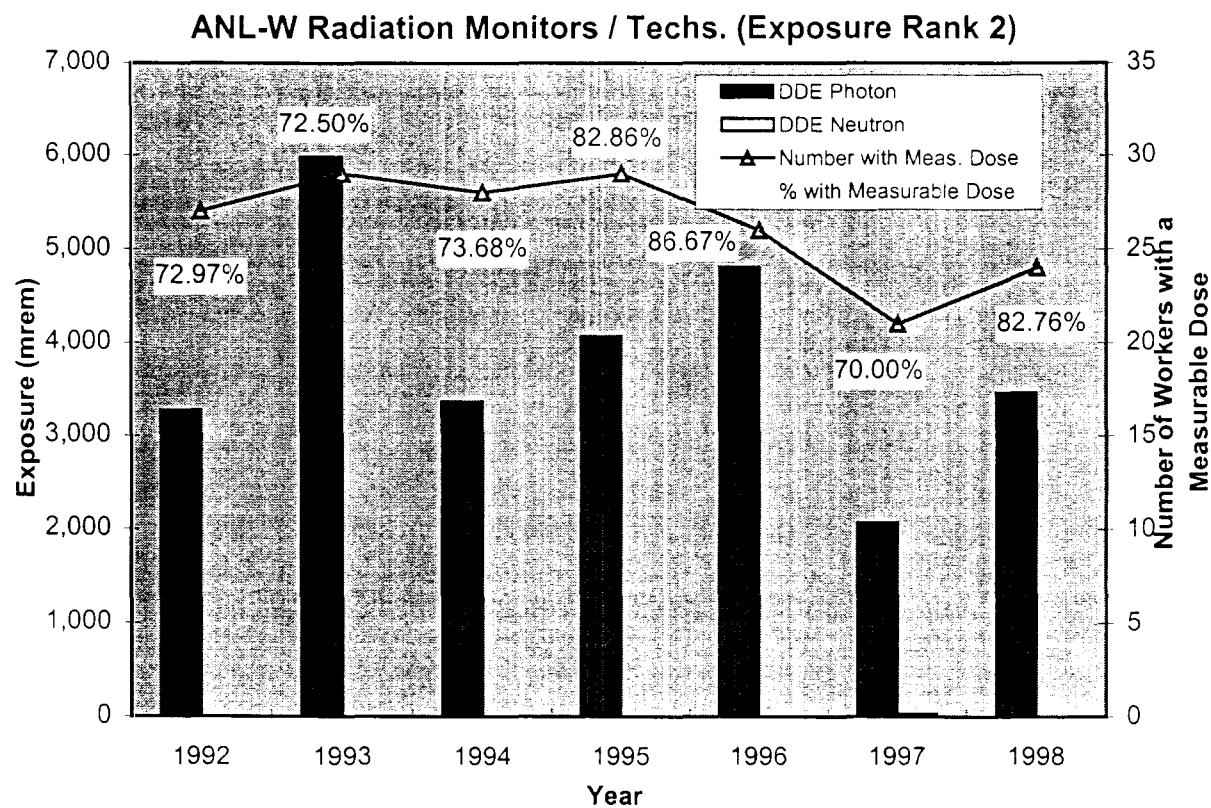
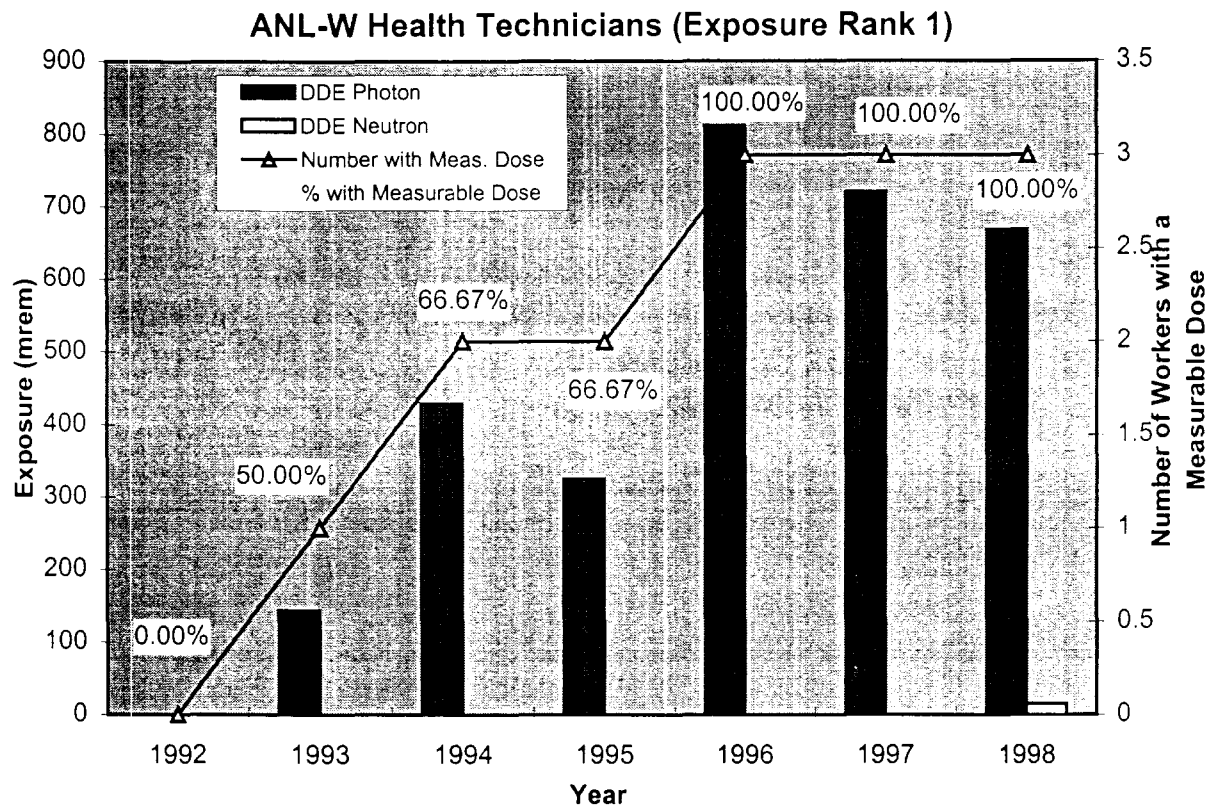


Exhibit 12.13 B: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Misc. Service and Unknown Personnel

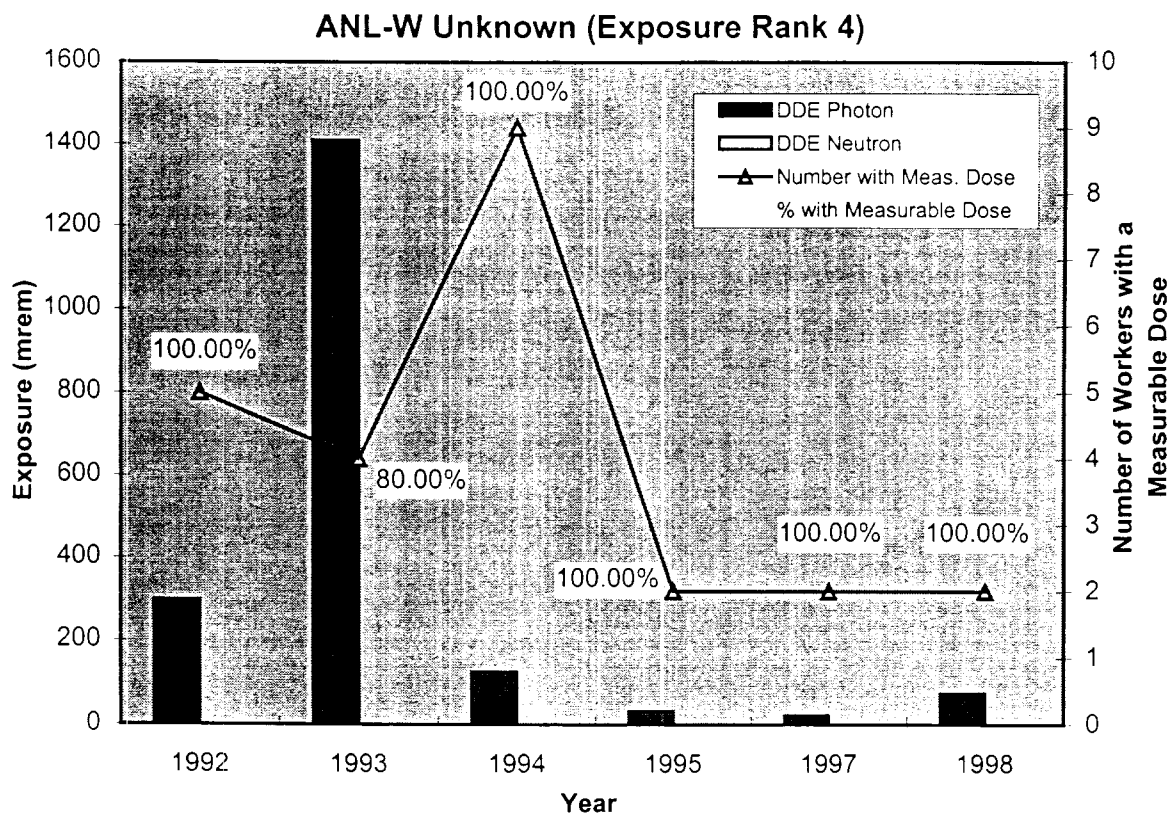
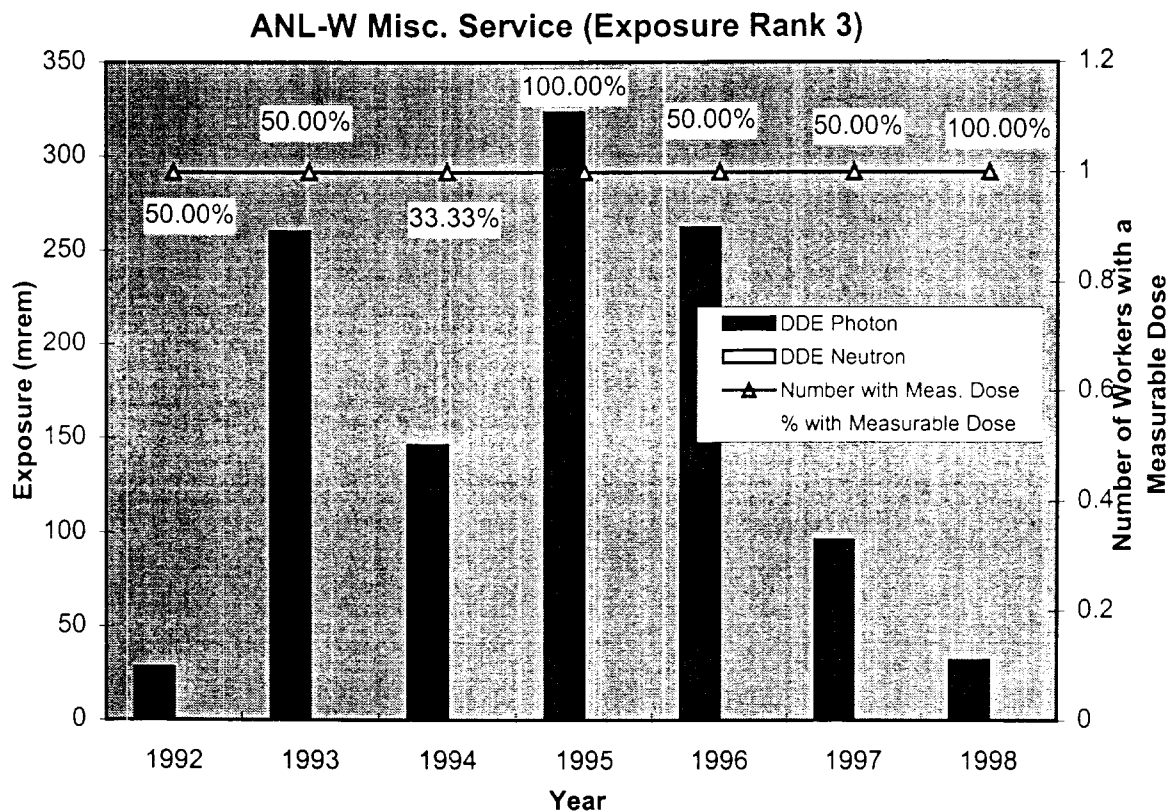


Exhibit 12.13 C: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Misc. Repair / Construction and Health Physicist

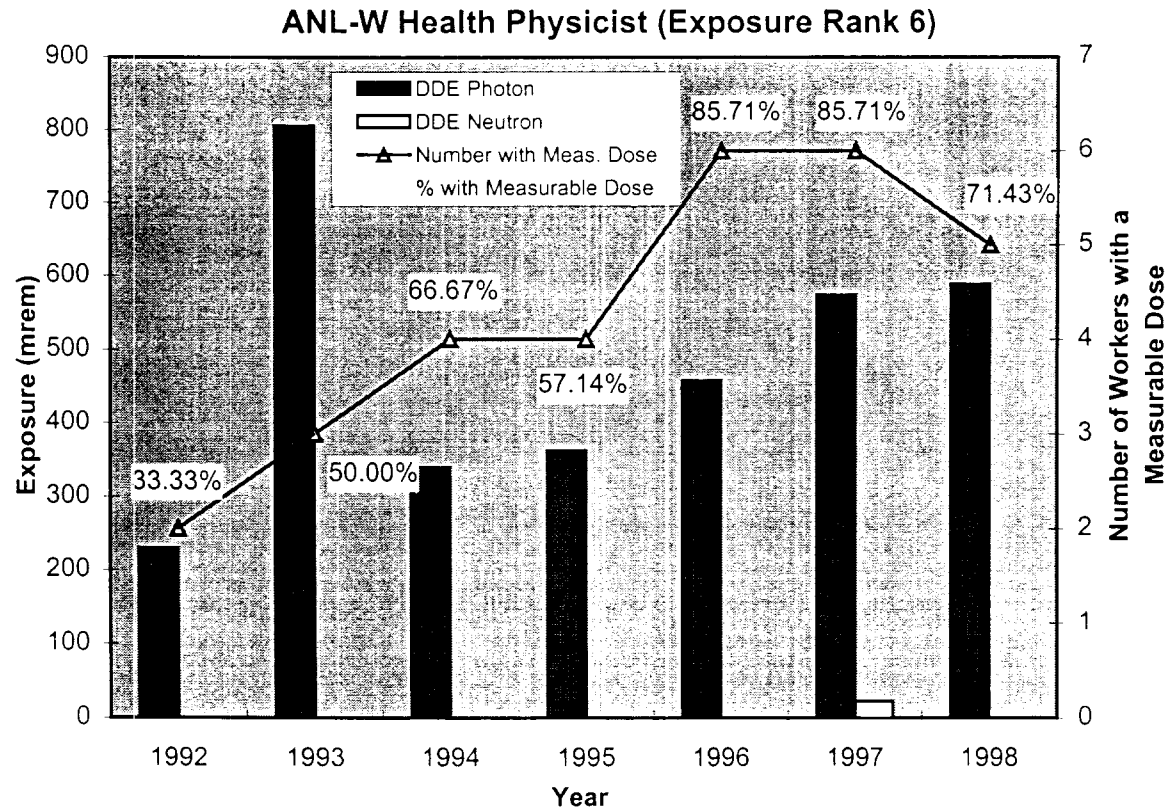
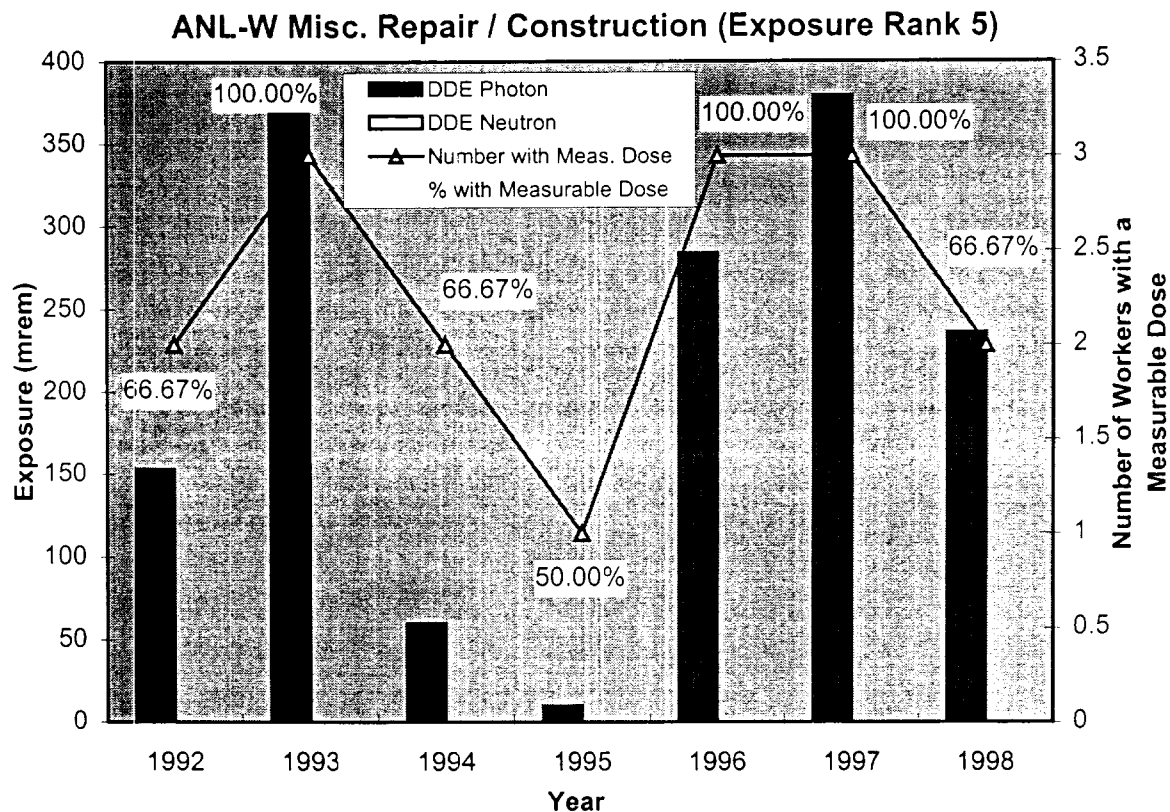
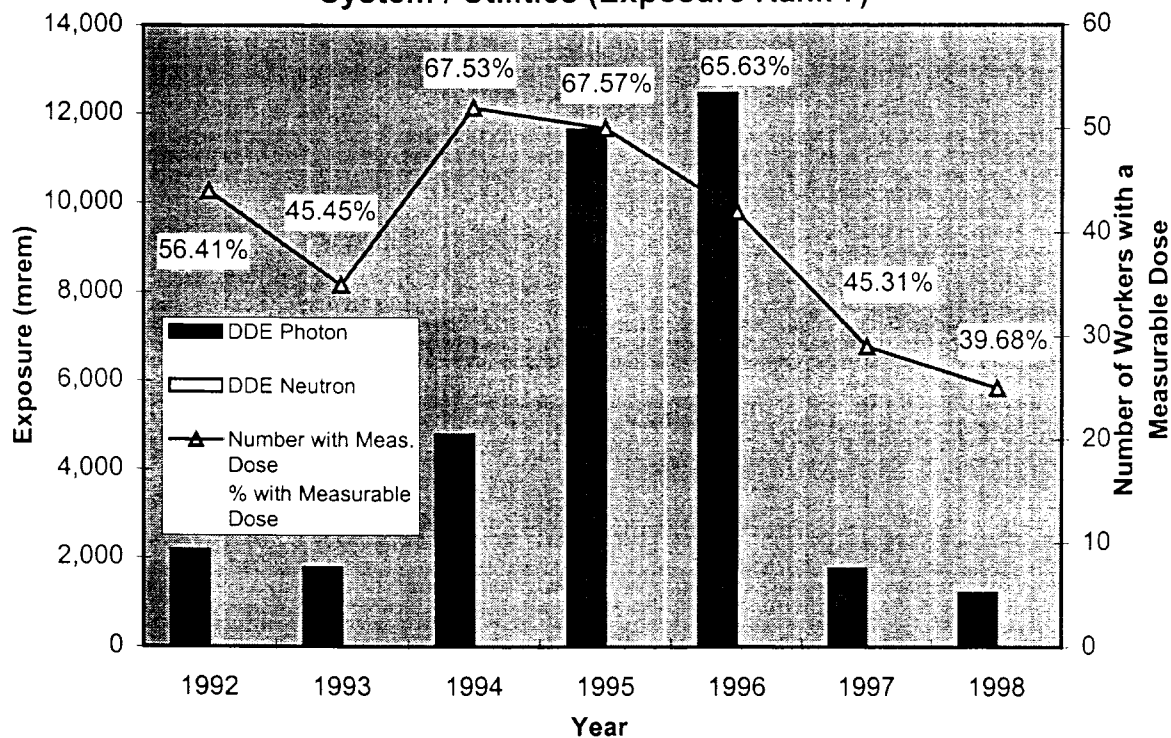


Exhibit 12.13 D: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Operators, Plant / System / Utilities and Mechanics / Repairers

ANL-W Operators, Plant / System / Utilities (Exposure Rank 7)



ANL-W Mechanics / Repairers (Exposure Rank 8)

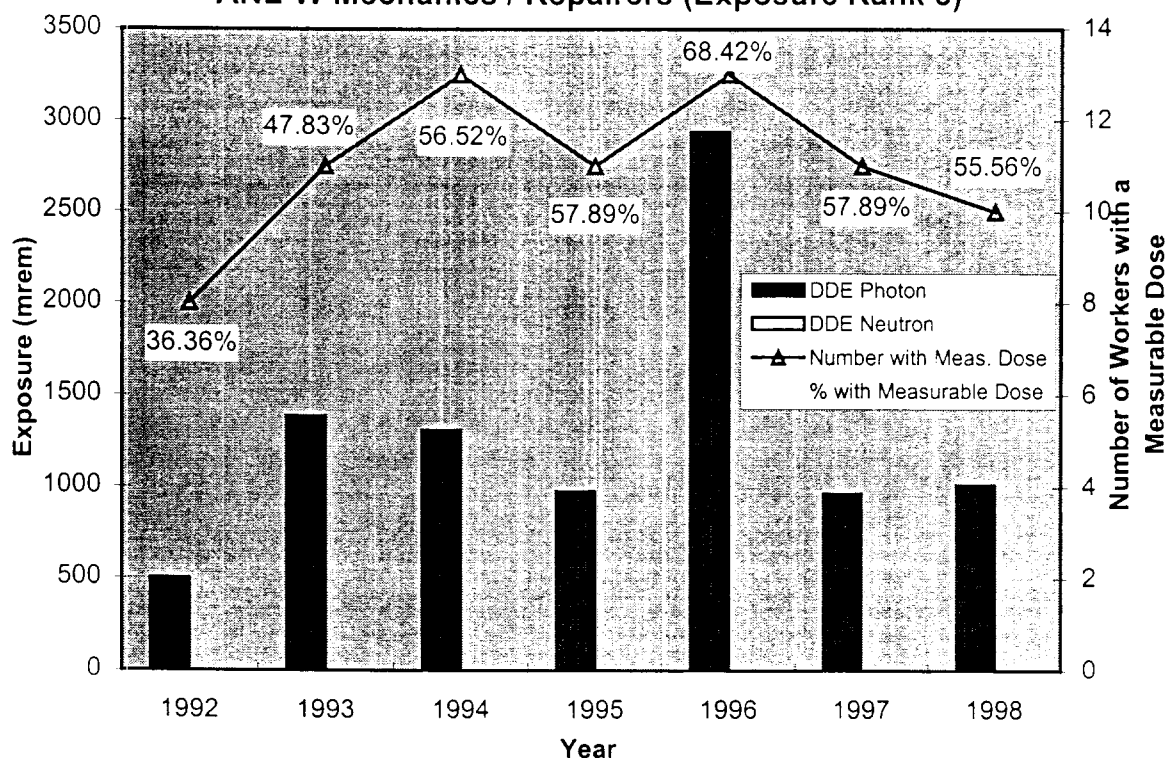


Exhibit 12.13 E: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Engineering Technicians and Science Technicians

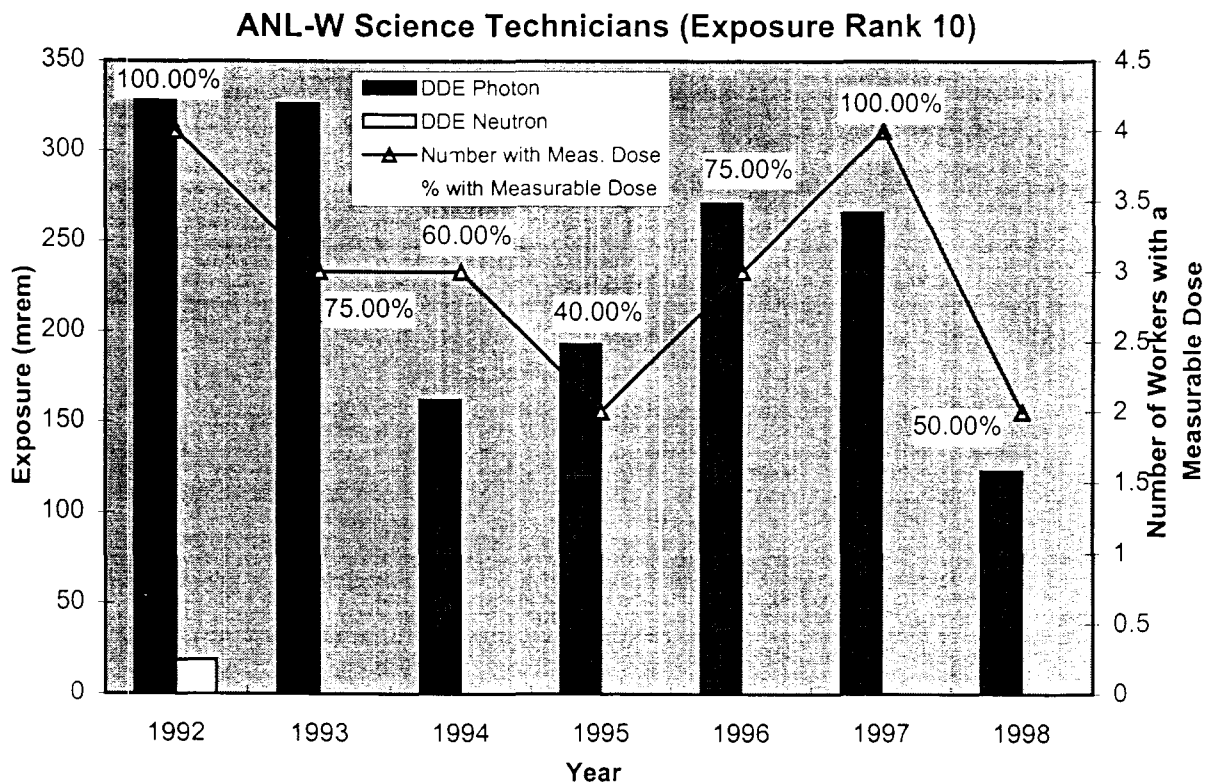
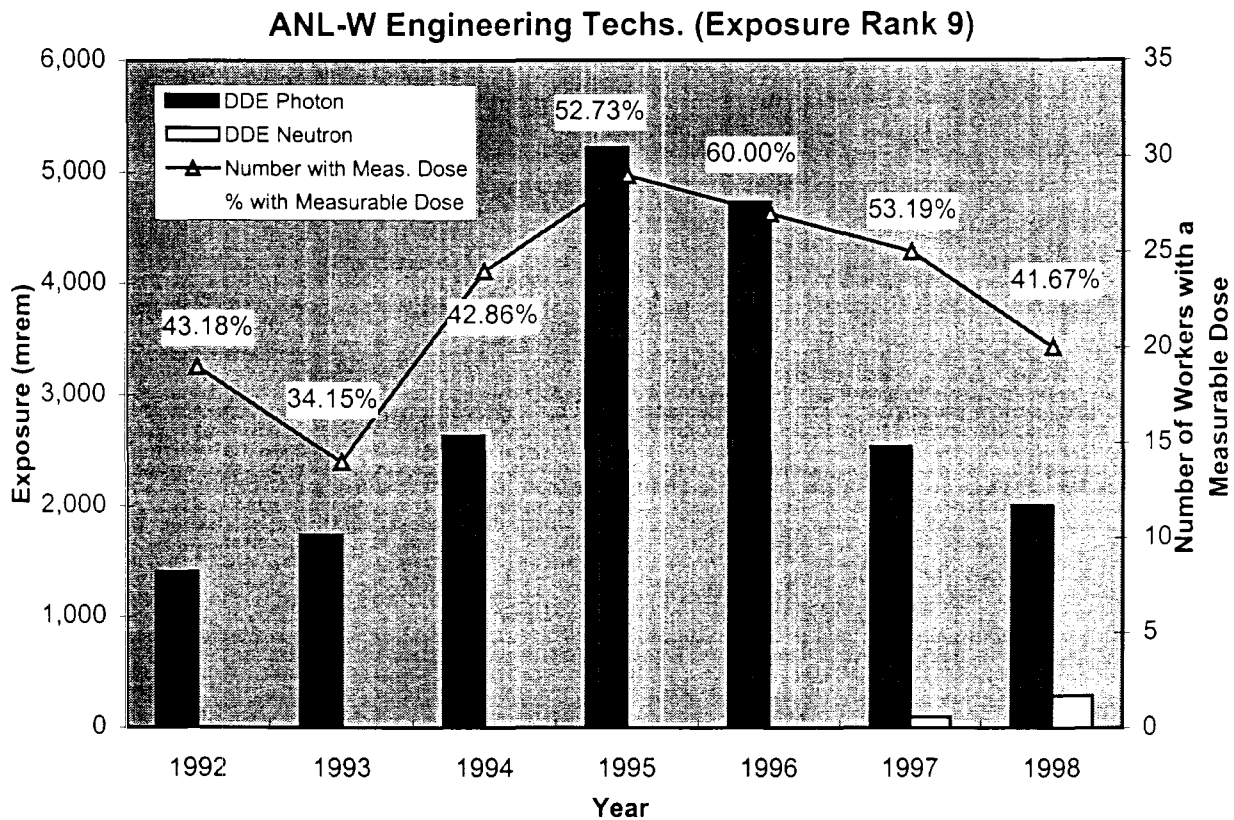


Exhibit 12.13 F: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Janitors and Technicians

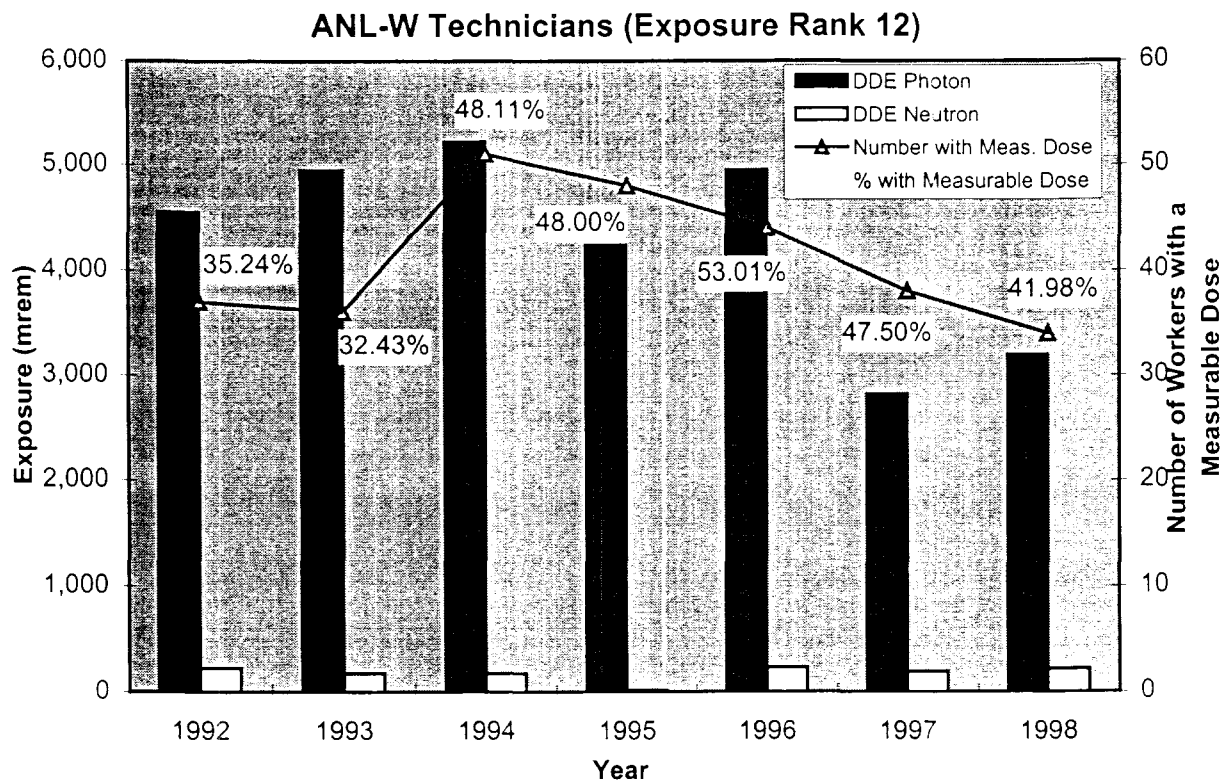
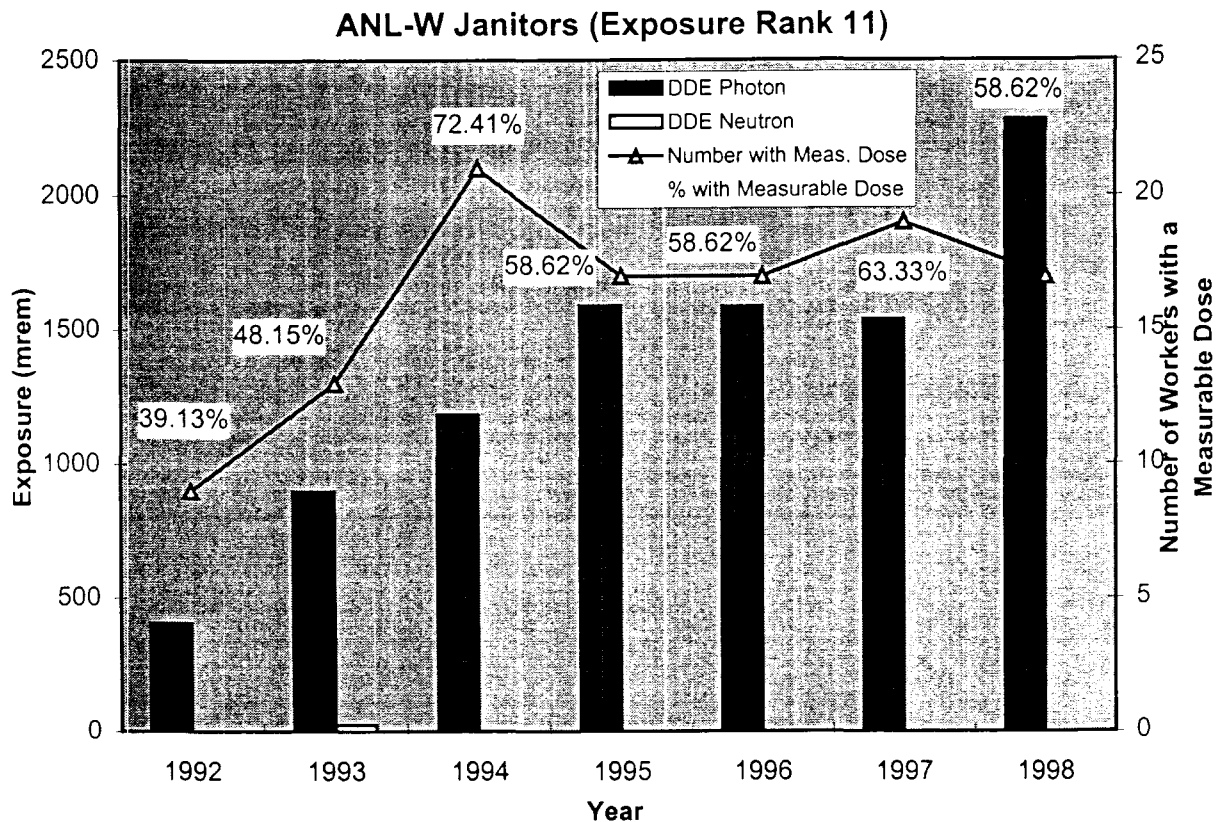


Exhibit 12.13 G: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Misc. Technicians and Truck Drivers

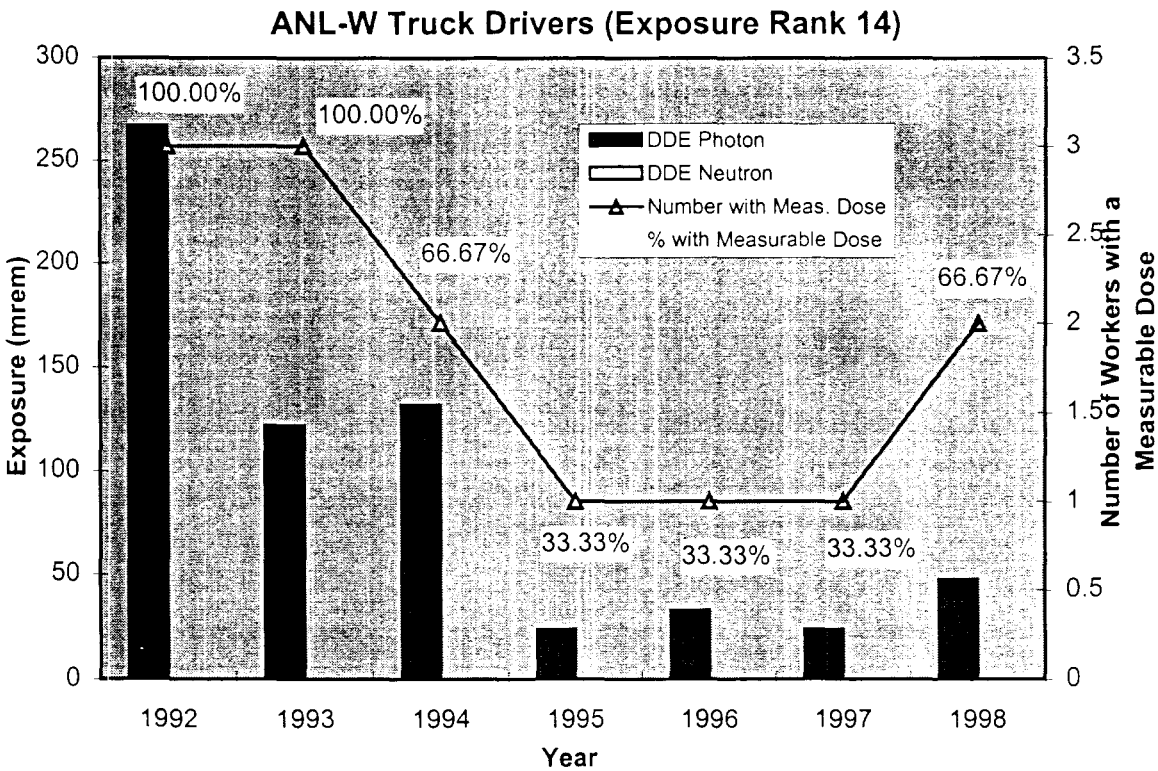
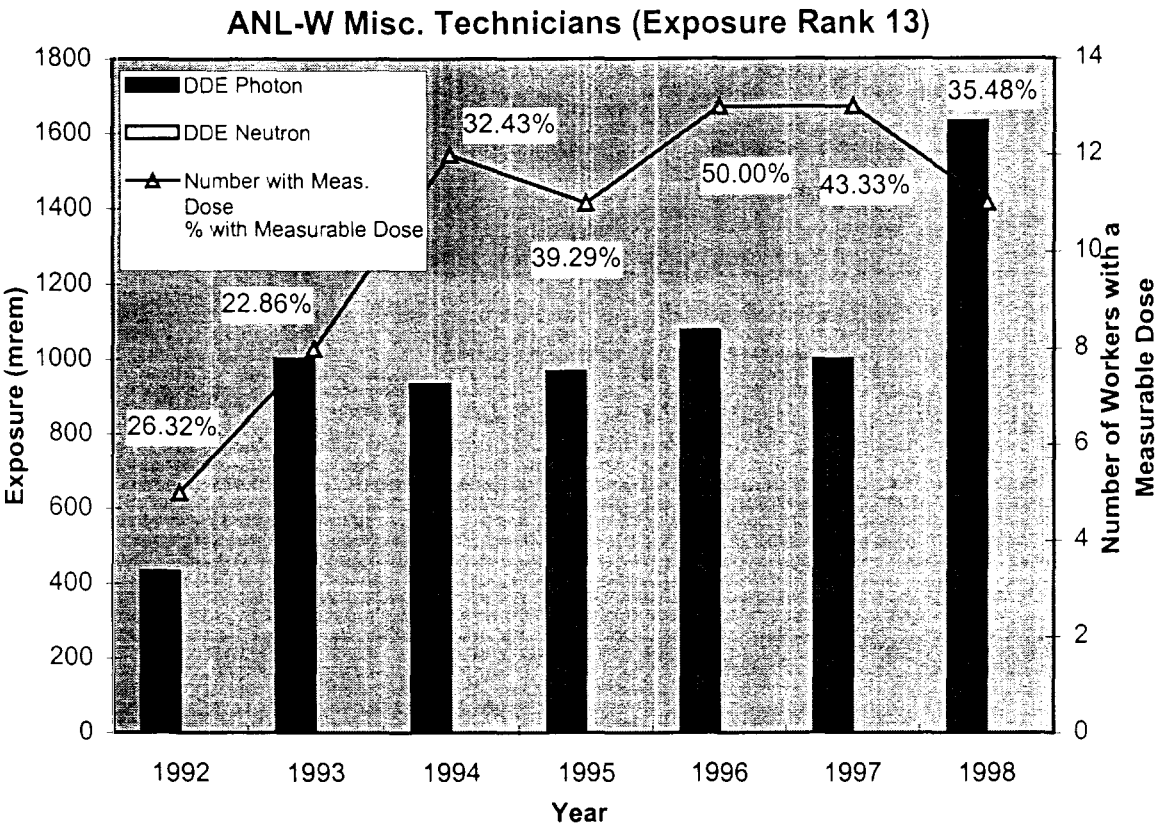
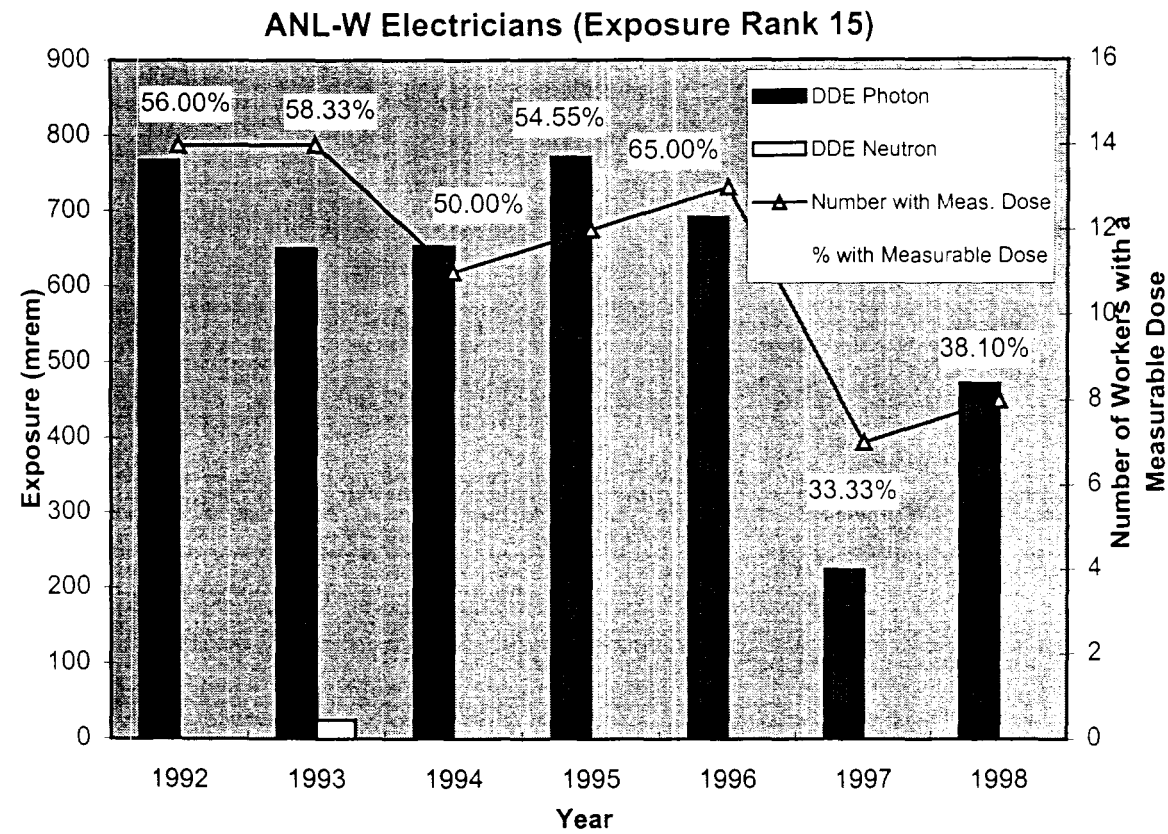


Exhibit 12.13 H: Summary Deep Dose Equivalent (DDE) Exposure Data 1989 to 1998 for ANL-W Electricians



Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non-Fatal Cases	Deaths
Idaho Field Office	1994 (1,2,3)	643,039	0	0.0	0	0.0	0	0	0	0	0	0
Idaho Field Office	1995	870,002	6	1.4	2	0.5	2	4	0	4	4	0
Idaho Field Office	1996	880,270	5	1.1	1	0.2	1	240	0	240	4	0
Idaho Field Office	1997	759,801	6	1.6	2	0.5	1	7	45	52	4	0
Idaho Field Office	1998	645,217	8	2.5	1	0.3	1	8	1	9	7	0
Idaho Field Office	1999 (1,2,3)	447,409	5	2.2	0	0.0	0	0	0	0	5	0
Lockheed Idaho Tech. Co. - Production	1994	4,363,323	51	2.3	25	1.1	4	89	306	395	26	0
Lockheed Idaho Tech. Co. - Production	1995	2,636,096	51	3.9	27	2.0	10	67	346	413	24	0
Lockheed Idaho Tech. Co. - Production	1996	2,493,094	33	2.6	18	1.4	8	94	317	411	15	0
Lockheed Idaho Tech. Co. - Production	1997	2,356,401	48	4.1	21	1.8	6	20	176	196	27	0
Lockheed Idaho Tech. Co. - Production	1998	2,313,439	32	2.8	13	1.1	4	17	201	218	19	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked

LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked

Note: Numbers preceding the year indicate quarters within the year.

Exhibit 12.14: INEEL Occupational Injury Statistics as Reported by the Incident and Incident Recordkeeping and Reporting System (CAIRS) 1. 1994 to 1999

Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non-Fatal Cases	Deaths
Lockheed Idaho Tech. Co. - Production	1999 (1.2.3)	2,626,488	46	3.5	27	2.1	9	106	481	587	19	0
Lockheed Idaho Tech. Co. - Research	1994	7,782,790	143	3.7	68	1.7	29	324	858	1182	75	0
Lockheed Idaho Tech. Co. - Research	1995	2,953,025	22	1.5	8	0.5	6	47	86	133	14	0
Lockheed Idaho Tech. Co. - Research	1996	2,819,139	11	0.8	2	0.1	1	11	6	17	9	0
Lockheed Idaho Tech. Co. - Research	1997	2,858,546	28	2.0	7	0.5	4	10	55	65	21	0
Lockheed Idaho Tech. Co. - Research	1998	2,908,926	37	2.5	5	0.3	0	0	128	128	32	0
Lockheed Idaho Tech. Co. - Research	1999 (1.2.3)	2,337,520	23	2.0	4	0.3	2	26	64	90	19	0
Lockheed Idaho Tech. Co. - Services	1994 (4)	1,217,563	26	4.3	9	1.5	6	57	115	172	17	0
Lockheed Idaho Tech. Co. - Services	1995	4,491,109	105	4.7	57	2.5	17	60	561	621	48	0
Lockheed Idaho Tech. Co. - Services	1996	4,194,650	100	4.8	47	2.2	17	107	547	654	53	0
Lockheed Idaho Tech. Co. - Services	1997	4,260,184	115	5.4	60	2.8	24	309	857	1166	55	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked

LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked

Note: Numbers preceding the year indicate quarters within the year.

Exhibit 12.14: INEEL Occupational Injury Statistics as Reported by the Accident and Incident Recordkeeping and Reporting System (CAIRS) 1994 to 1999

Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non-Fatal Cases	Deaths
Lockheed Idaho Tech. Co. - Services	1998	3,993,265	132	6.6	65	3.3	20	88	738	826	66	1
Lockheed Idaho Tech. Co. - Services	1999 (1,2,3)	2,396,319	70	5.8	19	1.6	6	94	376	470	51	0
Lockheed Idaho Tech. Co. - Construction	1994	491,724	7	2.8	1	0.4	1	3	0	3	6	0
Lockheed Idaho Tech. Co. - Construction	1995	493,482	15	6.1	8	3.2	4	58	93	151	7	0
Lockheed Idaho Tech. Co. - Construction	1996	454,307	13	5.7	7	3.1	1	1	33	34	6	0
Lockheed Idaho Tech. Co. - Construction	1997	376,686	5	2.7	3	1.6	1	3	60	63	2	0
Lockheed Idaho Tech. Co. - Construction	1998	359,059	5	2.8	0	0.0	0	0	0	0	5	0
Lockheed Idaho Tech. Co. - Construction	1999 (1,2,3)	310,018	3	1.9	1	0.6	0	0	11	11	2	0
Lockheed Idaho Tech. Co. - Arch./Eng.	1994(4)	61,511	0	0.0	0	0.0	0	0	0	0	0	0
Lockheed Idaho Tech. Co. - Arch./Eng.	1995	215,934	0	0.0	0	0.0	0	0	0	0	0	0
Lockheed Idaho Tech. Co. - Arch./Eng.	1996	207,141	0	0.0	0	0.0	0	0	0	0	0	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked

LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked

Note: Numbers preceding the year indicate quarters within the year.

Exhibit 12.14: INEEL Occupational Injury Statistics as Reported by the Accident and Incident Recordkeeping and Reporting System (CAIRS) , 1994 to 1999

Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non- Fatal Cases	Deaths
Lockheed Idaho Tech. Co. - Arch./Eng.	1997	216,095	1	0.9	1	0.9	1	1	0	1	0	0
Lockheed Idaho Tech. Co. - Arch./Eng.	1998	217,383	2	1.8	0	0.0	0	0	0	0	2	0
Lockheed Idaho Tech. Co. - Arch./Eng.	1999(1,2,3)	170,597	1	1.2	0	0.0	0	0	0	0	1	0
Lockheed Idaho Tech. Co. - Security	1994	805,276	9	2.2	5	1.2	4	27	21	48	4	0
Lockheed Idaho Tech. Co. - Security	1995	681,918	8	2.3	4	1.2	4	78	124	202	4	0
Lockheed Idaho Tech. Co. - Security	1996	590,420	18	6.1	1	0.3	1	65	0	65	17	0
Lockheed Idaho Tech. Co. - Security	1997	543,459	9	3.3	0	0.0	0	0	0	0	9	0
Lockheed Idaho Tech. Co. - Security	1998	637,841	12	3.8	3	0.9	1	1	3	4	9	0
Lockheed Idaho Tech. Co. - Security	1999(1,2,3)	611,174	11	3.6	6	2.0	4	15	23	38	5	0
LITCO Subcontractors - Construction	1994	488,635	13	5.3	2	0.8	0	0	23	23	11	0
LITCO Subcontractors - Construction	1995	626,252	28	8.9	7	2.2	5	33	31	64	21	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked

LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked

Note: Numbers proceeding the year indicate quarters within the year.

Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non-Fatal Cases	Deaths
LITCO Subcontractors - Construction	1996	260,672	12	9.2	3	2.3	0	0	28	28	8	1
LITCO Subcontractors - Construction	1997	182,438	7	7.7	0	0.0	0	0	0	0	7	0
LITCO Subcontractors - Construction	1998	92,430	9	19.5	3	6.5	0	0	16	16	6	0
LITCO Subcontractors - Construction	1999(1,2,3)	100,769	5	9.9	3	6.0	2	28	3	31	2	0
LITCO Subcontractor - Coleman	1994(4)	59,998	1	3.3	0	0.0	0	0	0	0	1	0
LITCO Subcontractor - Coleman	1995	300,151	4	2.7	0	0.0	0	0	0	0	4	0
LITCO Subcontractor - Coleman	1996	267,095	3	2.2	1	0.7	0	0	2	2	2	0
LITCO Subcontractor - Coleman	1997	247,163	5	4.0	1	0.8	1	2	1	3	4	0
LITCO Subcontractor - Coleman	1998	249,024	5	4.0	2	1.6	2	13	0	13	3	0
LITCO Subcontractor - Coleman	1999(1,2,3)	187,508	2	2.1	0	0.0	0	0	0	0	2	0
LITCO Subcontractor - Parsons	1994(4)	18,846	0	0.0	0	0.0	0	0	0	0	0	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked
 LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked
 Note: Numbers preceding the year indicate quarters within the year.

Exhibit 12.14: INEEL Occupational Injury Statistics as Reported by the Accident and Incident Recordkeeping and Reporting System (CAIRS) from 1994 to 1999

Organization NAME	YEAR-QUARTER	HOURS	Total Recordable Case (Injury and Illness)	TRATE	Lost Workday Case	LRATE	Days Away from Work Cases	Work Days Lost	Work Days Lost Restricted	Lost Workdays	Non- Fatal Cases	Deaths
LITCO Subcontractor - Parsons	1995(1,2,3)	59,361	0	0.0	0	0.0	0	0	0	0	0	0
LITCO Subcontractor - Parsons	1996	84,643	0	0.0	0	0.0	0	0	0	0	0	0
LITCO Subcontractor - Parsons	1997	100,270	1	2.0	0	0.0	0	0	0	0	1	0
LITCO Subcontractor - Parsons	1998	99,875	1	2.0	0	0.0	0	0	0	0	1	0
LITCO Subcontractor - Parsons	1999(1,2,3)	79,339	0	0.0	0	0.0	0	0	0	0	0	0
LESAT Subcontractors	1995(3,4)	195,620	2	2.0	1	1.0	0	0	32	32	1	0
LESAT Subcontractors	1996	459,631	2	0.9	0	0.0	0	0	0	0	2	0
LESAT Subcontractors	1997	177,192	3	3.4	1	1.1	0	0	8	8	2	0
LESAT Subcontractors	1998(1)	13,928	0	0.0	0	0.0	0	0	0	0	0	0

TRATE=(Number of Injuries or Illness X 200,000) / Employee Hours Worked

LRATE=Number of Lost Workdays X 200,000) / Employee Hours Worked

Note: Numbers preceding the year indicate quarters within the year.

Exhibit 12.15: 1995 Settlement Agreement Requirements for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
J.4.	after 10/16/95	If required NEPA analysis conflicts with agreement actions, DOE, Navy may request a modification to the agreement	NA	NA
F.7.	FY 95-00	Navy shall undertake \$45 million environmental remediation at NRF over 5 yrs	Complying	Remediation efforts on track.
I.1.	over 5 fiscal years (FY 96-00)	Provide to Idaho a total amount of \$30 million for community transition purposes beginning in FY 1996 and continuing through 1997-2000	FY 96,97 funding completed	Funding for FY 1998, 1999, and 2000 to be received prior to beginning of each remaining fiscal year.
D.1.c.	prior to 01/01 each year (96-35)	Navy provides Idaho with an estimate of shipments and metric tons of Naval spent fuel to be shipped during following year (each year through 2035)	Complying	Completed for each calendar year to date. Next report due to Idaho prior to Jan. 1, 1999.
D.2.g.	prior to 01/01 (96-35)	DOE provides Idaho an estimate of shipments and metric tons to be shipped during the following year	Complying	Completed for each calendar year to date. Next report due to Idaho prior to Jan. 1, 1999.
D.1.d.	by 01/3 each year (96-35)	Navy provides Idaho with actual no. of [spent fuel] shipments and metric tons shipped during preceding year	Complying	Completed for each calendar year to date. Next report due to Idaho prior to Jan. 31, 1999.
D.2.h.	by 01/31 (96-35)	DOE provides Idaho the actual shipments and metric tons of fuel shipped during the preceding year	Complying	Completed for each calendar year to date. Next report due to Idaho prior to Jan. 31, 1999.
F.3. 1st	9/30/96	Navy shall request from President FY 1997 funds necessary for the Dry Cell Expansion Project	Completed	Requirement completed; request for funding submitted.
F.5.	9/30/96	Navy shall request from President FY 1997 funds necessary to proceed with upgrades to ECF Hot Cell during next three years	Completed	Request for funding submitted.
F.6	09/30/96 (FY 97-01)	Navy shall request from President FY 1997 funds necessary to proceed with design and construction of dry storage container loading station at ECF; no less than \$20 million over next five years	Completed	Request for funding submitted.
K.3. [4.(a)]	12/31/96	Remove 622 units of spent fuel from north and middle basins at CPP-603	Completed 08/01/96	Requirement was met when other preceding milestones were completed.
F.2. 1st	9/30/97	Request from President FY 1998 funds necessary to initiate procurement of dry storage [for spent fuel]	Completed	Request for funding submitted and initial funding received in FY 1998 budget.
D.2.a. 1st	ending 12/31/00	DOE may send a maximum of 61 shipments of FRR spent fuel from date of DOE/Dept. of State policy adoption through end date	Complying	Refer to D.2.a., 3rd, 4th, and 5th requirements.

Exhibit 12.15: 1995 Settlement Agreement Requirements for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
D.2.c.	after 12/31/00	DOE may transport spent fuel to INEEL constituting a total of not more than 55 metric tons of DOE spent fuel. [See D.1.b.]	Complying	55 metric tons of spent fuel is equivalent to approx. 497 truck shipments.
D.2.f.	after 12/31/00	Until storage or permanent facility opens, DOE shall not ship more than 20 shipments of spent fuel in any year; except that:	Complying	Restriction has been written into planning documents.
D.2.f. (i)	NA	Until storage or permanent facility opens, DOE may not make more than 83 shipments of spent fuel from West Valley in one year;	Complying	Restriction has been written into planning documents.
D.2.f. (ii)	NA	Until storage or permanent facility opens, DOE may not make more than 13 shipments in any nine years succeeding the shipment of West Valley fuel; and	NA	Restriction has been written into planning documents.
D.2.f. (iii)	NA	Until storage or permanent facility opens, [West Valley] shipments DOE is entitled to-- but has not shipped, can be shipped in any subsequent year	NA	Restriction has been written into planning documents.
K.3.	12/31/00	Comply with provisions of paragraph 4 of the Dec. 22, 1993 Court Order concerning "Public Service Company of Colorado v. Batt, and United States of America v. Batt";	NA	Will be completed when removal of spent fuel from the south storage basin is completed. Completion is planned for March 31, 2000.
B.1.c.	1/1/03	After this date, a running average of no fewer than 2,000 cubic meters of TRU waste shall be shipped out of Idaho per year	NA	To be completed by 12/31/15, and in no event later than 12/31/18.
B.1. 2nd	12/31/18	Ship 65,000 cubic meters of TRU waste to WIPP or other disposal facility no later than deadline	NA	NA
K.2.c.	after 01/01/35	If all spent fuel is not removed from Idaho, federal parties shall pay Idaho \$60,000 per day	NA	NA
D.1.a.	12/31/35	Navy can ship spent fuel to INEEL to meet national security requirements or to examine fuel. Defense Secretary certifies to Gov. of Idaho total no. of shipments required through 2035.	Completed	Secretarial certification to State completed.
C.2.	end of any year	Shipments of aluminum-clad fuel from Savannah River cannot exceed number of shipments of same fuel from INEEL to Savannah River	NA	Restriction has been written into planning documents.
D.1.e.	NA	Naval spent fuel stored at INEEL when repository/storage facility opens shall be among early shipments to such facilities	NA	NA

Exhibit 12.15: 1995 Settlement Agreement Requirements for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
D.2.a.2nd	NA	Sec. of Energy must certify shipments are necessary to meet national security and nonproliferation requirements	NA	(Upon notice to State about fuel shipments.)
D.2.b.	NA	[State restriction related to spent fuel shipments and opening permanent repository or interim storage facility outside Idaho]	NA	NA
D.2.d.	NA	If/when shipments of fuel from Fort St. Vrain are received, they shall only remain until treatment for disposal is completed. Total shipments from Fort St. Vrain shall not exceed 244, constituting no more than 16 metric tons of spent fuel	NA	Fort St. Vrain spent fuel is to remain in Colorado, but may come to Idaho temporarily for treatment, if needed, after a spent fuel repository has opened.
D.2.e.	NA	Except for Fort St. Vrain fuel, DOE will make no shipments of commercial fuel to the INEEL	NA	Restriction has been written into planning documents.
E.1.	NA	[DOE agreement to treat spent fuel, high-level waste, and transuranic waste to permit disposal outside Idaho]	NA	NA
E.2.a.	ongoing	Continue to use Federal Facility Compliance Act process to determine locations for MLLW treatment and storage	NA	NA
F.1. 2nd	NA	...spent fuel for testing, except as permitted, shall leave Idaho within 5 years of receipt	NA	Restriction has been written into planning documents.
F.3. 2nd	NA	[Navy Dry Cell Expansion] Project shall commence as soon as Idaho issues required permit and funding is appropriated	Completed	Requirement completed; construction of the facility has commenced.
F.3. 3rd	NA	[Navy Dry Cell Expansion Project] and result in approx. \$26 million dollars in expenditures with completion [of Dry Cell Expansion by the Navy] in next five years	NA	Expenditures and construction are on track.
F.8.	State permit date	Commence installing new racks in the water pool at ICPP; install as soon as State issues permit	NA	Completed installation of new racks in pool #1 in 12/96. New racks for pools #5 and #6 have been postponed pending analysis of need.
G.1.	NA	Implement Environmental Restoration Program consistent with FFA/CO	NA	Enforceable deadlines for submission of key documents to agencies are identified in the FFA/CO action plan.

Exhibit 12.16: 1995 Settlement Agreement Milestones for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
K.3.[4.d]	9/1/94	Issue final schedule for removing spent fuel from CPP-603 and transferring to CPP-666	Completed 08/30/94	Completed on schedule.
K.3.[4.(a.1)]	9/30/94	Move at least 189 units of spent fuel to CPP-666	Completed 07/26/94	Completed 66 days ahead of schedule.
K.3.[4.c.]	12/31/94	All spent fuel in south basin inspected and placed in compliant storage configuration	Completed 12/14/94	Completed two weeks ahead of schedule.
K.3.[4.c.]	6/1/95	Start removing 718 units of spent fuel from south basin and transfer to CPP-666	Completed 05/12/95	Refer to K.3. [4], page B, for status.
F.1.1st	11/15/95	Designate the INEEL as DOE's lead lab for spent fuel	Completed 10/26/95	Designation given 10 days after signing of the agreement.
K.3.[4.(a.2)]	12/31/95	Move at least 189 units of spent fuel to CPP-666	Completed 09/01/95	Completed four months ahead of schedule.
D.1.b. 1st	12/31/95	Ship no more than 24 Naval shipments to INEEL from 10/16/95 to end of 1995	Complied	A total of 24 shipments were shipped.
E.3.1st	10/31/96	Commence operation of the high-level waste evaporator;	Completed 05/31/96	Commenced five months ahead of schedule.
D.2.a. 3rd	12/31/96	DOE may ship not more than 10 FRR shipments from date of policy adoption through 12/31/96	Complied	No FRR shipments were shipped to the INEEL in 1996.
D.1.b. 2nd	12/31/96	Ship no more than 36 Naval shipments in 1996	Complied	A total of 36 shipments were shipped.
K.3.[4.(a.3)]	12/31/96	Move 244 units of spent fuel to CPP-666	Completed 08/01/96	Completed five months ahead of schedule.
E.2.1st	6/1/97	DOE shall execute a contract for a mixed waste, TRU, and alpha-emitting MLLW treatment facility (AMWTP);	Completed 12/20/96	Contract with BNFL signed six months ahead of schedule; became effective 01/97.
E.6.1st	7/1/97	Solicit proposals for feasibility studies to treat calcined waste;	Completed 04/29/97	Completed two months ahead of schedule.
D.1.b. 3rd	1997-2000	No more than 20 Naval shipments per year from 1997 to 2000.	1997 Complied	19 shipments received in 1997. On track for completion.
D.2.a. 4th	12/31/97	...not more than 20 FRR shipments from the policy date through following year	Complied	No FRR shipments were shipped to the INEEL in 1997.
E.3.2nd	12/31/97	Reduce tank farm liquid waste volume by no fewer than 330,000 gallons	Completed 01/27/97	Completed 11 months ahead of schedule.
E.4.	6/30/98	Complete calcining all remaining non-sodium liquid HLW at INEEL	Completed 02/20/98	Completed four months ahead of schedule.

Exhibit 12.16: 1995 Settlement Agreement Milestones for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
D.2.a. 5th	12/31/98	...and not more than 40 FRR shipments from policy date through next year	NA	One shipment is anticipated for mid-1998.
E.7.1st	12/31/98	Complete construction of Three Mile Island dry spent fuel storage facility;	NA	Construction to begin in May 1998; completion of construction is anticipated by Dec. 31, 1998.
E.7.2nd	3/31/99	Commence moving [TMI] fuel into dry storage facility	NA	Preparations for operational readiness began in April 1998.
B.1.a.	4/30/99	First shipment of INEEL TRU waste to WIPP or other disposal facility begins by this date	NA	NA
F.4.	4/30/99	Complete and issue [DOE and Navy] Record of Decision[s] concerning NEPA analysis of preparing spent fuel to be shipped out of Idaho using MPC's	Navy Completed 01/08/97	Navy Record of Decision was signed 12/26/96 and published in the Federal Register on Jan. 8, 1997. Supplemental analysis of DOE's EIS is in progress.
E.6.2nd	12/31/99	Commence negotiating plan and schedule w/State for calcine waste treatment;	NA	ROD due 9/99; begin discussions with State in 12/99.
E.8.1st	12/31/99	Commence negotiating schedule with Idaho to transfer all spent fuel out of wet storage;	NA	Schedule development being accomplished as part of Accelerating Clean-up: Paths to Closure process. Formal negotiations w/Idaho haven't begun.
K.3.[4]	12/31/00	Empty the south basin of CPP-603 of spent fuel	NA	Removal of spent fuel is in progress; 460 of 744 units of spent fuel have been removed. Completion expected by March 31, 2000.
E.5.1st	6/1/01	Commence calcining sodium-bearing HLW;	Completed 02/20/98	Commenced treatment of sodium-bearing liquid high-level waste 3 years ahead of schedule.
D.1.b. 4th	01/01/01 to 12/31/35	May ship running average of no more than 20 Naval shipments per year to INEEL--total shipments through 2035 shall not exceed 575, nor exceed 55 metric tons of spent fuel. [Refer to D.2.c.]	Complying	On track for completion.
E.7. 3rd	6/1/01	Complete moving [TMI] fuel into dry storage facility	NA	NA
E.2. 2nd	12/31/02	Obtain necessary permits [for AMWTP] and complete construction;	NA	Work in progress and on schedule for initiation of construction.
B.1.b.	12/31/02	No fewer than 3,100 cubic meters of TRU waste shall have been shipped out of Idaho	NA	NA
E.2. 3rd	3/31/03	Commence operating [AMWTP] facility	NA	NA

Exhibit 12.16: 1995 Settlement Agreement Milestones for INEEL Spent Nuclear Fuel

Reference ID	Due date	Description	Status	Comments
F.2.2nd	7/1/03	Commence loading spent fuel into dry storage	NA	NA
E.6. 3rd	12/31/09	Issue Record of Decision for EIS concerning treatment of calcined waste;	NA	Ahead of schedule. Notice of Intent to prepare EIS was published in Federal Register in Sept. 1997. Projected completion is late 1999.
E.6. 5th	12/1/12	Submit to Idaho application for RCRA Part B permit	NA	NA
E.5.2nd	12/31/12	Complete calcining sodium-bearing HLW	NA	NA
B.1. 1st	12/31/15	Ship 65,000 cubic meters of TRU waste to WIPP or other disposal facility by target date;	NA	NA
E.8. 2nd	12/31/23	Complete transfer of all spent fuel from wet storage	NA	Plans for removal of fuel from wet storage are being developed.
C.1.	1/1/35	Remove all spent fuel, including Naval and Three Mile Island spent fuel from Idaho. Spent fuel used for testing subject to Section F.1.	NA	National and INEEL Spent Nuclear Fuel Programs support repository (Office of Civilian Radioactive Waste Management) in developing NEPA and planned license application for fuel at the INEEL.
C.3. and E.6.4th	12/31/35	Treat all high-level waste currently at INEEL to be moved out of Idaho for disposal by target date [E.6. 4th duplicates C.3.]	NA	NA

Exhibit 12.17: Work and Hazards at INEEL Facilities

Facility	Work	Hazards
Test Area North (TAN)	Supports Specific Manufacturing Capability (SMC) programs, hot cell work, cleanup, D&D activities, and fuel storage.	- Radiation, contamination, and criticality associated with the storage of irradiated nuclear fissile materials. - Hazards associated with chlorine gas and other hazardous chemicals. - Low-level radioactivity. - Airborne radionuclides. - Occupational hazards associated with processing heavy metals that contain radionuclides and are pyrophoric. Vulnerabilities - Large quantities of Three Mile Island fuel and debris. - Seismic threats, leak detection capabilities, pool liners, and ventilation at the fuel storage pools.
Test Reactor Area (TRA), which includes one operating reactor, the Advanced Test Reactor (ATR)	- Reactor operations. Materials and fuels are placed in test locations within and around the extremely high neutron flux generating core of the ATR to test their response to reactor environments. ATR also produces radioisotopes for medical and industrial applications. - Hot cells and related facilities to support testing for the naval nuclear propulsion program, commercial isotope production, domestic and foreign research and test programs.	- Associated with current and past operation of nuclear reactors. - Low-level radioactive and hazardous industrial wastes. - Radiological hazards from irradiated nuclear fuels temporarily stored in several shutdown reactor facilities and residual radiation from activated/contaminated components at such facilities. - ATR, as an operational nuclear facility, has a substantial post-accident nuclear source term. - Radiological hazards result from the ATR's irradiation component and material testing and radioisotope production mission. - Electrical and mechanical hazards from equipment. Vulnerabilities - Limited maintenance to non-ATR facilities due to funding. - Radiation and contamination associated with irradiated fuels.
Idaho Nuclear Technology and Engineering Center (INTEC); formerly Idaho Chemical Processing Plant (ICPP)	- Reprocesses spent fuel from government reactors (all of the reprocessing operations are currently idle). - Stores irradiated fuel from government reactors and liquid radioactive wastes from fuel reprocessing activities and other nuclear operations. - Houses a variety of facilities for radioactive waste storage and treatment, including the new waste calcining facility, where liquid radioactive waste is reduced by thermal treatment to solid waste, and the tank farm facility and associated evaporators, where liquid radioactive wastes are stored, blended, and/or volume-reduced. - Implementing a deactivation, decontamination, and decommissioning program that includes recovery of fissile material from the Rover facility in Building CPP-640. - A major effort to remove spent reactor fuel from CPP-603 to CPP-666 is under way in accordance with external commitments.	- Storage of corrosive, highly radioactive waste in underground storage tanks, transfer of this waste to processing facilities, and operation and maintenance of processing facilities. - Radiological and criticality hazards associated with storage of irradiated fuel. - Ongoing construction of new facilities, particularly the tank farm upgrade project. - New waste calcining facility evaporation. - Deactivation and decommissioning of facilities. Vulnerabilities - Handling of radioactive and hazardous wastes and spent nuclear fuel. - Construction activities.

Exhibit 12.17 (continued): Work and Hazards at INEEL Facilities

Central Facilities Area (CFA)	Supports engineering, maintenance, laboratory, service, transportation, and administrative functions.	- Minor radiological hazards. - Industrial hazards from high voltage and construction. - Chemical hazards.
Auxiliary Reactor Area (ARA), which includes an active decontamination and decommissioning project	- Decontamination and decommissioning (D&D) of dismantled nuclear reactor facilities (reactors have been dismantled and removed, or buried). - D&D projects are ongoing at ARA-II and ARA-III. The D&D activities are typically small in scale, ranging from 2000 to 8000 square feet.	- Construction, razing, and disassembly activities conducted as part of the D&D effort. - Radioactively contaminated materials could potentially leak to the environment if not adequately controlled. However, except for the buried SL-1 reactor components, radioactive materials have been removed from the facilities and the only radiation hazards are associated with equipment that may be contaminated. - D&D activities generate some low-level waste and small amounts of Toxic Substances Control Act Waste (such as asbestos and small amounts of polychlorinated biphenyls) and Resource Conservation and Recovery Act (RCRA) waste.
Waste Reduction Operations Complex (WROC)	- Facility for the compacting, sizing, or incineration of mixed low-level and low-level wastes. - Facilities for the storage of mixed low-level waste and hazardous materials. - Landfill for the disposal of industrial wastes. - Co-located test reactor awaiting D&D.	- High voltage, flammable liquids, gases, dusts, compressed gases, confined spaces, cryogenic systems, high temperature and pressure systems, inert and low oxygen atmospheres, direct radiation, chemical exposures, and high noise levels. - Radiation and contamination associated with spent fuel storage. Vulnerabilities - Corrosion of stainless steel fuel pins.
Radioactive Waste Management Complex (RWMC), including Pit-9 which is a fixed-price environmental remediation effort being undertaken at the Radioactive Waste Management Complex facility	- Storing a variety of low-level, mixed, and transuranic wastes for storage in burial grounds, retrievable storage pads, and enclosed storage facilities. - Several waste remediation projects on site. - Construction of new waste storage and remediation facilities.	- Buried hazardous and radioactive (mixed) transuranic waste, which could potentially leak to the environment. - Ongoing handling of radioactive and hazardous wastes - Construction activities. Vulnerabilities - Handling of radioactive and hazardous wastes. - Construction activities.
INEEL Research Center (IRC)	Supports advanced scientific research and development projects.	- Minor radiological hazards. - Industrial hazards from high voltage and construction. - Chemical hazards. Vulnerabilities - Biohazards, lasers, high temperature molten metals, and industrial hazards. - Lack of oversight by ES&H professionals.

Exhibit 12.18: Work and Hazards at ANL-W Facilities

FACILITY NAME	MISSION	Hazardous Materials and Environmental Impacts
Fuel Conditioning Facility (FCF): Buildings 765 & 709	Electrometallurgical treatment of fuel	Fissile and radioactive solids and gases, exposed heavy metals, hazardous metals, hydrogen, argon, sodium
Experimental Breeder Reactor II (EBR-II): Buildings 766-768, 793, 788 & 789	Shutdown	Sodium, hydrogen, and argon
Hot Fuel Examination Facility (HFEF): Building 785	Fuel examination and storage	Spent fuel and reactor irradiated nuclear material containing plutonium, fission products, sodium, argon, hydrogen
Zero Power Physics Reactor (ZPPR)	Simulates wide range of reactor properties while operating at low power levels	Fissile material (plutonium and uranium), low-level fission products, and small quantities of actinides in the fuel
Sodium Process Facility (SPF), Building 799	Processes mixed waste Na reactor coolant to LLW before shipment to INEEL for disposal	Caustic, hydrogen gas generation, sodium metal fire, low level fission products
Radioactive Scrap Waste Facility (RSWF): Building 771	Interim storage of high rad. Scrap (EBR-II fuel) and mixed waste	Fissile material, heavy metal, mixed waste, and fission products

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
ARA 617	Dynamic Processing Facility	Communications/ Control Centers	NA	Operating	Clean	1961	2010	Awaiting Demolition
B16 602	Pumphouse Fire Station No. 2	NA	NA	Inactivated/1997	Clean	1958	1997	Awaiting Demolition
B16 607	Training & Storage Building	NA	NA	Inactivated/1997	Clean	1982	1996	Awaiting Demolition
B16 703	Fire Station Training Facility	NA	NA	Shutdown	Clean	1980	1997	Awaiting Demolition
B23 602	Taylor Generator Building	NA	NA	Shutdown	Clean	1984	1993	Awaiting Demolition
CF 603	Dispensary	Vacant	Demolish	Inactivated/1997	Clean	1950	1997	Awaiting Demolition
CF 604	Emergency Generator Building	Vacant	Demolish	Inactivated/1995	Clean	1983	1995	Awaiting Demolition
CF 606	Office Building	Vacant	Demolish	Inactivated/1995	Clean	1942	1995	Awaiting Demolition
CF 607	Office Building	Vacant	Demolish	Inactivated/1996	Clean	1942	1996	Awaiting Demolition
CF 613	Bunkhouse	Vacant	Demolish	Inactivated/1995	Clean	1942	1995	Awaiting Demolition
CF 617	Laundry	Unoccupied (Temporary use as TAA)	Maintain	Inactivated/1995	Radioactive	1981	1995	Awaiting New Mission
CF 632	Boiler Operations Lunchroom	Vacant	Demolish	Inactivated/1996	Clean	1945	1996	Awaiting Demolition
CF 633	Health Physics Instrument Lab	Light Laboratory	Maintain	Operating	Clean	1942	2003	Awaiting Demolition
CF 635	Storage Bunker	Storage	Maintain	Operating	Clean	1943	1998	Awaiting Demolition
CF 643	Office Trailer	Offices	Maintain	Operating	Clean	1977	2003	Awaiting Removal
CF 650	Heating Plant	Utility	Maintain	Operating	Clean	1943	2003	Awaiting Demolition
CF 652	Office Trailer	Offices	Maintain	Operating	Clean	1977	2003	Awaiting Removal

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
CF 657	Pump House	Vacant	Demolish	Inactivated/1996	Radioactive	1953	1996	Decontaminate/Dismantle
CF 662	Cafeteria	Service	Maintain	Operating	Clean	1963	2003	Awaiting Demolition
CF 675	Generator Building	Vacant	Demolish	Inactivated/1997	Clean	1963	1997	Awaiting Demolition
CF 680	Storage	Vacant	Demolish	Inactivated/1995	Clean	1951	1995	Awaiting Demolition
CF 684	Flammable Storage	Storage	Maintain	Operating	Clean	1952	1998	Awaiting Demolition
CF 685	Bus Depot	Service	Maintain	Operating	Clean	1952	2003	Awaiting Demolition
CF 691	Sewage Plant	Vacant	Demolish	Inactivated/1995	Radioactive	1953	1995	Decontaminate/Dismantle
CF 692	Scale House	Vacant	Demolish	Inactivated/1997	Clean	1950	1997	Awaiting Demolition
CF 703	Microwave Tower	Towers (Voice/Data)	NA	Shutdown	Clean	1965	1997	Awaiting Demolition
CF 704	Concussion Wall	Catchall	NA	Operating	Clean	1942	2003	Awaiting Demolition
CF 716	Tank - Septic	Septic Tanks (Sewer)	NA	Shutdown	Radioactive	1950	1996	Decontaminate/Dismantle
CF 724	Fuel Oil Tank	Tanks (Oil)	NA	Shutdown	Chemical	1951	1994	Awaiting Demolition
CF 738	Fuel Oil Tank (CF-650)	Tanks (Oil)	NA	Operating	Chemical	1951	2003	Awaiting Demolition
CF 739	Fuel Oil Tank (CF-650)	Tanks (Oil)	NA	Operating	Chemical	1951	2003	Awaiting Demolition
CF 746	Fuel Oil Tank	Tanks (Oil)	NA	Shutdown	Chemical	1982	1994	Awaiting Demolition
CF 756	Water Storage Tank	Tanks, Pressure (Non-Potable)	NA	Shutdown	Clean	1950	1994	Awaiting Demolition
CF 758	Scale Truck Weight	Vehicle Weighing Facility	NA	Shutdown	Clean	1950	1997	Awaiting Demolition
CPP 1609	East Guardhouse #3	Guardhouse	Demolish	Inactivated/1998	Clean	1984	1998	Awaiting Removal
CPP 1657	Hazardous Temp. Accumulation	Storage	Remove	Operating	Clean	1991	2000	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
CPP 601	Fuel Process Building	Under Stabilization	Under Surveillance and Maintenance	Shutdown	Radioactive	1953	1994	EM-60 to Deactivate
CPP 603	Wet & Dry Fuel Storage Facility	Wet and Dry Fuel Storage	Fuel Movement and Canning. Upgrade tanks & power	Operating	Radioactive	1953	2000	EM-60 to Deactivate; Transfer to EM-60
CPP 608	Storage Building	Storage	Demolish	Shutdown	Radioactive	1953	1995	Decontaminate/Dismantle
CPP 625	Rectifier Building	Rectifier Building	Demolish	Shutdown	Clean	1971	1995	Awaiting Demolition
CPP 627	Remote Analytical Facility	Laboratory	Decontaminate	Shutdown	Radioactive	1955	2004	EM-60 to Deactivate
CPP 633	Waste Calciner Facility	Under Characterization and Assessment	Stabilize	Shutdown	Radioactive	1960	1984	EM-60 to Deactivate
CPP 640	Headend Process Plant	Shutdown	Uranium Removal	Shutdown	Radioactive	1961	1984	EM-60 to Deactivate
CPP 642	Hot Waste Pumphouse	Inactive	Decontaminate and Decommission	Shutdown	Radioactive	1958	1993	Decontaminate/Dismantle
CPP 650	Breathing Air Compressor	Inactive	Demolish	Operating	Clean	1979	1998	Awaiting Demolition
CPP 672	Rad-Con Storage	Storage for Rad Control Instruments and Equipment	No Action	Operating	Radioactive	1981	1998	Transfer to EM-40
CPP 681	Effluent/Environ Monitor	Storage	Remove	Inactivated/1997	Clean	1981	1997	Awaiting Demolition
CPP 683	Breathing Air Charger	Shutdown	Demolish	Operating	Clean	1981	1998	Awaiting Demolition
CPP 691	Fuel Processing Restoration Facility	Standby	Evaluate for possible uses	Standby	Clean	1992	TBD	New Mission
CPP 709	Service Waste Monitoring Station	Other, Pumping Stations	NA	Shutdown	Radioactive	1953	1993	Decontaminate/Dismantle
CPP 710	Solvent Storage Building	Other, Storage	NA	Shutdown	Chemical	1953	1991	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
CPP 727	FAST HF Acid Storage VES-CS-169	Other, Storage	NA	Shutdown	Clean	1983	1994	Awaiting Demolition
CPP 740	Settling Basin and Dry Well	Other, Storage	NA	Shutdown	Radioactive	1953	1993	Decontaminate/Dismantle
CPP 745	HF Acid Storage (VES-YDB-105)	NA	NA	Shutdown	Clean	1965	1985	Awaiting Demolition
CPP 759	Leaching Cesspool for MK Septic Tanks (Sewer) Building	NA	NA	Shutdown	Clean	1977	1996	Awaiting Demolition
CPP T-1	Construction Management Building	Lunch Room/Change Room	Remove	Inactivated/1997	Clean	1965	1996	Awaiting Removal
CPP T-2	Temporary Storage Building	Storage	Remove	Operating	Clean	1980	1996	Awaiting Removal
CPP T-3	Temporary Storage Building	Storage	Remove	Operating	Clean	1980	1996	Awaiting Removal
CPP T-5	Temporary Office Building	Construction Lunch Room/Change Room	Remove	Inactivated/1997	Clean	1965	1996	Awaiting Removal
CPP TB-6	Quality Office Building	Utility Planning/Scheduling Team	Remove	Inactivated/1997	Clean	1981	1997	Awaiting Removal
CPP TR-19	Office Trailer	Offices	Remove	Inactivated/1996	Clean	1974	1996	Awaiting Removal
CPP TR-20	FPR Office Trailer	Offices	FY98-Activate for TMI Fuel Project; FY99-Inactivate	Inactivated/1996	Clean	1960	1999	Reactivate in 1998
CPP TR-21	FPR Office Trailer	Offices	FY98-Activate for TMI Fuel Project; FY99-Inactivate	Inactivated/1996	Clean	1960	1999	Reactivate in 1998

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
CPP	TR-22 FPR Office Trailer	Offices	FY98-Activate for TMI Fuel Project;FY99-Inactivate	Inactivated/1996	Clean	1960	1999	Reactivate in 1998
CPP	TR-29 Office Trailer	Offices	Remove	Inactivated/1996	Clean	1960	1996	Awaiting Removal
CPP	TR-43 Trailer, QA Receiving & Inspection	Offices	Remove	Inactivated/1996	Clean	1960	1996	Awaiting Removal
INTE	757 Fluoboric Acid Storage Tank (VES-CS-113)	NA	NA	Shutdown	Chemical	1983	1995	Awaiting Demolition
PBF	604 Terminal Building	General Storage	Maintain	Shutdown	Clean	1955	1992	Transfer to EM-40
PBF	606 Instrument Cell	Instrument Cell	Maintain	Shutdown	Clean	1955	1992	Transfer to EM-40
PBF	616 Storage Building	Storage	Maintain	Shutdown	Clean	1962	1992	Transfer to EM-40
PBF	617 Storage Building	Storage	Maintain	Shutdown	Clean	1963	1992	Transfer to EM-40
PBF	619 Control Building	Communications	Maintain	Shutdown	Clean	1967	1992	Transfer to EM-40
PBF	620 Reactor Building	Reactor/Interim Fuel Storage	Maintain	Shutdown	Radioactive	1970	1992	Transfer to EM-40
PBF	621 Emergency Generator Building	Utility	Maintain	Shutdown	Chemical	1970	1992	Transfer to EM-40
PBF	624 Auxiliary Building	Utility	Maintain	Shutdown	Clean	1973	1992	Transfer to EM-40
PBF	625 Maintenance & Storage Building	Storage	Maintain	Shutdown	Clean	1966	1992	Transfer to EM-40
PBF	627 Gas Cylinder Storage	Gas Cylinder Storage	Maintain	Shutdown	Clean	1966	1992	Transfer to EM-40
PBF	629 Stack Gas Monitor Building	Reserve	Maintain	Shutdown	Radioactive	1981	1992	Transfer to EM-40
PBF	634 Fire Water Pump House	Utility	Maintain	Shutdown	Clean	1983	1992	Transfer to EM-40

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
PBF 709	Fuel Oil Tank	Tanks (Oil)	NA	Shutdown	Chemical	1958	1980	Transfer to EM-60; Awaiting Demolition
PBF 720	Cooling Tower	Towers (Chill Water)	NA	Shutdown	Chemical	1976	1992	Transfer to EM-40
PBF 722	Fuel Storage Tank	Tanks (Oil)	NA	Shutdown	Chemical	1971	1992	Transfer to EM-40
PBF 724	Septic Tank	Tanks (Industrial/Not Hazardous)	NA	Shutdown	Chemical	1968	1992	Transfer to EM-40
PBF 726	Septic Tank	Tanks (Industrial/Not Hazardous)	NA	Shutdown	Chemical	1988	1992	Transfer to EM-60; Awaiting Demolition
PBF 728	Septic Tank	Tanks (Industrial/Not Hazardous)	NA	Shutdown	Chemical	1968	1992	Transfer to EM-40
PBF 730	Primary Water Storage Tank	Tanks, Gravity (Potable)	NA	Shutdown	Radioactive	1976	1992	Transfer to EM-40
PBF 731	Corrosive Waste Disposal Sump	Other, Storage (Industrial)	NA	Shutdown	Chemical	1980	1992	Transfer to EM-40
PBF 732	Hot Waste Storage Tank	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1978	1992	Transfer to EM-40
PBF 735	Seepage Pit	Other, Storage (Industrial)	NA	Shutdown	Chemical	1972	1992	Transfer to EM-40
PBF 737	Fuel Oil Tank	NA	NA	Shutdown	Chemical	1970	1992	Transfer to EM-40
PBF 751	Radioactive Liquid Waste Storage Tank	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1979	1992	Transfer to EM-40
PBF 753	Leaching Pond	Other, Storage (Industrial)	NA	Shutdown	Chemical	1960	1980	Transfer to EM-40
PBF 754	Seepage Pit	Other, Storage (Industrial)	NA	Shutdown	Chemical	1980	1991	Transfer to EM-40

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
PBF 758	Leaching Pit	Other, Storage (Industrial)	NA	Shutdown	Chemical	1962	1970	Transfer to EM-40
STF 601	Security Training Facility	NA	NA	Inactivated/1997	Clean	1962	1997	Awaiting Demolition
STF 605	Deep Well Pumphouse	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 607	Deluge Valve House	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 610	PBF Test Facility	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 611	Pumphouse	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 612	Shooting House	NA	NA	Shutdown	Clean	1962	1993	Awaiting Demolition
STF 712	Primary Cooler and Trench	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 719	Blowdown Sump	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 721	Decay Loop Cooler	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
STF 722	Dowtherm Cooling Tower	NA	NA	Shutdown	Clean	1962	1990	Awaiting Demolition
TAN 1703	Waste Holding Tanks V1 V2 V3	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1955	1960	Decontaminate/Dismantle
TAN 1709	Caustic Storage Tank	Other, Storage (Industrial)	NA	Shutdown	Radioactive	1956	1993	Decontaminate/Dismantle
TAN 1710	Sand Tank	Other, Tanks (Gas)	NA	Shutdown	Radioactive	1955	1959	Decontaminate/Dismantle
TAN 1724	IET Exhaust Stack	NA	NA	Shutdown	Radioactive	1956	1985	Decontaminate/Dismantle
TAN 1725	IET Exhaust Filter Room	NA	NA	Shutdown	Radioactive	1956	1985	Decontaminate/Dismantle
TAN 1726	Disposal Well	NA	NA	Shutdown	Radioactive	1958	1990	Decontaminate/Dismantle
TAN 1728	Disposal Well	NA	NA	Shutdown	Radioactive	1956	1990	Decontaminate/Dismantle
TAN 602	Administration Building	Vacant	Demolish	Shutdown	Clean	1956	1995	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TAN 608	Water Filtration Building	Water filtration building	Maintain	Operating	Clean	1955	2001	Transfer to EM-60; Awaiting Demolition
TAN 609	Equipment Maintenance Shop	Vacant	Demolish	Inactivated/1995	Radioactive	1956	1995	Decontaminate/Dismantle
TAN 616	Liquid Waste Treatment	Abandoned	Decontaminate and dismantle	Shutdown	Radioactive	1955	1980	Decontaminate/Dismantle
TAN 620	IET Control & Equipment Building	Vacant	Demolish	Inactivated/1994	Radioactive	1956	1975	Decontaminate/Dismantle
TAN 624	Containment Building	Vacant	Demolish	Shutdown	Clean	1956	1986	Transfer to EM-40
TAN 630	Control & Equipment Building	Vacant	Demolish	Inactivated/1997	Clean	1959	1986	Awaiting Demolition
TAN 631	Tank Building	Inactivated	Demolish	Inactivated/1995	Clean	1959	1986	Awaiting Demolition
TAN 633	Hot Cell Annex	Hot cells	Maintain	Inactivated/1995	Radioactive	1958	1995	Transfer to EM-40
TAN 634	Diesel Generator Pad	Modular Building Foundation	Remove Modular Building	Shutdown	Clean	1956	1986	Awaiting Demolition
TAN 635	H&V 10 (So. CAM) Building	Vacant	Demolish	Inactivated/1995	Clean	1954	1986	Awaiting Demolition
TAN 637	Compressor Building	Inactive	Demolish	Inactivated/1995	Clean	1954	1995	Transfer to EM-60; Awaiting Demolition
TAN 638	Guard House	Vacant	Demolish	Inactivated/1995	Clean	1958	1986	Awaiting Demolition
TAN 643	Chlorination Building	Inactivated	Demolish	Inactivated/1995	Clean	1957	1990	Awaiting Demolition
TAN 650	Containment Service Building	Vacant	Demolish	Inactivated/1997	Radioactive	1977	1986	Transfer to EM-40
TAN 651	Heat Stress Relief Str.	Inactivated	Excess	Inactivated/1995	Clean	1969	1986	Awaiting Demolition
TAN 656	Change Room	Vacant	Demolish	Inactivated/1994	Radioactive	1969	1975	Decontaminate/Dismantle
TAN 657	Heat Stress Control Building	Inactivated	Excess	Inactivated/1995	Clean	1969	1986	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TAN 659	Control Building	Inactivated	Demolish	Shutdown	Clean	1976	1986	Awaiting Demolition
TAN 660	Maintenance Staging Building	Temporary storage	Demolish	Inactivated/1995	Clean	1976	1995	Awaiting Demolition
TAN 661	Control House for Turntable	Inactivated	Demolish	Inactivated/1995	Clean	1970	1990	Awaiting Demolition
TAN 663	H&V 10 (N Cam)	Inactivated	Demolish	Inactivated/1995	Clean	1979	1986	Awaiting Demolition
TAN 667	Small Machine Shop	Temporary storage	Maintain	Shutdown	Clean	1983	1998	Awaiting Demolition
TAN 670	Chlorine Treatment Building	Chlorine treatment building	Demolish	Inactivated/1995	Clean	1954	1995	Awaiting Demolition
TAN 702	Boiler Fuel Tank	Tanks (Oil)	NA	Shutdown	Clean	1956	1995	Awaiting Demolition
TAN 703	Exhaust Stack	Other, Other Service Structures	NA	Shutdown	Chemical	1976	1986	Awaiting Demolition
TAN 705	Turntable Outdoor (90 Ft Dia)	Other, Railroad Transportation	NA	Shutdown	Radioactive	1976	1990	Decontaminate/Dismantle
TAN 709	Transformer Station	Substations	NA	Shutdown	Chemical	1960	1997	Awaiting Demolition
TAN 710	Septic Tank	Septic Tanks (Sewer)	NA	Shutdown	Radioactive	1956	1980	Decontaminate/Dismantle
TAN 716	Exhaust Duct and Stack	Other, Other Service Structures	NA	Shutdown	Chemical	1956	1986	Awaiting Demolition
TAN 718	Exhaust Filter and Pad	Other, Other Service Structures	NA	Shutdown	Radioactive	1956	1980	Decontaminate/Dismantle
TAN 719	Shielded Roadway to TAN-630	Tunnels (Vehicular)	NA	Shutdown	Clean	1956	1986	Awaiting Demolition
TAN 720	Concrete Storage Cask	Other, Storage	NA	Operating	Radioactive	1961	1998	Transfer to EM-60; Awaiting Demolition
TAN 721	Concrete Storage Cask	Other, Storage	NA	Operating	Radioactive	1961	1998	Transfer to EM-60; Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TAN 723	Brine Pit	Other, Storage (Industrial)	NA	Shutdown	Chemical	1959	1995	Transfer to EM-60; Awaiting Demolition
TAN 724	Boiler Fuel Tank	Tanks (Oil)	NA	Shutdown	Chemical	1956	1995	Awaiting Demolition
TAN 725	Vault Exhaust Stack	Other, Other Service Structures	NA	Shutdown	Chemical	1956	1986	Awaiting Demolition
TAN 726	Hot Liquid Waste Storage Tank/Vault	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1975	1986	Decontaminate/Dismantle
TAN 736	Septic Tank	Septic Tanks (Sewer)	NA	Shutdown	Radioactive	1956	1993	Decontaminate/Dismantle
TAN 737	Septic Tank	Septic Tanks (Sewer)	NA	Shutdown	Radioactive	1957	1993	Decontaminate/Dismantle
TAN 742	Waste Holding Tanks TK 709 & 710	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1970	1993	Decontaminate/Dismantle
TAN 744	Inlet Gas Supply Platform	Other, Service Structures	NA	Shutdown	Clean	1960	1986	Awaiting Demolition
TAN 745	Sec. Coolant System Rec.	Structures, Industrial, Other	NA	Shutdown	Clean	1965	1986	Awaiting Demolition
TAN 746	Condenser Shelter	Other, Service Structures	NA	Shutdown	Clean	1958	1986	Awaiting Demolition
TAN 747	Steam Tanks	Structures, Industrial, Other	NA	Shutdown	Clean	1960	1986	Awaiting Demolition
TAN 750	Liquid Waste Disposal Pond	Other, Storage (Industrial)	NA	Shutdown	Radioactive	1960	1995	Decontaminate/Dismantle
TAN 758	Suppression Air Tank	Structures, Industrial, Other	NA	Shutdown	Clean	1965	1995	Awaiting Demolition
TAN 760	Fire Hose House	Other, Other Service Structures	NA	Shutdown	Clean	1958	1996	Awaiting Demolition
TAN 761	Fire Hose House	Other, Other Service Structures	NA	Shutdown	Clean	1958	1996	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TAN 765	Stop Tank	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1970	1986	Decontaminate/Dismantle
TAN 766	Diesel Fuel Oil Tank (DF-T-14)	Tanks (Oil)	NA	Shutdown	Chemical	1960	1986	Awaiting Demolition
TAN 767A	Boiler Fuel Tank (FO-T-13A)	Tanks (Oil)	NA	Shutdown	Chemical	1959	1985	Awaiting Demolition
TAN 767B	Boiler Fuel Tank (FO-T-13B)	Tanks (Oil)	NA	Shutdown	Chemical	1959	1986	Awaiting Demolition
TAN 771	Sulfuric Acid Tank	Other, Storage (Industrial)	NA	Shutdown	Chemical	1959	1995	Awaiting Demolition
TAN 772	Liquid Nitrogen Tank	Tanks (Process Gas)	NA	Shutdown	Chemical	1959	1995	Awaiting Demolition
TAN 774	Concrete Slab	Storage (Open Pavement)	NA	Shutdown	Clean	1959	1995	Awaiting Demolition
TAN 780	Tank Pad	Storage (Open Pavement)	NA	Shutdown	Clean	1970	1993	Awaiting Demolition
TAN 782	Drainage Pond, South	Other, Storage (Industrial)	NA	Shutdown	Radioactive	1960	1995	Decontaminate/Dismantle
TAN 790	Abnormal Waste Storage Pad	Storage (Open Pavement)	NA	Operating	Clean	1986	2002	Transfer to EM-60; Awaiting Demolition
TAN 791	Spent Fuel Storage Pad	Storage (Open Pavement)	NA	Operating	Clean	1986	2002	Transfer to EM-60; Awaiting Demolition
TRA 603	Material Test Reactor Building	Miscellaneous temporary experiments	Operate	Operating	Radioactive	1952	2015	Transfer to EM-60; Awaiting Demolition
TRA 611	Plug Storage Building	Abandoned	Demolish	Shutdown	Radioactive	1952	1973	Transfer to EM-40
TRA 612	Retention Sump Pumphouse	Inactive	Characterize	Shutdown	Radioactive	1952	1993	NE to Deactivate
TRA 615	Meteorological Inst. Building	Instrument Storage	Temporary Storage	Shutdown	Clean	1970	1997	Awaiting Demolition

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TRA 618	Warehouse	Storage	Deactivate	Operating	Clean	1952	1998	Awaiting Demolition
TRA 624	Sewage Treatment Building	Shutdown (1996/7)	Abandon	Shutdown	Radioactive	1952	1995	Transfer to EM-40
TRA 626	Maintenance Storage Building	Storage	Operate	Shutdown	Clean	1952	1998	Awaiting Demolition
TRA 629	Gas Cylinder Storage Building	Shutdown	Shutdown	Shutdown	Clean	1956	1996	Awaiting Demolition
TRA 631	Acid Pumphouse	Shutdown	Shutdown	Shutdown	Chemical	1952	1996	Awaiting Demolition
TRA 636	retention Basin Inlet Smp	Shutdown	Characterize	Shutdown	Chemical	1981	1995	NE to Deactivate
TRA 637	Bunkhouse Trailer	Sleeping Quarters	Deactivate	Operating	Clean	1957	1999	Awaiting Demolition
TRA 639	Sodium Safety Equipment Storage	NA	NA	Shutdown	Clean	1980	1994	Awaiting Demolition
TRA 641	Gamma Building	Shutdown/Deactivated	Deactivated	Deactivated	Radioactive	1955	1996	Decontaminate/Dismantle
TRA 642	Engineering Test Reactor Building	Shutdown	Awaiting D&D	Shutdown	Radioactive	1957	1981	Transfer to EM-40
TRA 643	ETR Compressor Building	Shutdown	Awaiting D&D	Shutdown	Radioactive	1957	1981	Transfer to EM-40
TRA 644	ETR Heat Exchanger Building	Shutdown	Awaiting D&D	Shutdown	Radioactive	1957	1981	Transfer to EM-40
TRA 655	ETR Air Intake Building	Inactive	Characterize Contamination	Shutdown	Radioactive	1957	1981	Transfer to EM-40
TRA 656	Maintenance Storage Building	D&D	D&D	Operating	Clean	1959	1981	Awaiting Demolition
TRA 660	Adv Reactivity Measurement Facility	Spent fuel storage	Remove spent fuel	Deactivated	Radioactive	1959	1991	Decontaminate/Dismantle
TRA 663	Superior Diesel Building	Temporary Storage	Deactivate	Shutdown	Clean	1957	1981	Awaiting Demolition
TRA 664	Hot Storage Building	Shutdown	Deactivate	Shutdown	Radioactive	1961	1997	Transfer to EM-40

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TRA 666	Hydraulic Test Facility	Shutdown	Temporary storage	Shutdown	Clean	1963	1994	Awaiting Demolition
TRA 669	Cold Storage Building	Shutdown	Deactivate	Shutdown	Clean	1968	1985	Awaiting Demolition
TRA 673	Storage Building	Shutdown	Deactivate	Shutdown	Clean	1971	1990	Awaiting Demolition
TRA 704	ETR Primary Filter Pit	Other, Other Service Structures	NA	Deactivated	Radioactive	1957	1982	Transfer to EM-40
TRA 705	ETR Secondary Filter Pit	Other, Other Service Structures	NA	Deactivated	Radioactive	1957	1982	Transfer to EM-40
TRA 706	Delay Tanks	Structures, Industrial, Other	NA	Deactivated	Radioactive	1957	1982	Transfer to EM-40
TRA 708B	Water Storage Tank	Tanks (Industrial/Not Hazardous)	NA	Shutdown	Clean	1952	1995	Awaiting Demolition
TRA 712	Retention Basin (Underground)	Other, Storage	NA	Shutdown	Radioactive	1952	1993	Awaiting Demolition
TRA 714	Steam Valve Box	Other, Other Service Structures	NA	Shutdown	Clean	1952	1988	Awaiting Demolition
TRA 727A	Fuel Oil Storage Tank (East)	Tanks (Oil)	NA	Shutdown	Chemical	1952	1988	Awaiting Demolition
TRA 727B	Fuel Oil Storage Tank (West)	Tanks (Oil)	NA	Shutdown	Chemical	1952	1988	Awaiting Demolition
TRA 730A	MTR Catch Tank #1	Tanks (Hazardous Contaminated)	NA	Operating	Radioactive	1986	1998	EM-60 to Deactivate
TRA 730B	MTR Catch Tank #2	Tanks (Hazardous Contaminated)	NA	Operating	Radioactive	1986	1998	EM-60 to Deactivate
TRA 730C	MTR Catch Tank #3	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1986	1998	EM-60 to Deactivate
TRA 730D	MTR Catch Tank #4	Tanks (Hazardous Contaminated)	NA	Shutdown	Radioactive	1986	1998	EM-60 to Deactivate

Exhibit 12.19: INEEL Excess Facilities: Proposed Deactivation and Demolition Projects

Facility #	Facility Name	Present Use	Interim Action	Operational Status	Hazard Type	Year Built	Year Mission Ends	Planned Action
TRA 731B	Caustic Storage Tank (North)	Tanks (Hazardous Not Contaminated)	NA	Shutdown	Chemical	1952	1993	Awaiting Demolition
TRA 731C	Caustic Storage Tank (South)	Tanks (Hazardous Not Contaminated)	NA	Shutdown	Chemical	1952	1993	Awaiting Demolition
TRA 731D	Acid Storage Tank (North)	Tanks (Hazardous Not Contaminated)	NA	Shutdown	Chemical	1952	1993	Awaiting Demolition
TRA 731E	Acid Storage Tank (South)	Tanks (Hazardous Not Contaminated)	NA	Shutdown	Chemical	1952	1993	Awaiting Demolition
TRA 732	Sewage Treatment Plant	Plants (Sewer, Primary Treatment)	NA	Shutdown	Radioactive	1952	1996	Transfer to EM-40
TRA 755	ETR Filter Pit	Structures, Industrial, Other	NA	Deactivated	Radioactive	1957	1982	Transfer to EM-40
TRA 758	Inactivated Leaching Pond	Structures, Industrial, Other	NA	Shutdown	Radioactive	1952	1993	Engineered Cap
TRA 760	Inactivated Monitor Station	Structures, Industrial, Other	NA	Shutdown	Radioactive	1959	1993	NE to Deactivate
TRA 763B	Air Storage Tank	Tanks (Process Gas)	NA	Shutdown	Clean	1952	1997	Awaiting Demolition
TRA 779	Decon Pad	Paving	NA	Shutdown	Clean	1989	1998	Awaiting Demolition
WMF 612	Certified and Segregated Waste Storage Building	NA	NA	Shutdown	Potential Radio	1984	1999	EM-30 to Remove
WMF 702	Liquid Corrosive Chemical Disp	Other, Storage (Industrial Waste/Haz)	NA	Shutdown	Chemical	1957	1978	Transfer to EM-40 Environmental Restoration
WMF 711	Air Support Weather Shield #2	Other, Service Structures	NA	Shutdown	Potential Radio	1981	1998	EM-30 to Remove

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
AEF 601	AEF-601 Demolition	Demolish the AEF-601 Reactor Building Basement.	TBA	TBA
ANL-W	Remote Treatment Facility	This facility will characterize, segregate, treat, and/or repackage remote-handled mixed waste from the INEEL.	2003	2005
ANL-W	Site Infrastructure Upgrades	This project provides for upgrades to the Argonne National Laboratory-West infrastructure.	2000	2000
ANL-W	Site Infrastructure Upgrades	This project provides for upgrades to the Argonne National Laboratory-West infrastructure.	2001	2001
ANL-W	Site Infrastructure Upgrades	This project provides for upgrades to the Argonne National Laboratory-West infrastructure.	2000	2000
ANL-W	Site Infrastructure Upgrades	This project provides for upgrades to the Argonne National Laboratory-West infrastructure.	2001	2001
ANL-W	Remote Treatment Facility	This facility will characterize, segregate, treat, and/or repackage remote-handled mixed waste from the INEEL.	2003	2005
ANL-W 704	ANLW-704 Fuel Manufacturing Facility	This project provides for upgrades to the Fuel Manufacturing Facility to facilitate spent fuel research.	2000	2000
ANL-W 704	ANLW-704 Fuel Manufacturing Facility	This project provides for upgrades to the Fuel Manufacturing Facility to facilitate spent fuel research.	2001	2001
ANL-W 704	ANL-W-704 Fuel Manufacturing Facility	This project provides for upgrades to the Fuel Manufacturing Facility to facilitate spent fuel research.	2000	2000
ANL-W 704	ANL-W - 704 Fuel Manufacturing Facility	This project provides for upgrades to the Fuel Manufacturing Facility to facilitate spent fuel research.	2001	2001
ANL-W 752	ANLW-752 Analytical Laboratory Waste Cask	This project provides a cask to transfer material to and from the Analytical Laboratory Hot Cells.	2000	2001
ANL-W 752	ANLW 752 Analytical Laboratory Waste Cask	This project provides a cask to transfer material to and from the Analytical Laboratory Hot Cells.	2000	2001
ANL-W 765	ANLW-765 Fuel Conditioning Facility Equipment Upgrades	This project provides for upgrades to equipment in the Fuel Conditioning Facility to handle the fuel from the Experimental Breeder Reactor II.	2000	2000
ANL-W 765	ANLW-765 Fuel Conditioning Facility Equipment Upgrades	This project provides for upgrades to equipment in the Fuel Conditioning Facility to handle the fuel from the Experimental Breeder Reactor II.	2001	2001
ANL-W 765	ANL-W 765 Fuel Conditioning Facility Equipment Upgrades	This project provides for upgrades to equipment in the Fuel Condition Facility to handle the fuel from the Experimental Breeder Reactor II.	2000	2000
ANL-W 765	ANL-W 765 Fuel Conditioning Facility Equipment Upgrades	This project provides for upgrades to equipment in the Fuel Condition Facility to handle the fuel from the Experimental Breeder Reactor II.	2001	2001

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #	Project	Description	Project Start	Project End
ANL-W 771	ANLW-771 Fiscal Year 1998 Radioactive Scrap and Waste Facility Upgrades	This project provides new storage liners at the Radioactive Scrap and Waste Facility for storage of radioactive materials.	1998	1998
ANL-W 771	ANL-W 771 Fiscal Year 1998 Radioactive Scrap and Waste Facility Upgrades	This project provides new storage liners at the Radioactive Scrap and Waste Facility for storage of radioactive materials.	2000	2000
ANL-W 785	ANLW-785 Hot Fuel Examination Facility Equipment Upgrades	This project provides for upgrades to the Hot Fuel Examination Facility to enable processing of the Experimental Breeder Reactor II sodium.	2001	2001
ANL-W 785	ANL-W-785 Hot Fuel Examination Facility Equipment Upgrades	This project provides for upgrades to the Hot Fuel Examination Facility to enable processing of the Experimental Breeder Reactor II sodium.	2001	2001
ANL-W 785	ANL-W-785 Hot Fuel Examination Facility Equipment Upgrades	This project provides for upgrades to the Hot Fuel Examination Facility to enable processing of the Experimental Breeder Reactor II sodium.	2000	2000
ANL-W 785	ANLW-785 Hot Fuel Examination Facility Equipment Upgrades	This project provides for upgrades to the Hot Fuel Examination Facility to enable processing of the Experimental Breeder Reactor II sodium.	2000	2000
ARA 609	ARA-609 Demolition	Demolish the ARA-609 Gatehouse.	1997	1999
ARA 617	ARA-617 Demolition	Demolish the ARA-617 Dynamic Processing Facility	1999	2010
ARA 622	ARA-622 Demolition	Demolish the ARA-622 Warehouse Building	1997	1999
ARA 626	ARA-626 Demolition	Demolish the ARA-626 Hot Cell Building	1997	1999
ARA 626	ARA-626 Demolition	Demolish the ARA-626 Hot Cell Building	1997	1999
ARA 628	ARA-628 Demolition	Demolish the ARA-628 Guardhouse	1997	1999
ARA 628	ARA-628 Demolition	Demolish the ARA-628 Guardhouse	1997	1999
ARA 729	ARA-729 Demolition	Demolish the ARA-729 Hot Waste Tank	1997	2000
ARA 729	ARA-729 Demolition	Demolish the ARA-729 Hot Waste Tank (near AEF- 07)	1997	2000
ARA 742	ARA-742 Demolition	Demolish the ARA-742 Seepage Pit.	1997	2000
ARA-II	Auxiliary Reactor Area II Demolition	Remove underground utilities and clean up the soil at the Auxiliary Reactor Area II.	1996	1999
B16 703	B16-703 Demolition	Demolish the B16-703 Fire Station Training Facility	1999	1999
B23 602	B23-602 Demolition	Demolish the B23-602 Taylor generator.	1999	1999
CFA	INEEL Security Alarm System	Establish alarm center consolidations to provide immediate and continuing cost reductions to security operations while maintaining adequate alarm monitoring.	1998	1999

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #	Project	Description	Project Start	Project End
CFA	CFA Communications Upgrade	Correct communication line deficiencies and provide communications capability to areas that are not currently served.	1998	1999
CFA	Health Physics Instrumentation Laboratory	Provide a new 15,500-square-foot(approximately) Health Physics Instrumentation Laboratory in the Central Facilities Area to replace the existing CFA-633 laboratory, which is 50 years old, is too small, is structurally and seismically unsafe, and has systems that do not provide essential functions and do not meet minimum requirements for safety.	1999	2002
CFA	INEEL Site Operations Center	Provide 30,000 square feet of office space and special purpose space consisting of a food service area, conference rooms, a copy/print shop, a mail service area, overnight work accommodations, and an electronic records storage area. This single facility will replace several inadequate, deteriorating, maintenance-intensive buildings that have exceeded their design life. The new facility will also fulfill future facility requirements and incorporate new, more efficient technologies.	2000	2003
CFA	601 CFA-601 Warehouse Upgrades/Renovation	Correct electrical deficiencies and upgrade heating, ventilating, and air-conditioning system inadequacies.	1997	1998
CFA	603 CFA-603 Dispensary Demolition	Demolish the CFA-603 Dispensary.	2002	2002
CFA	604 CFA-604 Emergency Generator Building Demolition.	Demolish the CFA-604 Emergency Generator Building.	2002	2002
CFA	606 CFA-606 Office Building Demolition	Demolish the CFA-606 Office Building.	2002	2002
CFA	607 CFA-607 Office Building Demolition	Demolish the CFA-607 Office Building.	2000	2000
CFA	613 CFA-613 Bunkhouse Demolition	Demolish the CFA-613 Bunkhouse.	1999	1999
CFA	632 CFA-632 Boiler Operations Lunch Room Demolition	Demolish the CFA-632 Boiler Operations Lunch Room.	2000	2000
CFA	633 CFA-633 Health Physics Instrument Laboratory Demolition	Demolish the CFA-633 Health Physics Instrument Laboratory.	2002	2003
CFA	635 CFA-635 Storage Bunker	Demolish the CFA-635 Storage Bunker.	2003	2003
CFA	643 CFA-643 Office Trailer Demolition	Demolish the CFA-643 Office Trailer.	2003	2003
CFA	650 CFA-650 Heating Plant Demolition	Demolish the CFA-650 Heating Plant.	2002	2003
CFA	652 CFA-652 Office Trailer Demolition	Demolish the CFA-652 Office Trailer.	2003	2003
CFA	657 CFA-657 Septic Tank Pumpouse Demolition	Demolish the CFA-657 Septic Tank Pumpouse.	1998	1999
CFA	662 CFA-662 Cafeteria Demolition	Demolish the CFA-602 Cafeteria.	2003	2005
CFA	668 CFA-668 Roof Replacement and Heating, Ventilating, and Air Conditioning Upgrade	Replace the CFA-668 roof and upgrade the heating, ventilating, and air conditioning to protect vital communications equipment.	1997	1998

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #	Project	Description	Project Start	Project End
CFA 675	CFA-675 Generator Building Demolition	Demolish the CFA-675 Generator Building.	2002	2002
CFA 680	CFA-680 Generator Building Demolition	Demolish the CFA-680 Generator Building.	2002	2002
CFA 684	CFA-684 Flammable Storage Building	Demolish the CFA-684 Flammable Storage Building.	2002	2002
CFA 685	CFA-685 Bus Depot	Demolish the CFA-685 Bus Depot.	2003	2004
CFA 691	CFA-691 Sewage Plant Demolition	Demolish the CFA-691 Sewage Plant.	1998	1999
CFA 692	CFA-692 Scale House Demolition	Demolish the CFA-692 Scale House.	1999	1999
CFA 703	CFA-703 Microwave Tower Demolition	Demolish the CFA-703 Microwave Tower.	2002	2002
CFA 704	CFA-704 Concussion Wall Demolition	Demolish the CFA-704 Concussion Wall.	2002	2003
CFA 716	CFA-716 Septic Tank Demolition	Demolish the CFA-716 Septic Tank.	1998	1999
CFA 724	CFA-724 Fuel Oil Tank Demolition	Demolish the CFA-724 Fuel Oil Tank.	2002	2002
CFA 738	CFA-738 Fuel Oil Tank Demolition	Demolish the CFA-738 Fuel Oil Tank. (At CF-650)	2002	2002
CFA 739	CFA-739 Fuel Oil Tank Demolition	Demolish the CFA-739 Fuel Oil Tank. (At CF-650)	2002	2002
CFA 746	CFA-746 Fuel Oil Tank Demolition	Demolish the CFA-746 Fuel Oil Tank. (Beneath CF-604)	2002	2002
CFA 756	CFA-756 Water Storage Tank Demolition	Demolish the CFA-756 Water Storage Tank. (Underground)	2001	2001
CFA 758	CFA-758 Truck Weighing Scale Demolition	Demolish the CFA-758 Truck Weighing Scale.	1999	1999
CPP	Three-Mile Island Unit 2 Fuel Dry Storage	Correct deficiencies in the storage of fuel-bearing materials in the Test Area North Hot Shop. The pool and surrounding facilities lack the positive means of leak protection and ventilation control required. Provide long-term, dry, in-cask storage at the Idaho Nuclear Technology and Engineering Center for this material.	1993	1998
CPP	Westside Condensate Piping Replacement	Replace the condensate receiver and piping to CPP-606, -652, -645, -669/686, -668 and -640.	1997	1998
CPP	Spent Nuclear Fuel Dry Storage Project	Provide capabilities to transfer spent nuclear fuel from CPP-666 into interim dry storage at the Idaho Nuclear Technology and Engineering Center.	1997	2008
CPP	New Waste Calcining Facility Valve Loop Assemblies	Build a weld fixture to construct two new valve loops for the the New Waste Calcining Facility.	1997	1998
CPP	New Waste Calcining Facility Modifications for Sodium Bearing Waste and MACT Upgrade	Upgrade the New Waste Calcining Facility to increase throughput of sodium-bearing waste and to meet new maximum achievable control technology requirement.	2000	2006

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #	Project	Description	Project Start	Project End
CPP	Tank Farm Heel Removal	Provide the capability to remove final high-level waste heels from tank farm tanks.	1997	2010
CPP	Resource Conservation and Recovery Act Compliant Tankage	Provide additional approved Tank Farm storage tanks that comply with the Resource Conservation and Recovery Act.	2004	TBA
CPP	Valve Boxes B9 and C25	Replace failing valves with remotely maintainable valves, and replace the reach rods in the Tank Farm.	1998	1998
CPP	Operating Projects	Grout facility for facility closure and treatment of low-activity waste.	2002	TBA
CPP	Operating Projects	Close the Tank Farm tanks one by one, remove heels, grout the tanks (Resource Conservation and Recovery Act closure), and then perform closure activities on soils, etc., per the Comprehensive Environmental Response, Compensation, and Liability Act.	2002	TBA
CPP	New Ash Pit	A study has been initiated to explore alternative uses for fly ash.	1998	1999
CPP	Idaho Nuclear Technology and Engineering Center Miscellaneous Roofing	Perform miscellaneous roof repairs on seven Idaho Nuclear Technology and Engineering Center buildings.	1998	1998
CPP	Liquid Effluent Treatment and Disposal Facility Piping Replacement	Replace the process piping in CPP-1618, Liquid Effluent Treatment and Disposal Facility.	1998	1999
CPP	Spent Nuclear Fuel Dry Transfer Cell and Storage Project	Provide a dry transfer cell and dry storage for fuel from the Fluorinel Dissolution Process and Fuel Storage Facility and foreign research reactors.	1998	2002
CPP	Safety Access to the Utility Tunnel	Install six ladder accesses in the utility tunnel.	1998	1998
CPP	Cathodic Protection System Upgrade	Install new anode strings to provide corrosion protection for existing underground piping.	1993	TBA
CPP	Electrical and Utility Systems Upgrade	Upgrade will correct electrical and utility systems that do not meet environmental, safety, and health codes.	1996	2003
CPP	Rover Mechanical Handling Cave and Cell Cleanout	Clean up the Rover Project in CPP-640, the Headend Process Plant.	1995	TBA
CPP	Coal-Fired Steam Generation Facility Overrun/Replacement	Replace the existing generation system with a new state-of-the-art system.	2007	2012
CPP	High-Activity Waste Treatment Project	Retrieve calcine from bins, separate it into high-level waste and low-level waste fractions, and then glassify the high-level waste.	2010	2017
CPP	Low-Level Waste Treatment Project	This new facility will mix low-level waste with grout in preparation for final disposal.	1998	2004
CPP	Bin Set #8	New Bin Set will hold calcified sodium-bearing waste.	2004	TBA

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #	Project	Description	Project Start	Project End
CPP	Cathodic Protection System Expansion	Expand the cathodic protection system to the tank farm, dry fuel storage area and various other systems.	2000	1999
CPP	Idaho Nuclear Technology and Engineering Center Administrative Office Support Facility	Provide new office space, a medical dispensary, and sleeping quarters.	2003	2006
CPP	Utilities Distribution System Replacement/Upgrade	Replace or upgrade the utilities distribution systems.	2013	2017
CPP	Security Facilities	This project is divided into seven tasks and will provide an upgraded security alarm system control station and reduce the protected area at the Idaho Nuclear Technology and Engineering Center.	1995	1999
CPP	1657 CPP-1657 Demolition	Demolish CPP-1657, Hazardous Waste Temporary Accumulation Area.	2002	2003
CPP	601 627 CPP-601, -640, and -627 Deactivation	This project is currently in the conceptual design phase. This project will remove utilities and reroute to affected facilities.	1997	TBA
CPP	602 CPP-602 Cross-Connections	Eliminate cross-connection concerns in potable and treated water systems.	1998	1998
CPP	603 CPP-603 Irradiated Fuel Storage Facility Crane Upgrade	Perform an electrical upgrade on the 15-ton crane, and change the trolley on the manipulator.	1998	1998
CPP	603 CPP-603 Basin Deactivation	Remove water from fuel storage basins. Remove aboveground equipment, and place it in basins. Fill the basins with grout.	1997	2004
CPP	603 CPP-603 Irradiated Fuel Storage Facility Heating, Ventilating, and Air Conditioning	Install new heating/cooling unit in the control room.	1998	1998
CPP	603 Irradiated Fuel Storage Facility Roof Replacement	Remove the membrane roof, and install an epoxy concrete coating at CPP-603.	1998	1998
CPP	603 CPP-603 Decontamination and Dismantlement	Decontaminate and dismantle CPP-603, Underwater Fuel Receipt and Storage Building.	2015	2022
CPP	605 WL-210, -211, and -212 Damper Upgrade	Upgrade blowers WL-210,-211, and -212 in CPP-605.	1996	1999
CPP	606 Idaho Nuclear Technology and Engineering Center Boiler Feed Water Piping Replacement at CPP-606	Replace about 200 feet of three-inch and 250 feet of one-and-one-half-inch boiler feed water piping that is covered with asbestos. The existing boiler feed water pumping stations will be upgraded, and two deaerators will be replaced.	1996	1998
CPP	615 Sewer Line Floodmeter Installation	Install two mainholes and ultrasonic flowmeters with a remote readout located in CPP-615.	1998	1998
CPP	621 CPP-621 Condensate Line	Install condensate piping in the CPP-621 chemical pipe trench and the Maple Street utility tunnel.	1998	1998
CPP	625 CPP-625 Demolition	Demolish CPP-625, Rectifier Building for Electrolytic Dissolver (South).	1997	2003

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
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Facility #		Project	Description	Project Start	Project End
CPP	637 687	CPP-637/687 Roof Replacements	Remove built-up roof, and install fully adhered membrane.	1998	1998
CPP	642	CPP-642 Decontamination and Dismantlement	Decontaminate and dismantle CPP-642, Hot Waste Pumphouse and Pit.	2000	2000
CPP	650	CPP-650 Demolition	Demolish CPP-650, Breathing Air Compressor Building.	1997	2003
CPP	666	CPP-666 Cell Cask Support Equipment	Provide the capability for unloading larger Expanded Core Facility fuel casks at CPP-666, the Fluorinel Dissolution Process and Fuel Storage Facility.	1995	1997
CPP	672	CPP-672 Decontamination and Dismantlement	Decontaminate and dismantle CPP-672, Contaminated Tool Storage Building.	TBA	2000
CPP	683	CPP-683 Demolition	Demolish CPP-683, Breathing Air Charging Station.	1997	2003
CPP	687	Upgrades to the Coal-Fired Steam Generation Facility	Install a new control panel for CPP-687.	1998	1998
CPP	709	CPP-709 Decontamination and Decommissioning	Decontaminate and decommission CPP-709, East Side Service Waste Monitor Station.	1996	2003
CPP	740	CPP-740 Decontamination and Dismantlement	Decontaminate and dismantle CPP-740, Settling Basin and Dry Well.	2000	2002
CPP	T-1	T-1 Demolition	Demolish T-1, Construction Building.	1998	2003
CPP	T-2	T-2 Demolition	Demolish T-2, Caliner Storage.	1998	TBA
CPP	T-3	T-3 Demolition	Demolish T-3, Calciner Storage.	1998	TBA
CPP	T-5	T-5 Demolition	Demolish T-5, Construction Building.	1998	TBA
CPP	TB-6	TB-6 Demolition	Demolish TB-6, Utilities Work Control Facility.	1998	TBA
CPP	TR-2	TR-20 Demolition	Demolish TR-20, Office Trailer.	1998	TBA
CPP	TR-2	TR-21 Demolition	Demolish TR-21, Office Trailer.	1998	TBA
CPP	TR-2	TR-22 Demolition	Demolish TR-22, Office Trailer.	1998	TBA
CPP	TR-2	TR-29 Demolition	Demolish TR-29, Office Trailer.	1998	TBA
CPP	TR-4	TR-43 Demolition	Demolish TR-43, Quality Assurance Receiving Inspection Building.	1998	TBA
PBF	604	PBF-604 Demolition	Demolish the PBF-604 Terminal Building.	2002	2007
PBF	606	PBF-606 Demolition	Demolish the PBF-606 Instrument Cell.	2002	2007
PBF	613	PBF-613 Boiler Replacement	Replace the oil-fired boiler in the PBF-613 Mixed Waste Storage Facility with a new oil-fired furnace.	1998	1999
PBF	616	PBF-616 Demolition	Demolish the PBF-616 Storage Building.	2002	2007
PBF	617	PBF-617 Demolition	Demolish the PBF-617 Storage Building.	2002	2007

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
PBF 619	PBF-619 Demolition	Demolish the PBF-619 Control Building.	2002	2007
PBF 620	PBF-620 Demolition	Demolish the PBF-620 Reactor Building.(NOTE: Total estimated cost to demolish the PBF Reactor Building and 20 ancillary buildings and structures is \$10,856.9K. Costs to demolish each ancillary facility is not shown at this time, so no cost entry appears with those facilities.)	2002	2007
PBF 621	PBF-621 Demolition	Demolish the PBF-621 Emergency Generator Building.	2002	2007
PBF 622	PBF-622 Macro Encapsulation Skid	Develop and manufacture a macro encapsulation skid at the PBF-622 Compaction and Sizing Facility.	1997	1998
PBF 622	PBF-622 Sizing Skid	Develop and manufacture a sizing skid at the PBF-622 Compaction and Sizing Facility.	1997	1998
PBF 624	PBF-624 Demolition	Demolish the PBF-624 Auxiliary Building.	2002	2007
PBF 625	PBF-625 Demolition	Demolish the PBF-625 Maintenance Storage Building.	2002	2007
PBF 627	PBF-627 Demolition	Demolish the PBF-627 Gas Cylinder Storage Building.	2002	2007
PBF 629	PBF-629 Demolition	Demolish the PBF-629 Stack Gas Monitor Building.	2002	2007
PBF 632	Waste Reduction Operations Complex Local Area Network Project	Intall fiber optic cable in the PBF-632 Waste Reduction Operations Complex Support Building, connecting it to the INEEL communications network. This project will also provide a premise distribution system.	1998	1999
PBF 634	PBF-634 Demolition	Demolish the PBF-634 Pumphouse.	2002	2007
PBF 709	PBF-709 Demolition	Demolish the PBF-709 Fuel Oil Tank.	2002	2008
PBF 720	PBF-720 Demolition	Demolish the PBF-720 Cooling Tower.	2002	2007
PBF 722	PBF-722 Demolition	Demolish the PBF-722 Fuel Oil Storage Tank.	2002	2007
PBF 723	PBF-723 Demolition	Demolish the PBF-723 Liquid Nitrogen Storage Yard.	2002	2007
PBF 724	PBF-724 Demolition	Demolish the PBF-724 Septic Tank.	2002	2007
PBF 726	PBF-726 Demolition	Demolish the PBF-726 Septic Tank.	2002	2008
PBF 728	PBF-728 Demolition	Demolish the PBF-728 Septic Tank.	2002	2007
PBF 730	PBF-730 Demolition	Demolish the PBF-730 Primary Water Storage Tank.	2002	2007
PBF 731	PBF-731 Demolition	Demolish the PBF-731 Corrosive Waste Disposal Sump.	2002	2007
PBF 732	PBF-732 Demolition	Demolish the PBF-732 Hot Waste Storage Tank.	2002	2007

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #		Project	Description	Project Start	Project End
PBF	735	PBF-735 Demolition	Demolish the PBF-735 Seepage Tank.	2002	2007
PBF	751	PBF-751 Demolition	Demolish the PBF-751 Radioactive Liquid Storage Tank.	2002	2005
PBF	753	PBF-753 Demolition	Demolish the PBF-753 Leaching Pond.	2002	2008
PBF	754	PBF-754 Demolition	Demolish the PBF-754 Seepage Pit.	2002	2008
PBF	758	PBF-758 Demolition	Demolish the PBF-758 Leaching Pond.	2002	2008
STF	601	STF-601 Demolition	Demolish the STF-601 Security Training Facility	1999	2000
STF	605	STF-605 Demolition	Demolish the STF-605 Deep Well Pumphouse.	1999	1999
STF	607	STF-607 Demolition	Demolish the STF-607 Deluge Valve House.	1999	1999
STF	610	STF-610 Demolition	Demolish the STF-610 Power Burst Facility Test Facility.	1999	1999
STF	611	STF-611 Demolition	Demolish the STF-611 Pumphouse.	1999	1999
STF	612	STF-612 Demolition	Demolish the STF-612 Security Shooting House	1999	1999
SW		INEEL Electrical Distribution Upgrade	To comply with the State and local electric codes, this upgrade will correct deficiencies in the INEEL's electrical distribution system. Old, obsolete, and high-maintenance equipment will be replaced.	1996	1999
SW		INEEL Road Rehabilitation	This project will provide continuing safe and effective transportation infrastructure for all future INEEL activities. This project directly supports the SW-specific planning goal of providing roads that meet the State of Idaho road standard and the INEEL Standard of pavement Condition Index. Upgrades to the heavy equipment storage yards and vehicle staging areas will be completed to maintain their usefulness and integrity.	1998	2000
SW		INEEL Proprietary Supervising Station	The project will upgrade the emergency alarm systems at the INEEL.	1999	1999
SW		Howe Peak Upgrade	This project will provide a new weather enclosure for the Howe Peak communications equipment.	1999	1999
TAN		Mobile Test Assembly Demolition	Demolish the Mobile Test Assembly	2001	2001
TAN	1703	TAN-1703 Storage Tanks Demolition	Demolish the TAN-1703 V1, V2, and V3 Storage Tanks.	TBA	TBA
TAN	1709	TAN-1709 Caustic Storage Tank Demolition	Demolish the TAN-1709 Caustic Storage Tank.	TBA	TBA
TAN	1710	TAN-1710 Sand Tank Demolition	Demolish the TAN-1710 Sand Tank.	TBA	TBA
TAN	1725	TAN-1725 Exhaust Filter Room Demolition	Demolish the TAN-1725 Initial Engine Test Facility Exhaust Filter Room.	TBA	TBA

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
TAN 1726	TAN-1726 Disposal Well Demolition	Demolish the TAN-1726 Disposal Well.	TBA	TBA
TAN 1728	TAN-1728 Disposal Well Demolition	Demolish the TAN-1728 Disposal Well.	TBA	TBA
TAN 602	TAN-602 Administration Building Demolition	Demolish the TAN-602 Administration Building.	2001	2003
TAN 603 607	Steam and Condensate Line Replacement from TAN-603 to TAN-607 (with asbestos removal)	This project will remove and replace the steam and condensate line (and associated asbestos) between TAN-603 and TAN-607.	2000	2001
TAN 608	TAN-608 Water Filtration Building Demolition	Transfer the TAN-608 Water Filtration Building to EM-60 and Demolish.	TBA	TBA
TAN 609	TAN-609 Equipment Maintenance Shop Demolition	Demolish the TAN-609 Equipment Maintenance Shop.	2002	2006
TAN 610	Upgrade TAN-610 Water Pumphouse	This project will modify the existing jockey pumps and associated piping to provide a constant pressure to the underground fire water supply piping without use of a pressure tank.	2000	2001
TAN 616	TAN-616 Liquid Waste Treatment Building Demolition	Demolish the TAN-616 Liquid Waste Treatment Building.	1999	2001
TAN 620	TAN-620 Control and Equipment Building Demolition	Demolish the TAN-620 Control and Equipment Building at the Initial Engine Test Facility.	2001	2003
TAN 624	TAN-624 Containment Building Entry Demolition	Demolish the TAN-624 Containment Building Entry.	2001	2002
TAN 630	TAN-630 Control and Equipment Building Demolition	Demolish the TAN-630 Control and Equipment Building.	2003	2005
TAN 631	TAN-631 Tank Building Demolition	Demolish the TAN-631 Tank Building.	2001	2002
TAN 633	TAN-633 Hot Cell Annex Demolition	Transfer the TAN-633 Hot Cell Annex to EM-40 and Demolish.	TBA	TBA
TAN 634	TAN-634 Diesel Pad Demolition	Demolish the TAN-634 Diesel Pad.	2001	2001
TAN 635	TAN-635 Constant Air Monitor Building Demolition	Demolish the TAN-635 Heating and Ventilating 10 South, Constant Air Monitor Building.	2001	2002
TAN 637	TAN-637 Compressor Building Demolition	Transfer the TAN-637 Compressor Building to EM-60 and Demolish.	TBA	TBA
TAN 638	TAN-638 Guardhouse Demolition	Demolish the TAN-638 Guardhouse.	2001	2001
TAN 640 641	TAN-640 and -641 Upgrades	This project will result in multiple upgrades and improvements to the Water Reactor Research Test Facility to ensure its continued use for research and development activities in a professional and marketable manner.	1999	2000
TAN 643	TAN-643 Chlorination Building Demolition	Demolish the TAN-643 Chlorination Building.	2004	2004

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #		Project	Description	Project Start	Project End
TAN	645 646	TAN-645 and -646 Upgrades	This project will consist of upgrading the Motor Control Centers, improvements to the electrical distribution systems, and improvements to the flexibility of electrical needs within the Water Reactor Research Test Facility.	2000	2001
TAN	647	TAN-647 Contaminated Storage Building Demolition	Demolish the TAN-647 Contaminated Storage Building.	TBA	TBA
TAN	648	TAN-648 Storage Building Demolition	Demolish the TAN-648 Storage Building.	TBA	TBA
TAN	650	TAN-650 Containment Service Building Demolition	Transfer TAN-650 Containment Service Building to EM-40 and Demolish.	TBA	TBA
TAN	651	TAN-651 Heat Stress Building Excess	Excess the TAN-651 Heat Stress Building.	2001	2001
TAN	656	TAN-656 Change Room Demolition	Demolish the TAN-656 Change Room.	1999	1999
TAN	657	TAN-657 Heat Stress Control Building Excess	Excess the TAN-657 Heat Stress Control Building.	2001	2001
TAN	659	TAN-659 Control Shelter Demolition	Demolish the TAN-659 Control Shelter.	2001	2001
TAN	660	TAN-660 Maintenance Staging Building Demolition	Demolish the TAN-660 Maintenance Staging Building.	2001	2002
TAN	661	TAN-661 Turntable Control Building Demolition	Demolish the TAN-661 Turntable Control Building.	2001	2001
TAN	663	TAN-663 Constant Air Monitor Building Demolition	Demolish the TAN-663 Heating and Ventilating 10 North, Constant Air Monitor Building.	2001	2001
TAN	667	TAN-667 Machine Shop Demolition	Demolish the TAN-667 Machine Shop.	2002	2003
TAN	670	TAN-670 Chlorine Treatment Building Demolition	Demolish the TAN-670 Chlorine Treatment Building.	2001	2001
TAN	702	TAN-702 Fuel Oil Tank Demolition	Demolish the TAN-702 Fuel Oil Tank.	2002	2003
TAN	703	TAN-703 Exhaust Stack Demolition	Demolish the TAN-703 Exhaust Stack.	2003	2004
TAN	705	TAN-705 Railroad Turntable Demolition	Demolish the TAN-705 Railroad Turntable.	2001	TBA
TAN	709	TAN-709 Transformer Station Demolition	Demolish the TAN-709 Transformer Station.	2001	2001
TAN	716	TAN-716 Exhaust Stack Demolition	Demolish the TAN-716 Exhaust Stack.	2003	2004
TAN	718	TAN-718 Exhaust Filter and Pad Demolition	Demolish the TAN-718 Exhaust Filter and Pad.	TBA	TBA
TAN	719	TAN-719 Shielded Roadway Demolition	Demolish the TAN-719 Shielded Roadway.	2003	2004
TAN	720	TAN-720 Concrete Storage Cask Demolition	Transfer the TAN-720 Concrete Storage Cask to EM-60 and Demolish.	TBA	TBA
TAN	721	TAN-721 Concrete Storage Cask Demolition	Transfer the TAN-721 Concrete Storage Cask to EM-60 and Demolish.	TBA	TBA

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
TAN 723	TAN-723 Brine Pit Demolition	Transfer the TAN-723 Brine Pit to EM-60 and Demolish.	TBA	TBA
TAN 724	TAN-724 Fuel Oil Tank Demolition	Demolish the TAN-724 Fuel Oil Tank.	2002	2003
TAN 725	TAN-725 Exhaust Stack Demolition	Demolish the TAN-725 Exhaust Stack.	2001	2001
TAN 726	TAN-726 Hot Liquid Waste Storage Tank Demolition	Demolish the TAN-726 Hot Liquid Waste Storage Tank.	TBA	TBA
TAN 736	TAN-736 Septic Tank Demolition	Demolish the TAN-736 Septic Tank.	TBA	TBA
TAN 737	TAN-737 Septic Tank Demolition	Demolish the TAN-737 Septic Tank.	TBA	TBA
TAN 740	TAN-740 Waste Storage Pad Demolition	Transfer the TAN-740 Waste Storage Pad to EM-60 and Demolish.	TBA	TBA
TAN 742	TAN-742 Waste Holding Tank Demolition	Demolish the TAN-742 Waste Holding Tank.	TBA	TBA
TAN 743	TAN-743 Cylinder Storage Demolition	Demolition of the TAN-743 Cylinder Storage.	2002	2003
TAN 744	TAN-744 Inlet Gas Supply Platform Demolition	Demolish the TAN-744 Inlet Gas Supply Platform.	2003	2003
TAN 745	TAN-745 Secondary Coolant/Heating System Demolition	Demolish the TAN-745 Secondary Coolant/Heating System.	2003	2003
TAN 746	TAN-746 Condenser Shelter Demolition	Demolish the TAN-746 Condenser Shelter.	2003	2003
TAN 747	TAN-747 Steam Tanks Demolition	Demolish the TAN-747 Steam Tanks.	2004	2004
TAN 750	TAN-750 Liquid Waste Disposal Pond Demolition	Demolish the TAN-750 Liquid Waste Disposal Pond.	TBA	TBA
TAN 758	TAN-758 Suppression Air Tank Demolition	Demolish the TAN-758 Suppression Air Tank.	2004	2004
TAN 760	TAN-760 Fire Hose House Demolition	Demolish the TAN-760 Fire Hose House.	2004	2004
TAN 761	TAN-761 Fire Hose House Demolition	Demolish the TAN-761 Fire Hose House.	2004	2004
TAN 765	TAN-765 Slop Tank Demolition	Demolish the TAN-765 Slop Tank.	TBA	TBA
TAN 766	TAN-766 Diesel Oil Tank Demolition	Demolish the TAN-766 Diesel Oil Tank.	2003	2004
TAN 767A	TAN-767A Fuel Oil Tank Demolition	Demolish the TAN-767A Fuel Oil Tank.	2003	2004
TAN 767B	TAN-767B Fuel Oil Tank Demolition	Demolish the TAN-767B Fuel Oil Tank.	2003	2004
TAN 771	TAN-771 Sulfuric Acid Tank Demolition	Demolish the TAN-771 Sulfuric Acid Tank.	2003	2004
TAN 772	TAN-772 Liquid Nitrogen Tank Demolition	Demolish the TAN-772 Liquid Nitrogen Tank.	2003	2003
TAN 774	TAN-774 Concrete Slab Demolition	Demolish the TAN-774 Concrete Slab.	2003	2003
TAN 780	TAN-780 Tank Structure Demolition	Demolition of the TAN-780 Tank Structure.	2002	2003

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
TAN 782	TAN-782 Drainage Pond Demolition	Demolish the TAN-782 Drainage Pond.	TBA	TBA
TAN 791	TAN-791 Waste Storage Pad Demolition	Transfer the TAN-791 Waste Storage Pad to EM-60 and Demolish.	TBA	TBA
TAN TK71	TAN-TK710 Septic Tank Demolition	Demolish the TAN-TK710 Septic Tank.	TBA	TBA
TRA	Hot Cell Truck Enclosure	Add an enclosure to the TRA-632 Hot Cell Building to protect the area from adverse weather during hot cell loading, and build an addition containing one office, a change/locker room, restrooms, and a briefing room.	2000	2001
TRA	Advanced Test Reactor Building Leak Rate System	Install a blower and an airflow measurement system and instrumentation to permit measurement of the leak rate in the building and to detect degradation.	1999	1999
TRA	Test Reactor Area Laboratory Effluent Upgrade	Provide a system for processing and disposal of isotope processing and decontamination liquids produced in the Test Reactor Area Hot Cells and Laboratory 661.	2000	2000
TRA	Test Reactor Area Hot Cell Air Monitoring	Install an air-monitoring system downstream of the Test Reactor Area Hot Cell stack discharge system. The air monitoring system will provide analytical validation that air effluents from the Hot Cell comply with the National Emission Standards for Hazardous Air Pollutants (NESHAP).	2001	2002
TRA	Test Reactor Area Demineralization Plant Replacement	Replace the existing Demineralization Plant due to the age of the equipment and the obsolescence of the control system.	1998	1999
TRA	Advanced Test Reactor Secondary Coolant System Refurbishment	Refurbishment will involve all secondary coolant, utility cooling water piping, pumps, and equipment outside the Advanced Test Reactor as well as the Cooling Tower structure and equipment.	1997	1999
TRA	Test Reactor Area Retention Basin Upgrade	Upgrade the warm and the cold waste systems. The integrity of these systems has been severely affected due to age and should be modified to eliminate possible environmental impacts.	2000	2001
TRA	Advanced Test Reactor Air Effluent Monitoring Upgrade	Replace the existing air effluent sampler and monitoring system with new equipment based on modern technology that complies with the National Emission Standards for Hazardous Air Pollutants (NESHAP).	2005	TBA
TRA	Advanced Test Reactor Distributed Control System Upgrade	Replace the existing distributed control system at the Advanced Test Reactor with new equipment based on modern technology. The new system installation will include various Advanced Test Reactor equipment and support activities.	2005	2008
TRA	Liquid Nitrogen Tank Replacement	Replace an old and deteriorating liquid nitrogen storage tank and necessary piping system with a new and larger-capacity system. The larger-capacity system will allow for operational business benefits associated with economies of scale.	1999	1999

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
TRA	Advanced Test Reactor Regulation Rod Control	Modernize the Advanced Test Reactor regulation rod system that controls the reactor power. This project will replace all components associated with the regulation rod system, excluding the interface from the servo driver out to the servo/racks. Improves operator efficiency.	2001	TBA
TRA	Test Reactor Area Communication Cabling	Replace and upgrade telephone, network, and alarm system cabling to improve reliability and increase capacity as needed.	2002	2002
TRA	Test Reactor Area Fire and Life Safety Improvements	Provide for the design, procurement, and construction activities to correct fire protection and life safety code deficiencies at the Test Reactor Area.	1995	2001
TRA	Test Reactor Area Utility Upgrades	This upgrade will reburish the cathodic protection, sewer, and potable water systems throughout the Test Reactor Area.	2000	2005
TRA	Test Reactor Area Electric Utility Upgrades	This upgrade will refurbish the electrical systems throughout the Test Reactor Area.	1998	2004
TRA	Test Reactor Area Radiological Waste Upgrade	This upgrade will include installation of underground double-contained piping from a new tank storage facility to a new truck transfer facility, construction of new tank vaults to hold 15,000-gallon holding tanks, and construction of a sampling-and-mixing station.	1995	1999
TRA	Advanced Test Reactor Plant Protection System and Reactor Control Relay Replacement	Design and provide equipment to replace the plant protection system and associated reactor control relays at the Advanced Test Reactor.	2002	TBA
TRA	Surveillance and Test System/Plant Protection System Replacements and Upgrades	Replace the existing surveillance and test system/plant protection system with new equipment based on modern control technology.	2000	2002
TRA	Advanced Test Reactor Plant Protection System Power (Breaker) Upgrade	Upgrade the plant protection system power distribution system and its spare battery bank. The system components to be upgraded have become obsolete. Implementation of this project will also enhance the reliability of the power supply system by using components of the latest technology.	2002	TBA
TRA	Advanced Test Reactor 40-Ton Crane Upgrade	Replace the existing crane trolley with a new single failure-proof trolley while upgrading the rated lifting capacity from 40 tons to 50 tons.	2003	2000
TRA	Advanced Test Reactor 30-Ton Crane Upgrade	Modify the canal bridge crane at the Advanced Test Reactor to reduce the chance of dropping a heavy load in or around the reactor canal. Modifications will include the addition of drum brakes and other safety features on the trolley and main hoist.	TBA	TBA
TRA	Test Reactor Area Site Paging and Evacuation System	Renovate the Test Reactor Area evacuation system by replacing failed wiring and speakers and to provide complete plant-wide coverage.	2001	2002

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #		Project	Description	Project Start	Project End
TRA		Digital Radiation Monitoring System/Radiation Monitoring System Upgrade	The existing radiation monitoring system will be upgraded to improve the reliability and maintainability of an engineered safety feature for the Advanced Test Reactor radiation monitoring and seal system.	1998	2000
TRA	604	TRA-604 Stack Monitor Upgrade	Upgrade the exhaust gas stack monitor in order to ensure compliance with National Emission Standards for Category II emission source generation.	1999	1999
TRA	618	TRA-618 Demolition	Demolish the TRA-618 Warehouse.	2006	2006
TRA	624	TRA-624 Demolition	Demolish the TRA-624 Sewage Treatment Building.	2002	2002
TRA	629	TRA-629 Demolition	Demolish the TRA-629 Gas Cylinder Storage Building.	2006	2006
TRA	637	TRA-637 Demolition	Demolish the TRA-637 Bunkhouse Trailer.	2006	2006
TRA	656	TRA-656 Demolition	Demolish the TRA-656 Maintenance Storage Building.	2000	2000
TRA	660	TRA-660 Demolition	Demolish the TRA-660 Measurement Facility.	2000	2001
TRA	663	TRA-663 Demolition	Demolish the TRA-663 Superior Diesel Building.	2004	2004
TRA	664	TRA-664 Demolition	Demolish the TRA-664 Hot Storage Building.	2003	2003
TRA	669	TRA-669 Demolition	Demolish the TRA-669 Cold Storage Building.	2001	2001
TRA	673	TRA-673 Demolition	Demolish the TRA-673 Storage Building.	2001	2001
TRA	704	TRA-704 Demolition	Demolish the TRA-704 Engineering Test Reactor Primary Filter Pit.	2000	2001
TRA	705	TRA-705 Demolition	Demolish the TRA-705 Engineering Test Secondary Filter Pit.	2000	2001
TRA	708B	TRA-708B Demolition	Demolish the TRA-708B Water Storage Tank.	2004	2004
TRA	714	TRA-714 Demolition	Demolish the TRA-714 Steam Valve Box.	2004	2004
TRA	715	TRA-715 Evaporation Pond Upgrade	Install a new evaporation pond at the Test Reactor Area, or enhance the existing pond such that evaporation rates are high enough to prevent filling during cool, wet weather. Project development studies will evaluate methods to increase the evaporation rate and/or better manage inflow rates to reduce evaporation requirements as an alternative to a new pond.	2005	TBA
TRA	727A	TRA-727A Demolition	Demolish the TRA-727A Fuel Oil Tank.	2004	2004
TRA	727B	TRA-727B Demolition	Demolish the TRA-727B Fuel Oil Tank.	2004	2004
TRA	732	TRA-732 Demolition	Demolish the TRA-732 Sewage Treatment Plant.	2002	2002

**Exhibit 12.20: INEEL Remediation Projects as Determined by the INEEL
Comprehensive Facility and Land Use Plan**

Facility #	Project	Description	Project Start	Project End
TRA 753	TRA-753 Demolition	Demolish the TRA-753 Engineering Test Reactor Exhaust Stack.	2021	2021
TRA 755	TRA-755 Demolition	Demolish the TRA-755 Engineering Test Reactor Filter Pit Building.	2000	2002
WMF	Pit 9 Comprehensive Demonstration Project	Provide a facility to remediate Pit 9 contents in accordance with the 1993 record of decision. Utility upgrades, including installation of a production well, a 33% increase in sewage capacity, and an increase in the electrical supply from 12.5 kVA to 138 kVA, will be completed to support the Pit 9 project.	1995	2003
WMF	Active Low-Level Waste Monitoring	Monitor active low-level waste in the Subsurface Disposal Area pit.	1997	2001
WMF	Remote-Handled Low-Level Waste Disposal Vaults	Provide 60 additional concrete-lined vaults for disposal of remote-handled low-level waste.	1998	2001
WMF	Technology Deployment Center	Provide the capability and infrastructure to safely and cost-effectively obtain objective validation data on environmental systems, processes, and technologies over a full range of conditions.	2000	2003
WMF	Advanced Mixed Waste Treatment Project (Phase 1)	British Nuclear Fuels will complete Phase 1 detailed designs, provide DOE with environmental data, and obtain necessary regulatory permits. Phase 2 focuses on the construction and testing of the treatment facility. The final phase - waste retrieval, characterization, and treatment - is slated to begin in 2003.	1997	1999
WMF	RWMC Stored Waste Examination Pilot Plant High Bay Climate Control Project	Provide climate control for the Stored Waste Examination Pilot Plant High Bay area. Electronic equipment experiences calibration and increased maintenance problems because of the elevated temperatures in the area. The resultant downtime negatively impacts the settlement agreement because of lowered production rates through the Stored Waste Examination Pilot Plant, and this is unacceptable.	1998	1999
WMF 612	WMF-612 Demolition	Demolish the WMF-612 Stored Waste Examination Pilot Plant Certification and Segregation Building.	1999	1999
WMF 619	RWMC WMF-619 Dial Room Expansion Project	Provide additional floor space for upgrading the voice network, life safety systems, data networks, and radio and alarm systems equipment at the Radioactive Waste Management Complex. This project also expands the existing stand-alone facility, doubling the size of the existing 20- by 20-foot building.	1998	1999
WMF 702	WMF-702 Demolition	Demolish the WMF-702 Liquid Chemical Disposal Area, Environmental Restoration.	1978	2001
WMF 711	WMF-711 Demolition	Demolish the WMF-711 Stored Waste Examination Pilot Plant Air Support Structure.	1998	2001

**Exhibit 12.21: Priority Deactivation Projects Reported by the Excess Facility
Action Plan as of June 1999**

Facility #	Name	Present Use
TAN 607	Hot Shop/Manufacturing & Assembly	Radioactive material storage and research an
TRA 603	Material Test Reactor Building	Miscellaneous temporary experiments
CPP 601	Fuel Process Building	Under Stabilization
CPP 603	Wet & Dry Fuel Storage Facility	Wet and Dry Fuel Storage
CPP 627	Remote Analytical Facility	Laboratory
CPP 633	Waste Calciner Facility	Under Characterization and Assessment
CPP 640	Headend Process Plant	Shutdown
PBF 620	Reactor Building	Reactor/Interim Fuel Storage

Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999

Facility #	Name	PresentUse
TAN 602	Administration Building	Vacant
TAN 608	Water Filtration Building	Water filtration building
TAN 630	Control & Equipment Building	Vacant
TAN 631	Tank Building	Inactivated
TAN 634	Diesel Generator Pad	Modular Building Foundation
TAN 635	H&V 10 (So. CAM) Building	Vacant
TAN 637	Compressor Building	Inactive
TAN 638	Guard House	Vacant
TAN 643	Chlorination Building	Inactivated
TAN 651	Heat Stress Relief Str.	Inactivated
TAN 657	Heat Stress Control Building	Inactivated
TAN 659	Control Building	Inactivated
TAN 660	Maintenance Staging Building	Temporary storage
TAN 661	Control House for Turntable	Inactivated
TAN 663	H&V 10 (N Cam)	Inactivated
TAN 667	Small Machine Shop	Temporary storage
TAN 670	Chlorine Treatment Building	Chlorine treatment building
TAN 702	Boiler Fuel Tank	Tanks (Oil)
TAN 703	Exhaust Stack	Other, Other Service Structures
TAN 710	Septic Tank	Septic Tanks (Sewer)
TAN 716	Exhaust Duct and Stack	Other, Other Service Structures
TAN 719	Shielded Roadway to TAN-630	Tunnels (Vehicular)
TAN 720	Concrete Storage Cask	Other, Storage
TAN 721	Concrete Storage Cask	Other, Storage
TAN 723	Brine Pit	Other, Storage (Industrial)
TAN 724	Boiler Fuel Tank	Tanks (Oil)
TAN 725	Vault Exhaust Stack	Other, Other Service Structures
TAN 744	Inlet Gas Supply Platform	Other, Service Structures
TAN 745	Sec. Coolant System Rec.	Structures, Industrial, Other
TAN 746	Condenser Shelter	Other, Service Structures

Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999

Facility #	Name	Present Use
TAN 747	Steam Tanks	Structures, Industrial, Other
TAN 758	Suppression Air Tank	Structures, Industrial, Other
TAN 760	Fire Hose House	Other, Other Service Structures
TAN 761	Fire Hose House	Other, Other Service Structures
TAN 766	Diesel Fuel Oil Tank (DF-T-14)	Tanks (Oil)
TAN 767A	Boiler Fuel Tank (FO-T-13A)	Tanks (Oil)
TAN 767B	Boiler Fuel Tank (FO-T-13B)	Tanks (Oil)
TAN 771	Sulfuric Acid Tank	Other, Storage (Industrial)
TAN 772	Liquid Nitrogen Tank	Tanks (Process Gas)
TAN 774	Concrete Slab	Storage (Open Pavement)
TAN 780	Tank Pad	Storage (Open Pavement)
TAN 790	Abnormal Waste Storage Pad	Storage (Open Pavement)
TAN 791	Spent Fuel Storage Pad	Storage (Open Pavement)
TRA 618	Warehouse	Storage
TRA 626	Maintenance Storage Building	Storage
TRA 629	Gas Cylinder Storage Building	Shutdown
TRA 637	Bunkhouse Trailer	Sleeping Quarters
TRA 656	Maintenance Storage Building	D&D
TRA 663	Superior Diesel Building	Temporary Storage
TRA 666	Hydraulic Test Facility	Shutdown
TRA 669	Cold Storage Building	Shutdown
TRA 673	Storage Building	Shutdown
TRA 708B	Water Storage Tank	Tanks (Industrial/Not Hazardous)
TRA 714	Steam Valve Box	Other, Other Service Structures
TRA 727A	Fuel Oil Storage Tank (East)	Tanks (Oil)
TRA 727B	Fuel Oil Storage Tank (West)	Tanks (Oil)
TRA 763B	Air Storage Tank	Tanks (Process Gas)
TRA 779	Decon Pad	Paving
CPP 1609	East Guardhouse #3	Guardhouse
CPP 1657	Hazardous Temp. Accumulation	Storage

Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999

Facility #	Name	PresentUse
CPP 625	Rectifier Building	Rectifier Building
CPP 650	Breathing Air Compressor	Inactive
CPP 681	Effluent/Environ Monitor	Storage
CPP 683	Breathing Air Charger	Shutdown
CPP T-1	Construction Management Building	Lunch Room/Change Room
CPP T-2	Temporary Storage Building	Storage
CPP T-3	Temporary Storage Building	Storage
CPP T-5	Temporary Office Building	Construction Lunch Room/Change Room
CPP TB-6	Quality Office Building	Utility Planning/Scheduling Team
CPP TR-20	FPR Office Trailer	Offices
CPP TR-21	FPR Office Trailer	Offices
CPP TR-22	FPR Office Trailer	Offices
CPP TR-29	Office Trailer	Offices
CPP TR-43	Trailer, QA Receiving & Inspection	Offices
CPP 710	Solvent Storage Building	Other, Storage
CPP 727	FAST HF Acid Storage VES-CS-169	Other, Storage
CPP 759	Leaching Cesspool for MK Building	Septic Tanks (Sewer)
CF 603	Dispensary	Vacant
CF 604	Emergency Generator Building	Vacant
CF 606	Office Building	Vacant
CF 607	Office Building	Vacant
CF 613	Bunkhouse	Vacant
CF 632	Boiler Operations Lunchroom	Vacant
CF 633	Health Physics Instrument Lab	Light Laboratory
CF 635	Storage Bunker	Storage
CF 643	Office Trailer	Offices
CF 650	Heating Plant	Utility
CF 652	Office Trailer	Offices
CF 662	Cafeteria	Service
CF 680	Storage	Vacant

Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999

Facility #	Name	Present Use
CF 684	Flammable Storage	Storage
CF 685	Bus Depot	Service
CF 692	Scale House	Vacant
CF 703	Microwave Tower	Towers (Voice/Data)
CF 704	Concussion Wall	Catchall
CF 724	Fuel Oil Tank	Tanks (Oil)
CF 738	Fuel Oil Tank (CF-650)	Tanks (Oil)
CF 739	Fuel Oil Tank (CF-650)	Tanks (Oil)
CF 746	Fuel Oil Tank	Tanks (Oil)
CF 756	Water Storage Tank	Tanks, Pressure (Non-Potable)
CF 758	Scale Truck Weight	Vehicle Weighing Facility
PBF 709	Fuel Oil Tank	Tanks (Oil)
PBF 726	Septic Tank	Tanks (Industrial/Not Hazardous)
ARA 617	Dynamic Processing Facility	Communications/Control Centers
TRA 639	Sodium Safety Equipment Storage	NA
CPP 745	HF Acid Storage (VES-YDB-105)	NA
INTE 757	Fluoboric Acid Storage Tank (VES-CS-113)	NA
B16 602	Pumphouse Fire Station No. 2	NA
B16 607	Training & Storage Building	NA
B16 703	Fire Station Training Facility	NA
B23 602	Taylor Generator Building	NA
STF 601	Security Training Facility	NA
STF 605	Deep Well Pumphouse	NA
STF 607	Deluge Valve House	NA
STF 610	PBF Test Facility	NA
STF 611	Pumphouse	NA
STF 612	Shooting House	NA
STF 712	Primary Cooler and Trench	NA
STF 719	Blowdown Sump	NA
STF 721	Decay Loop Cooler	NA

Exhibit 12.22: Priority Demolition Projects Reported by the Excess Facility Action Plan as of June 1999

Facility #	Name	PresentUse
STF 722	Downtherm Cooling Tower	NA
CPP TR-10	Red Cross Building	Inactivated
CPP TR-17	Office Trailer	Inactivated
CPP TR-18	Office Trailer	Inactivated

Exhibit 12.23: All Past, Present, and Future Remediation Worker Technologies Deployed and/or Demonstrated at INEEL ^(360, 361, 362)

- 1 Advanced Calcination
- 2 Advanced Integrated Solvent Extraction Systems
- 3 Advanced Tensiometer
- 4 Alloy Analyzer
- 5 Barometrically Enhanced Remediation Technology (BERT TM)
- 6 Biodecontamination of Concrete
- 7 Biological Destruction
- 8 Bioremediation of Explosive Contaminated Soils
- 9 Borehole Miner
- 10 Brokk Demolition Robot
- 11 Bulk Concrete Waste Disposal System
- 12 Calcine Dissolution
- 13 Calcium Fluoride Detector Array
- 14 Cesium Removal by Resorcinol-Formaldehyde
- 15 Cesium Removal Using Crystalline Silicotitanate
- 16 Characterization of Flow and Contaminant Transport in Fractured Rock
- 17 CH-TRU NDA Calibration Standards and INEEL Waste Matrix Surrogates
- 18 Combination Well (Inside-Out Well)
- 19 Complex Wide Waste Flow Analysis
- 20 Concrete Crusher
- 21 Confined Sluicing End Effector
- 22 Cooperative Telerobotic Retrieval
- 23 Crossflow Filtration
- 24 Cuber Machine
- 25 D&D, and Remediation Optimal Planning System (DDROPS)
- 26 Deep Tensiometer
- 27 Depleted Uranium Concrete (DUCRETE)
- 28 Depleted Uranium Recycling/Products
- 29 Dig Face Trolley
- 30 Directional Drilling
- 31 DOE Landtrek - INEEL TAN Post-ROD Research Roadmap
- 32 Drum Vent System (DVS)
- 33 Dry Transfer System
- 34 Dual Arm Work Platform (DAWP)
- 35 EBR II Ultra Sound and Eddy Current System
- 36 Electromagnetic Radiography
- 37 Electronic Signature System
- 38 Electro-Optic High Voltage Sensor
- 39 Enhanced In Situ Bioremediation (ISB)
- 40 Excel Modular Scaffold

Exhibit 12.23 (Continued): All Past, Present, and Future Remediation Worker Technologies Deployed and/or Demonstrated at INEEL ^(360, 361, 362)

- 41 Expert System Development for NDA Data Validation
- 42 Flameless Thermal Oxidizer
- 43 Foreign Research Reactor Fuels (FRR) Video System
- 44 Fuel Canning Station/Process
- 45 Gamma Cam (TM) Radiation Imaging System
- 46 Gamma Ray Spectrometer System (SGRS)
- 47 Gamma Spectroscopy Logging System (GSLs)
- 48 Gamma/Neutron Mapper
- 49 Global Positioning Radiometric Scanner
- 50 Heated Vacuum Drying System (HVDS)
- 51 High Activity Waste Forms and Processes
- 52 High Frequency Ultra Sonics
- 53 High Resolution Subsurface Imaging and Neural Network Recognition
- 54 Hydrogen Gas Getters
- 55 Improved HEPA Filter for Flexible and Rigid Containment Barriers
- 56 INEEL ASTD: Release of Concrete for Recycle from D&D Projects
- 57 INEEL HLW Processing
- 58 In Situ Beta Detector
- 59 In Situ Bioremediation
- 60 In Situ Object Counting System (ISOCS)
- 61 In Situ Sampler
- 62 In Situ Stabilization (Grouting)
- 63 Integrated Waste Tracking System (IWTS)
- 64 Internal Duct Characterization System
- 65 Inverse Scattering Ground Penetrating Radar Imaging of Buried Objects
- 66 LDUA - Eddy Current Non-Destructive Examination End Effector
- 67 LDUA - Gripper End Effector
- 68 LDUA - Heel Sampling End Effector
- 69 LDUA - High Resolution Stereo Video End Effector
- 70 LDUA - INEEL Light Duty Utility Arm Robotic System
- 71 LDUA - OSS Tank Inspection End Effector
- 72 LDUA - Remote End Effector Exchange Plate
- 73 LDUA - Remote End Effector Exchange System
- 74 LDUA - Remote End Effector Tool Plate
- 75 LDUA - Stereo Photographic End Effector
- 76 LDUA - Supervisory Data Acquisition and Supervisory Control System
- 77 Lead Brick Volumetric Radioassay
- 78 Lead Paint Analyzer
- 79 Low Activity Waste Forms
- 80 Material Handling and Waste Conveyance

Exhibit 12.23 (Continued): All Past, Present, and Future Remediation Worker Technologies Deployed and/or Demonstrated at INEEL ^(360, 361, 362)

- 81 Maverick (Petroleum Tank Inspection Device)
- 82 Mechanical Systems-Handling Material in Contact-Handled Processes Using HANDS-55
- 83 Membrane Separation of HTO
- 84 Membrane-Supported Particle-Bound Ligands for Cesium Removal (Empore)
- 85 Micropurge Sampling (Deep Zone)
- 86 Mighty Mac Pole Puller
- 87 Minilab
- 88 Modular Dry Storage for Spent Nuclear Fuel
- 89 Multi-Axis NDE System for SNF
- 90 Multi-detector Analysis System (MDAS)
- 91 NUKEM/RADOS Copper Recycle System
- 92 NWCF Offgas Sampling
- 93 Off-Gas Components-Test Components Based on the Use of WETO Test Facility
- 94 Oxy-Gasoline Torch
- 95 Paint Scaler-Bosch Rotary Hammer Drill
- 96 Personal Ice Cooling System (PICS) Coolsuit
- 97 Phytoremediation
- 98 Pipe Explorer
- 99 Planar In Situ Vitrification (ISV)
- 100 Plasma Hearth Process
- 101 Plastic Scintillator
- 102 PLUME - Groundwater Modeling
- 103 Polymer Microencapsulation
- 104 Polysiloxane Encapsulation of Mixed Waste
- 105 Portable Analyzer for Chlorinated Compounds
- 106 Portable Hi-Purity Germanium Detectors for Delineating Contamination in Soils
- 107 Portable Isotopic Neutron Spectroscopy (PINS)
- 108 Portable Photon Analysis Spectrometer
- 109 Portable Tensiometer
- 110 Pulsating Mixer Pump
- 111 Pulsed Gamma Neutron Activation Analysis (PGNAA) System for the Assay of RCRA Metals in Mixed Waste
- 112 Radiation Tracking System (RTRAX) for Delineating Contamination in Soils
- 113 Rapid Geophysical Surveyor (RGS)
- 114 Real Time Radioscopic (RTR) System
- 115 Reduced Access Characterization Subsystem
- 116 Remedial Action Management System
- 117 Remote Surveillance of Facilities Awaiting D&D
- 118 Remote Underwater Characterization System (RUCS)
- 119 Resonant Sonic Drilling

Exhibit 12.23 (Continued): All Past, Present, and Future Remediation Worker Technologies Deployed and/or Demonstrated at INEEL ^(360, 361, 362)

- 120 RH-TRU Waste Surrogates
- 121 Robust Hydrogen Sensor Demonstration
- 122 RSS Software for Soil Excavation Control for Delineating Contamination in Soils
- 123 Russian Separations - Cobalt Dicarbollide
- 124 Salt Splitting with Ceramic Membranes
- 125 Secondary Ion-Mass Spectroscopy Analysis
- 126 Segmented Gate System (SGS)
- 127 Sepradyne - Thermal Desorption Process for Treatment of Dioxin
- 128 Small Pipe Characterization System
- 129 Soft-Sided Container
- 130 Spectro Xepos XRF Analyzer (PCB Analyzer)
- 131 Sponge-Jet Sponge Blasting System™
- 132 Stereo Viewing System
- 133 Suction Bailer (Portable Lysimeter)
- 134 Surface Acoustic Wave/Gas Chromatography System for Trace Vapor Analysis
- 135 Surface Contamination Monitor and Survey Information Management System
- 136 Surfactant-Enhanced Aquifer Remediation at Neutral Buoyancy (SEAR-NB)
- 137 SWEPP Passive/Active Neutron (PAN) Drum Assay System
- 138 Thermal Denitration
- 139 TRUEX/SREX
- 140 TRU/Mixed Waste System
- 141 Universal Solvent Extraction Process for Treatment of High-level Waste
- 142 Utilivac Vacuum Excavation System
- 143 Very Early Time Electromagnetic (VETEM) System
- 144 VirtualWindow
- 145 Vitrification of Ion Exchange Materials
- 146 Warthog
- 147 X-Ray Fluorescence Spectrometry for Real-Time Monitoring of Slag Phase

Table 13.1: Contacts and Demographic Description of Prime and Subcontractor Remediation Workers at INEEL as of December 1998

Facility / Area	Assoc. Tasks	Contractor / Contacts	Number of Remediation Workers	Responsibility / Industry Profile	Top 5 Remediation Job Titles	Primary Job Task(s)	Number of Workers
INEEL (All areas except NRF and ANL-W)	LMITCO employees all Remediation worker tasks CW, De, Di, and HW tasks	Lockheed Martin Idaho Technologies Company (LMITCO) Prime Contractor Company P. O. Box 1625 Idaho Falls, Idaho 83415-3127 Contact: Dei Barney, Director, Staffing e-mail: DEI@inel.gov Telephone 208-526-8274 Facsimile 208-526-8342 Joy McDonald, Staffing Manager. e-mail: MLJ@inel.gov Telephone 208-526-2070 Facsimile 208-526-0025	= 782 (Includes LMITCO's teaming partners and major subcontractors)	M&O Prime Contractor Company for DOE-ID. 1) Solid, Hazardous, Mixed Waste, and HLW T/S/D facility Workers 2) Construction & Demolition Workers 3) Nuclear Power Plant Maintenance Workers	1. Operator/ Senior Operator 2. Rad Control Technician 3. Laborer 4. Mechanic 5. Custodian	LLMW, LLRW, TRU / TRU Mixed Waste, SNF, and HLW Waste Treatment, Characterization, Storage and Disposal, Maintenance, Surveillance, Operations, Research and Technology Development, and Environmental Restoration (Soil and Groundwater Clean-up).	1. 157 2. 109 3. 91 4. 44 5. 43

Table 13.1 (continued): Contacts and Demographic Description of Prime and Subcontractor Remediation Workers at INEEL as of December 1998

Facility / Area	Assoc. Tasks	Contractor / Contacts	Number of Remediation Workers	Responsibility / Industry Profile	Top 5 Remediation Job Titles	Primary Job Task(s)	Number of Workers
INEEL (All Areas)	HW, CW, De, Di Tasks	Oil, Chemical Atomic Workers International (OCAW) Local # 2-652 Contact: David H. Fox OCAW Union Safety /VPP Representative. 1855 W. 17 th South, Idaho Falls, Idaho 83402 Telephone 208-526-3278 e-mail: DHFI@inel.gov	= 767 (OCAW members (PACE as of May, 1999) are also LMITCO or ANL-W employees)	Primary Union Council 1) Solid, Hazardous, Mixed Waste, and HL W T/S/D facility Workers 2) Construction & Demolition Workers 3) Nuclear Power Plant Maintenance Workers	1. All Operators 2. Rad Control Technicians 3. Laborers 4. Electricians 5. Instrument Technicians	System Maintenance, and Operations. Deactivation, Dismantlement of buildings and equipment. Construction. Transportation/ Storage/ Disposal (T/S/D) for HLW/MW/LLRW waste types.	1. 168 2. 106 3. 74 4. 61 5. 51

Table 13.1 (continued): Contacts and Demographic Description of Prime and Subcontractor Remediation Workers at INEEL as of December 1998

Facility / Area	Assoc. Tasks	Contractor / Contacts	Number of Remediation Workers	Responsibility / Industry Profile	Top 5 Remediation Job Titles	Primary Job Task(s)	Number of Workers
INEEL Site Wide	CW Tasks	Building Trades Consortium Contact: Bob Bodeil, IBEW # 449 Business Manager and Current Consortium President, P. O. Box 4949, Pocatello, Idaho 83205 Telephone 208-232-5263 e-mail: IBFWLU449@cs.com	Members=962 (100 member perform routine work at INEEL through the year) The number of workers may increase up to 962 during the summer months or when projects face upcoming deadlines.	Union Council (includes crafts) 1) Solid, Hazardous, Mixed Waste, and HLW T/S/D facility Workers 2) Construction & Demolition Workers	1. Carpenter 2. Iron worker 3. Electricians 4. Laborers 5. Plumbers	Construction of new facilities and maintenance of existing facilities.	1. 341 2. 175 3. 137 4. 110 5. 40

Table 13.1 (continued): Contacts and Demographic Description of Prime and Subcontractor Remediation Workers at INEEL as of December 1998

Facility / Area	Assoc. Tasks	Contractor / Contacts	Number of Remediation Workers	Responsibility / Industry Profile	Top 5 Remediation Job Titles	Primary Job Task(s)	Number of Workers
INEEL (WAG 9: ANL-W)	HW, CW, De, Di Tasks	Argonne National Laboratory- West, Located onsite the INEEL P. O. Box 2528 Idaho Falls, Idaho 83403-2528 Contact: Gary C. Marshall, PhD. Environment, Safety & Health, Program Control Manager, Reactor Program Services Division Telephone 208-533-7666 Facsimile 208-533-7996 e-mail: GARY.MARSHALL@anl.gov Also Contact: Mike Janeszczo, ANL-W Human Resources Manager.	= 236 (as of June 1999)	ANL-W is a National Laboratory Research Operation Center located onsite the INEEL. Responsible for: Nuclear Operations of Experimental Breeder Reactor Programs and ancillary programs. ANL-W is self contained in its own Health and Safety and ER/WM Programs.	1. Nuclear Facility Operator 2. Maintenance Specialist 3. HPT 4. I & C Technician 5. Engineering Technician	LLMW, LLRW, TRU / TRU Mixed Waste, SNF, and HLW Waste Treatment, Characterization, Storage and Disposal, Maintenance, Surveillance, Operations, Research and Technology Development, and Environmental Restoration (Soil and Groundwater Clean-up).	1. 71 2. 48 3. 30 4. 24 5. 14

Table 13.2: INEEL Remediation Worker Activity Descriptions as Reported June 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 5/ WM	HW	138, 139, 140	Activity 1: WERF: Incinerator Operations Personnel at the WERF identify, characterize, and repackage (from metal drums to burn boxes) LLMW to be incinerated. Repackaged waste is staged in the WERF waste storage building and is inspected daily. Incinerated ash is transferred to metal drums for stabilization and direct disposal.	Mixed	1. RCRA 2. CAA	1984 to >2006	>20 years	MED: 11-75
INEEL/ WAG 7/ WM	CW/ HW	142, 143, 144	Activity 2: Surveillance, Monitoring, and Sampling at Subsurface Disposal Area (SDA) Personnel at RWMC's SDA routinely conduct subsurface monitoring through core drilling to determine if radionuclides have migrated to the Snake River Plain Aquifer.	Mixed	1. RCRA 2. CERCLA 3. FFA/CO	1970 to >2006	>30 years	MED: 11-75
INEEL/ WAG 7/ WM	CW/ HW	144, 145, 146	Activity 3: Retrieval and Maintenance of TRU Mixed Waste Containers at the Transuranic Storage Area (TSA) Operations at TSA include: 1) clean soil removal using an excavator, 2) manually removing contaminated soil with a hot vacuum system mounted on a cart with HEPA filters and a 55 gallon drum, 3) manually stacking clean plywood on pallets and lowering, using the excavator, to floor level or placing directly on a flatbed trailer, 4) manually size reducing clean fabric and placing it on pallets, and 5) in place decontamination and size reducing contaminated fabric, timber and plywood. Personnel will conduct 1) contamination checks with survey instrumentation and swipes within a shielded box area, 2) bar code labeling of waste containers, 3) vertical drum retrieval with the use of a drum grapple, and 4) horizontal drum retrieval with special fork lifts.	Mixed	1. RCRA 2. CERCLA 3. FFA/CO	1970 to >2006	>30 years	MED: 11-75

Table 13.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Arca/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 7/ WM	CW/ HW/ De	144, 146	Activity 4: Sampling and Analysis of TSA Overburden Soil and Decontamination of Sampling Equipment Personnel sample and analyze TSA overburden with a gas chromatograph. Personnel will also perform decontamination of sampling equipment as it is used throughout the work day. Sampling equipment decontamination procedures include: 1) wash and scrub equipment with non-phosphate detergent, 2) rinse with tap water, 3) rinse with deionized water, 4) rinse with pesticide grade methanol, 5) collect equipment blank (rinse) from last water rinse (when needed), 6) air dry all sampling equipment (if possible) prior to sample collection, and 7) wrap in aluminum foil.	Mixed	1. RCRA 2. CERCLA 3. FFA/CO	1970 to >2006	>30 years	MED: 11-75
INEEL/ WAG 7/ WM	CW	147	Activity 5: TRUPACT-II Loading Facility (TLF) Operations At the TLF, personnel will package contact-handled transuranic (CH-TRU) materials in a payload container. The operator in the waste generating area will visually examine and verify CH-TRU physical waste prior to placement into plastic bags and the payload containers. The operator will inspect and remove all prohibited waste forms prior to filling and closing the payload container. The operator may use real-time radiography (RTR) to perform the above tasks.	Mixed	1. RCRA	1999 to >2006	<10 years	MED: 11-75
INEEL/ WAG 7/ WM	CW/ HW	146, 148, 149	Activity 6: Supercompaction at the AMWTP Facility Personnel conducting activities during the AMWTP supercompaction process will: 1) receive drums of sorted waste debris from pretreatment lines or direct feed drums from the waste receiving and staging areas via the central conveyor system, 2) puncture waste drums, 3) compact drums with a hydraulic press that controls the shape of the resultant supercompacted puck through the use of a mold, 4) under extreme pressure, vent gas and process the drums through the facility air pollution control system, 5) place pucks into a puck drum within the postcompaction glovebox, and 6) transfer puck drums to the macroencapsulation process.	Mixed	1. RCRA 2. 1995 Settlement Agreement	2003 to 2015	>10 years	HIGH: >75
INEEL/ WAG 1/ SNF	CW	12, 152, 153	Activity 7: TAN Hot Shop Operations Personnel in the TAN Hot Shop examine, test, and monitor SNF using overhead cranes, a large overhead manipulator, auxiliary wall mounted manipulators, and other equipment for remote handling of SNF and storage casks. Operators will also temporarily position and store SNF assemblies in the TAN Hot Shop silo, a shielded enclosure, and the Hot Shop floor. The equipment is operated by technicians from control stations in the north and south gallery areas.	Radiological	1. 1995 Settlement Agreement	1989 to >2006	>10 years	HIGH: >75

Table 13.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 1/ SNF	CW	12, 152, 153	Activity 8: Removal of SNF from the TAN Pool While submerged in the TAN Pool, TMI canisters are dewatered. To dewater, the canisters are purged with a gas (such as air, nitrogen or argon) to displace the majority of free water in the canister. Once they are dewatered, the canisters are removed from the pool and prepared for drying in the Hot Shop area. TAN operators use underwater exam/handling equipment to perform canister dewatering and overhead cranes for removal.	Radiological	1. 1995 Settlement Agreement	1999 to 2000	1 year	MED: 11-75
INEEL/ WAG 1/ SNF	CW	152, 153	Activity 9: Drying Operations at the TAN Hot Shop After initial dewatering of TMI canisters and commercial fuel, the canisters are dried further to remove remaining free water. Personnel remove canisters from the TAN pool using an overhead crane system and place one to four canisters into a portable Heat Vacuum Drying System (HVDS) located in the TAN Hot Shop. Personnel operate an electrically-powered furnace that provides the heat source for drying operations. They also operate monitors, controllers, condensers, and vacuum pumps mounted on a skid next to the furnace. The vacuum furnace is sealed and heated to approximately 600 degrees F while the vacuum pump is in operation.	Radiological	1. 1995 Settlement Agreement	through 2000	1 year	LOW: <11
INEEL/ WAG 1,3/ SNF	CW	153, 154	Activity 10: Loading SNF Casks and Transportation to INEEL Dry Storage After removing water from the canisters and fuels, operators load processed SNF into casks for shipment to ICPP dry storage. Hardware to be disposed of as LLW would be placed in boxes and shipped to RWMC.	Radiological	1. 1995 Settlement Agreement	1995 to 2000	5 years	MED: 11-75
INEEL/ WAG 3/ SNF	CW	153, 155, 156	Activity 11: Storage of SNF at INEEL's CPP-666 Fluorinel and Storage Facility (FAST) and Dry Storage Vaults Personnel at the CPP-666 fuel storage area survey and maintain fuel assemblies transferred from aging underwater storage facilities at INEEL via above-pool grates. Personnel will also rinse storage casks using hand held sprayers prior to dry storage at INTEC.	Radiological	?	1995 to >2035	> 40 years	LOW: <11

Table 1.3.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 1/ ER	CW/ HW	47, 158, 159, 160	Activity 12: Operable Unit 1-07A and 1-07B: TAN Injection Well (TSF-05) Maintenance and Monitoring Personnel at TSF-05: 1) monitor and secure the area, 2) oversee groundwater pumping and treatment facilities, 3) treat pumped groundwater using filtration, air stripping, carbon absorption, and ion exchange methods and instrumentation, 4) install equipment such as additional monitoring wells, and 5) monitor bioremediation field operations.	Mixed	1. FFA/CO 2. RCRA 3. CERCLA	1994 to 2006	>10 years	LOW: <11
INEEL/ WAG 2/ ER	CW/ HW	161	Activity 13: Operable Unit 2-10 and 2-13: TRA-03B Warm Waste Pond Containment, Excavation, and Monitoring Personnel at the Warm Waste Pond will execute the methods necessary for onsite physical separation and containment of large and fine-grained materials. The actions will consist of covering contaminated soils in the area, excavating and disposing contaminated soil, implementing institutional controls such as spraying surfactant to control dust, and monitoring.	Mixed	1. FFA/CO 2. CERCLA	1994 to >2006	>10 years	MED: 11-75
INEEL/ WAG 3/ ER	CW	N/A	Activity 14: Operable Unit 3-13: CPP-69 Abandoned Liquid Radioactive Waste Tank Remediation Personnel will continue to implement institution controls at this waste site including security, access restrictions, site inspections, environmental monitoring, and general maintenance. The preferred clean-up method includes removal of the tank system, treatment of tank liquid, and disposal. Tasks will include: 1) removal of tank liquid and treatment at the PEW evaporator, 2) filling the tank and associated structures with concrete or grout to solidify and stabilize remaining contaminants, 3) drumming and disposing the sludge at a suitable engineered disposal facility, 4) excavating, removing, and disposing remaining components of the tank system, and 5) backfilling the excavation to grade with clean soils.	Radiological	1. FFA/CO 2. CERCLA	1999 to >2006	>5 years	MED: 11-75
INEEL/ WAG 4/ ER	HW	162	Activity 15: Operable Unit 4-12: CFA-02 and 03 Landfill II and III Investigation, Sampling, Action, and Monitoring Personnel will conduct the following activities: 1) soil cover investigations and surveys, 2) shallow soil gas surveys, 3) borehole soil gas surveys, 4) well investigation of 27 Snake River Plain Aquifer monitoring wells, 5) groundwater sampling of 10 Snake River Plain Aquifer monitoring wells, and 6) soil sampling of seven boreholes in Landfill II.	Mixed	1. CERCLA 2. RCRA 3. FFA/CO	1993 to >2006	>10 years	MED: 11-75

Table 13.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 5/ ER	CW	162	Activity 16: Operable Unit 5-05: ARA-06 ARA-II SL-1 Burial Ground Containment and Monitoring Personnel at the site: 1) sample inside the SL-1 Burial Ground perimeter fence, 2) consolidate contaminated soils over pits and trenches before placement of a barrier, and 3) place barriers using heavy equipment consisting of a biotic barrier (cobble and pea gravel) and a human intrusion barrier (basalt boulders).	Radiological	1. CERCLA 2. FFA/CO	1999 to 2006	7 years	MED: 11-75
INEEL/ WAG 6/ ER	CW	162	Activity 17: Operable Unit 6-02: BORAX-02 BORAX-I Burial Ground Remediation Personnel at the site collect radioactive debris, consolidate it in the below ground foundation of the former reactor, and bury it using heavy equipment using approximately five feet of soil. Surrounding the buried reactor, a 84,000 square foot area of radiologically contaminated surface soil was covered with approximately 6 inches of gravel to reduce radiation levels at ground surface. It is not documented when these remediation activities occurred.	Radiological	1. CERCLA 2. FFA/CO	N/A	N/A	MED: 11-75
INEEL/ WAG 7/ ER	CW/ HW	163	Activity 18: Operable Unit 7-10: RWMC-04 Pit 9 Process Demonstration Remediation Personnel at Pit 9 initially conduct exploratory surveying and analysis, core drilling to obtain waste samples (using a drill rig), characterization of samples, and bench-scale treatability studies of the samples. Full-scale remediation would occur after 2003.	Mixed	1. CERCLA 2. RCRA 3. FFA/CO	1998 to 2006	<10 years	LOW: <11
INEEL/ WAG 8/ ER	De/ CW	N/A	Activity 19: Operable Unit 8-08: NRF-17 SIW Retention Basin Remediation Personnel perform the remediation tasks including decontamination, dismantlement, and removal of the basins. Soil sampling will occur after the basins have been removed. The area will then be backfilled with soil. This is expected to occur in late 1999.	Radiological	1. FFA/CO 2. CERCLA	1999 to >2006	>5 years	MED: 11-75
INEEL/ WAG 9/ ER	CW/ HW	164, 165, 166	Activity 20: Phytoremediation at ANL-W Selected Waste Sites Personnel at ANL-W (personnel may include ANL-W labor or INEEL contractors as backup support) will 1) plant and harvest selected plants at various ANL-W waste sites, 2) sample, package and transport harvested plants to an incinerator, and 3) transport the incinerated wastes to a landfill for final disposal.	Mixed	1. FFA/CO 2. RCRA 3. CERCLA	1999 to >2006	>5 years	LOW: <11

Table 13.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ WAG 4/ D&D	Di/ De/ HW/ CW	168, 169, 170	Activity 21: Operable Unit 4-13: CFA-08 Sewage Treatment Plant Remediation and D&D D&D and environmental restoration work was performed by a subcontractor under the direction of Parsons I&T. The STP was demolished using standard D&D techniques including a universal processor/excavator, hoisting and rigging equipment, frontend loader, and other equipment necessary to dismantle structures.	Mixed	1. RCRA 2. CERCLA 3. NEPA	1953 to 1999	>40 years	MED: 11-75
INEEL/ WAG 5/ D&D	Di/ De/ HW/ CW	169	Activity 22: ARA III Decontamination and Dismantlement The ARA III D&D project consisted of the D&D of the following: the ARA-608 Reactor Building, ARA-612 Pumphouse, ARA-708 Storage Tank, ARA-714 Process Stack, ARA-735 HLW Storage Tank, ARA-736 LLW Storage Tank, and the ARA-715 Ventilation Stack.	Mixed	1. CERCLA 2. RCRA	1992 to 1997	>5 years	MED: 11-75

Table 13.2 (continued): INEEL Remediation Worker Activity Descriptions as Reported July 1999

Facility/ Area/ Project	Task Type	Information Resource(s)	Activity Title and Description	Primary Exposure Type	Regulatory Driver(s)	Activity Time Line	Duration	Workers per Activity/ Task
INEEL/ D&D	Di/ De/ CW/ HW	169	Activity 23: WMO-601/601A and AEF-603 D&D The following D&D and waste disposal activities occurred at WMO-601/601A and AEF-603 from March to October 1995: 1.) Task 23A: Site Preparation: All utilities were verified as disconnected or isolated. Phone lines were rerouted to EBR-1 and the D&D office trailer. Power for the office trailer was rerouted and connected. The buildings were remediated for hanta-virus. All openings were sealed and a negative pressure system was created using negative air machines with HEPA filters so the asbestos could be removed from the interior without spreading asbestos particles outside of the buildings. 2.) Task 23B: Remove and Dispose Hazardous/Radioactive Materials: All identified asbestos was removed from the windows, walls, piping, boiler, boiler room ceiling, and roofing. Further asbestos abatement was accomplished in conjunction with dismantlement of the interior structure. This is explained in Task 23D. 3.) Task 23C: Remove and Dispose Equipment and Interior Systems: All equipment was disposed of at the CFA landfill or recycled by hauling the items to the CFA Excess Yard. Each item of equipment going to the CFA landfill or recycle center were surveyed and a release tag attached to certify that the item was not contaminated. All interior mechanical, electric, lighting, and heating and ventilation systems were surveyed, decontaminated, and removed before demolition. 4.) Task 23D: Dismantle and Dispose Main Structure: All ACM was removed, packaged, and then disposed of at the CFA landfill. 5.) Task 23E: Post-D&D Activities: The post dismantlement characterization of WMO-601/601A and AEF-603 consisted primarily of radiation measurements performed on trenches and berms of soil formed during excavation, as well as the entire site following back filling, grading and seeding. Since no chemical hazards were present at the site, no chemical sampling was performed.	Mixed	1. CERCLA 2. RCRA 3. Asbestos Hazard Emergency Response Act	March to October 1995	<1 year	MED: 11-75

Table 13.3: Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
TRA CFA Sewage Treatment Plant	Deployed (Past/Present) CW Task	Maintenance D&D	Technology 1: Excel Modular Scaffold A components modular, snap together scaffolding that does not require any tools to set-up or dismantle due to an automatic locking mechanism. This allows for a more efficient operation. (180, 181, 182, 183)	LOW: <11 (Total 2 for set-up)	1. Indoors/ Outdoors 2. PPE 3. Contact	1. More efficient operation (no tools required, allowing for faster set-up and take- down time) 2. Efficiency reduces exposure risk (less time in radiation areas)	1. In tight or confined areas, the spacing of the cups may make the scaffolding less versatile 2. More difficult to decontaminate after use in asbestos areas because fibers settle in the cups
ANL-W	Deployed (Past/Present) CW Task	Treatment/ Characterization LLRW	Technology 2: Improved HEPA Filters-Flexible/Rigid Containment Barriers A flexible sheet (polypropylene filter) that can be adapted to a wide variety of applications. It was evaluated for use in packaging waste to ship to WIPP. Some radioactive waste forms are shipped to WIPP in sealed 55-gallon drums that have been fitted with HEPA drum vent filters in the lids to vent hydrogen gas generated by the radiolytic decomposition of hydrogenous materials. (185, 186)	Dependant upon the specific function the filters have	1. PPE 2. Contact	1. Significant cost savings 2. Improves operational reliability and safety 3. Increase waste loading in drums by 20% 4. Total waste volume reduction 5. Easily modified to suit specific operational needs	1. The filter/barrier needs to be tailored to the specific application

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
TRA Perch Well TAN Injection Well ARA-1 Chemical Evaporation Pond CFA Drain Field	Deployed (Past/Present) CW Task	Characterization/ Retrieval	Technology 3: In Situ Beta Detector Used to locate and quantify subsurface radionuclide contamination in the vadose zone and groundwater, specifically analyses of gross beta, strontium-90 and uranium-238. Allows entire length of borehole to be assessed for beta-emitting contamination. Measurements are duplicated and repeated to determine whether or not contamination is migrating vertically. (188, 189)	LOW: <11	1. Outdoors 2. Limited Contact	1. Reduce/eliminate waste material generated with conventional sampling methods 2. Reduced analytical costs 3. Near real-time data analysis 4. Reduced exposure of personnel to potentially radioactive contamination 5. Repeats measurements along the entire length of the borehole	NR
Cold Test Pit Acid Test Pit Subsurface Disposal Area Acid Pit	Deployed (Past/Present) CW Task	Treatment MW	Technology 4: In Situ Stabilization (Grouting) Encases contaminants in grout to prevent escape into the surrounding environment. Grout can halt migration of contaminants stored in shallow burial pits by creating an area impervious to water migration. It can be used on contaminated soils, buried debris, and materials containing hazardous, radioactive, and transuranic waste. (191, 192, 193)	LOW: <11 (9 member production crew)	1. Contact	1. Potential long-term stabilization of wastes 2. Reduces risk and costs associated with waste removal (i.e. dust control) 3. Barrier walls allow retrieval of specific hot spots from within a waste area and impede contaminant migration	NR

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
INTEC Fuel Processing Restoration Facility INTEC Tank WM-188	Deployed (Present) CW Task	Characterization/ Retrieval HLW/MW	Technology 5: Light Duty Utility Arm (LDUA) A mobile, multi-axis positioning/ manipulator system that uses a robotic arm to deploy different sensors and light-duty waste analysis tools (referred to as end effectors) into hazardous environments. It is remotely operated and used for in situ examinations of USTs, allowing for assessment and sampling within a 10 ft. radius of the tank riser axis. (196, 197, 198, 199)	MEDIUM: 11-75 (15 total for set-up and operation)	1. Limited Contact 2. Remote	1. Remote operation of system reduces contamination and exposures to workers 2. Waste sample data is improved through on- demand analysis	1. Expensive to implement
NR	Demonstrated (Proposed) CW Task	Maintenance/ Retrieval	Technology 6: Maverick (Petroleum Tank Inspection Device) A robotic inspection system designed for service in above ground storage tanks. It can be submerged into chemicals or refined petroleum products to inspect the interior of the tank without draining the tank. The robot is remote-controlled and uses ultrasonic signals and an internal camera to inspect tank wall integrity for corrosion & test seams for signs of degraded welds. (201, 202, 203, 204)	LOW: <11 (3 total)	1. Limited Contact 2. Remote	1. More efficient and cost effective than conventional methods	1. Technology is not geared to inspect tanks with mixed waste

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
Remote Analytical Lab Tank ICPP-183	Demonstrated (Proposed) CW Task	Treatment HLW/LLW/TRU	Technology 7: Transuranic Extraction/Strontium Extraction (TRUEX/SREX) The TRUEX process uses a complexing agent solvent to pull transuranic elements away from inert materials in the waste. The SREX process is similar to TRUEX except it removes strontium. By removing these elements, the waste can be disposed of as low-level waste (LLW) rather than high-level waste (HLW). (206, 207)	MEDIUM: 11-75	1. Limited Contact	1. Treatment and disposal as low-level waste is less expensive than as high level waste	NR
RWMC SWEPP Facility	Deployed (Past/Present) CW Task	Characterize TRU	Technology 8: Stored Waste Examination Pilot Plant (SWEPP) Technologies Operators utilize these technology systems to measure waste drum content: 1) SWEPP Passive/active Neutron (PAN) Drum Assay System, 2) Gamma Ray Spectrometer System (SGRS), 3) Real Time Radioscopic (RTR) System, and 4) Drum Vent System (DVS). (209, 210, 211, 212, 213, 214, 215)	MEDIUM: 11-75	1. Limited Contact 2. PPE	1. Reduces potential for contamination release to environment 2. Reduces worker exposure due to non- intrusive examination	1. Drum handling is not automated between systems, increasing the potential for them to be dropped, causing a potential contamination release to the environment

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
RWMC Aquifer Pumping and Infiltration Test TAN Technical Support Facility (TSF) Wells (3)	Deployed (Past/Present) CW Task	Maintenance/ Characterization MW	Technology 9: Gamma Spectroscopy Logging System (GSLs) A portable, self-contained field system equipped for logging any borehole with a 4.0 inch diameter or larger and capable of reaching a depth of approx. 760 feet below ground surface. It aids in routine ground monitoring and site characterization, and allows the entire length of the borehole to be assessed. It is based on high-resolution gamma spectroscopy with high-purity germanium detectors (HPGe) coupled to NIM-BIN and a personal computer. (217, 218, 219, 220, 221, 222)	LOW: <11	1. Limited Contact 2. Outdoors	1. Allows repeat measurements in same well or bore hole 2. Analytical costs are reduced (eliminates sample preparation, shipping and chain-of-custody) 3. Increases accuracy through use of near real time data information 4. Exposure is eliminated and minimal waste is generated GSLS	1. Maintenance costs associated with system (minimal when compared to costs associated with hiring collectors and labs to analyze samples)
FEMP Building 68	Demonstrated (Past) CW Task	Maintenance	Technology 10: Personal Ice Cooling System (PICS) Coolsuit A self-contained core body temperature control system uses ordinary ice as coolant and circulates chilled water through tubing incorporated into a durable full body garment. Frozen water bottles are worn outside/inside of anti-Cs. A rate adjustable, battery powered pump circulates the chilled water through the tubing in the suit, allowing the worker to control his/her temperature based upon work load. (223, 224, 225, 226)	LOW: <11 (1-2 total; 1 performs work with another assisting in the donning and doffing)	1. PPE	1. Increases stay times in contaminated work zones 2. Reduces cost as a result of longer stay times and fewer stoppages 3. Decreases the number of PPEs used 4. Ensures a safer body temperature	1. Unit worn outside of suit making it difficult to clean and decontaminate
TAN Preparation Facility	Deployed (Present) CW Task						

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
ORNL	Demonstrated (Past) CW Task	Characterization/ Retrieval	Technology 11: Internal Duct Characterization System (IDCS) A remote-controlled vehicle system used to visually inspect the interior condition of ducts. It is capable of maneuvering through duct work systems as small as 6" in diameter and travel up to 250 feet through multiple fittings and branches. It uses a color video camera, an integrated radiation sensor, and directional sensors to produce as-built mapping of the duct work. Constructed to allow liquid decontamination upon retrieval. (228, 229, 230, 231)	LOW: <11	1. Limited Contact 2. Remote	1. Reduces cost of D&D activities by allowing duct work to be handled appropriately, rather than treating all work as contaminated 2. Reduces secondary waste generated 3. Reduces work health risk 4. Increased maneuverability allows characterization of duct work otherwise not possible	NR
	Deployed (Past/Present) CW Task						
INTEC High Level Waste (HLW) Tank Farm	Deployed (Past/Present) CW Task	Characterization HLW	Technology 12: Utilivac Vacuum Excavation System Used to dig very small diameter holes in soil that is potentially contaminated or may contain unknown structures or lines. High pressure air is directed through an air lance nozzle to break up soil, and a vacuum tube is used to retrieve the soil into a 55-gallon drum. (232, 233, 234)	LOW: <11	1. Contact 2. PPE 3. Outdoors	1. Faster than conventional methods 2. Reduces radiological risk and waste generation 3. Reduces costs 4. Prevents damage to underground structures	NR

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
INTEC	Demonstrated (Proposed) CW Task	Treatment HLW/LLRW	Technology 13: Crossflow Filtration A solid-liquid separation technology. The method recirculates the slurry and thereby maintains a high velocity of flow parallel, or crossflow, to the media surface. This minimizes particle build-up on the filter. (235, 236)	LOW: <11	1. Contact	1. Can handle a wide variety of waste types and concentrate slurries to very high solids content 2. Can be operated continuously and maintained remotely 3. Lower cost than conventional methods 4. Reduces the amount of chemicals needed for pretreatment	NR
NR	Demonstrated (Proposed) CW Task	Characterization	Technology 14: Reduced Access Characterization Subsystem (RACS) Robotic system used for characterization in large areas and in areas where entry by a RCT is not acceptable. The system consists of a robot with a homing/repeater beacon, and uses ultrasonic sensors for wall following and homing activities, infrared sensors and bump sensors for collision avoidance, and a radiation detector for gathering data. (237, 238, 239, 240)	LOW: <11	1. Limited Contact 2. Remote 3. Indoors	1. Characterization in large areas can be done more quickly 2. More detailed and accurate data than manual methods 3. Reduces worker exposure; removes RCTs from potentially hazardous areas	NR

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
EBRI Subpile Room CFA Building 674B	Demonstrated (Proposed) CW Task	Treatment LLRW	Technology 15: Biodecontamination of Concrete A process that uses naturally occurring microbes to degrade concrete for removal of radionuclide surface material. The passive process leaves bacteria to actively degrade the cement matrix until the concrete surface material is loosened for easy removal to a desired depth. The process takes 6- 18 months for completion, depending on depth and extent of contamination. (241, 242, 243, 244)	LOW: <11	1. Limited Contact 2. Outdoors	1. Lower costs 2. Reduced waste volumes 3. Reduced risk of environmental release 4. Reduced worker exposures	NR
RWMC Research Facility	Demonstrated (Proposed) CW Task	Characterization	Technology 16: Advanced Tensiometer The new advanced tensiometer operates on the same principles as the conventional tensiometer. The device's ceramic cup is filled with water and placed in contact with soil or rock in the vadose zone. As the water is drawn from the cup into the soil, a vacuum forms in the cup. When the system reaches equilibrium, changes in the vacuum indicate changes in the soil moisture. A pressure transducer measures the partial vacuum, and a data logger records the measurement. Multiple instruments assist in estimating fluid movement between land surface/water table. (246, 247, 248, 249, 250)	LOW: <11 (3 total)	1. Remote 2. Limited Contact	1. Deeper installations than conventional methods 2. Improves precision and stability 3. Minimal maintenance (no moving parts) and 4. Lower noise to signal ratio 5. Electronic components are serviceable from land surface	1. Requires borehole into soil to install. This has associated hazardous chemical and/or radiological contamination concerns

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
Sitewide	Demonstrated (Proposed) CW Task	Treatment HLW/MW/TRU	Technology 17: Planar In Situ Vitrification (ISV) GeoMelt A thermal process for remediating contaminated soil, sediment, sludge, mill tailings, and other earthen materials containing hazardous/radioactive contaminants. It has a high tolerance for debris that might be in the treatment area. It destroys most organic and inorganic compounds by thermally induced decomposition (pyrolysis) in the oxygen-depleted environment in and around the melt zone. Remaining volatile components are treated by the off-gas system, and contaminants remaining in the molten soil are incorporated into a non-leachable vitrified product. (253, 254, 255)	LOW: <11	1. PPE 2. Outdoors	1. Attainment of deeper and/or narrower melts 2. Can be used for special applications involving high concentrations of gas-generating materials 3. Vaporization/removal from the treatment zone is followed by removal and/or thermal destruction by the off-gas treatment system 4. Immobilization with residual vitrified product (surpassing TCLP requirements)	1. Treatment depth over 20 feet requires special provisions 2. Total organic content over 10 percent weight may impact processing rate 3. Media must be acceptable for joule-heated melting 4. Sealed containers of liquids, gases, or gas-generating materials require special provisions
RWMC WROC	Deployed (Past/Present) HW Task	Characterization	Technology 18: Lead Brick Volumetric Radioassay A system used to analyze lead bricks for contaminants. It uses gamma-ray spectrometric screening to survey every brick and all sides of the brick for both surface and internal contamination. (257)	LOW: <11	1. Contact	1. Saves time and money by performing near real-time analysis	1. Limited to analyzing objects only rectangular in shapes

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
ANL-W	Deployed (Present) HW Task	Treatment	Technology 19: Phytoremediation A process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment. The process may be used for the remediation of metals, pesticides, solvents, explosives, crude oil and landfill leachates. Selected plants are planted and harvested at waste sites, then sampled, packaged, and transported to an incinerator. Then the incinerated wastes are transported to a landfill for final disposal. (258)	LOW: <11	1. Limited Contact 2. Outdoors	1. Applicable to remediate metals, pesticides, solvents, explosives, crude oil, poly-aromatic hydrocarbons, landfill leachates 2. Remediation cost/acre of lead contaminated soil to a depth of 50 centimeters is far less than excavating and/or land filling the same soil volume	1. Usually limited to shallow soils 2. High concentrations of hazardous materials are toxic to plants 3. Involves same mass transfer limitations as other biotreatments 4. May be seasonal, depending on location 5. Transfers contamination across media (i.e. soil to air) 6. Not effective for strongly sorbed (PCBs) and weakly sorbed contaminants 7. Products may be mobilized into ground water or bio-accumulate in animals
Sitewide	Demonstrated (Proposed) HW Task						

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
NR	Demonstrated (Proposed) HW Tasks	Characterization/ Retrieval	Technology 20: Warthog/Dig Face System (Ex-situ waste site characterization tool) The system is used to investigate an area of contamination by scanning the surface for changing chemical, radiological, and physical conditions in the subsurface. It is a specialized track based platform to which a variety of on-site, remotely operated radiation sensors can be attached. The sensors relay data to a control station through radio frequency links. (260, 261, 262, 263, 264)	LOW: <11	1. Limited Contact 2. PPE Reduced 3. Outdoors	1. Reduces risks by providing continuous, real-time monitoring/analysis of hazards 2. Reduces PPE and removes worker from an "unknown" contaminant environment 3. Avoids biases caused by small scale heterogeneity in the contaminant plume 4. Adaptable for site specific requirements 5. More portable than conventional systems	NR
TAN Groundwater wells #32 and #40	Deployed (Past/Present) HW Task	Characterization	Technology 21: In Situ Sampler (ISS) Allows researchers to collect information on the vertical distribution of contaminants in groundwater, specifically trichloroethene (TCE). It contains a long, semi-permeable sample tube internally, which absorbs TCE from the groundwater. Several of these samplers can be lowered into the well and a vapor sample can be collected after removing the unit from the well. The sample will then be analyzed onsite to determine TCE concentrations. (266, 267, 268)	LOW: <11 (1-2)	1. PPE 2. Contact	1. Less monitoring equipment needed 2. No purge water 3. Quickly obtained analytical results 4. Reduces costs (no shipping, laboratory, or purge water disposal costs)	1. Can detect but not quantify amounts of contamination for other hydrocarbons

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
RWMC TAN	Deployed (Past/Present) HW Task	Characterization/ Sampling LLRW/HW	Technology 22: Combination Well (Inside-Out Well) The "inside-out" well is designed so that the gas sampling tubing and ports are attached on the exterior of the well casing. Thus, groundwater and soil sampling do not interfere with each other, so the well can be used simultaneously for monitoring and remediation purposes, allowing direct comparison of data. It provides a means for simpler and less expensive sampling than conventional techniques. (270, 271, 272, 273, 274)	LOW: <11	1. Limited Contact 2. Remote	1. Reduction of cost 2. Effective in angled boreholes to reach areas of interests without drilling through the waste site itself 3. Groundwater and soil gas sampling activities do not interfere with each other 4. Assembled easily in the field before the casing is placed in the borehole 5. Precise gas port depths are known; reduces potential for grouting over ports after the casing is set	NR
TAN	Deployed (Present) HW Task	Treatment MW	Technology 23: Enhanced In Situ Bioremediation (ISB) A treatment process that increases the degradation of contaminants in the subsurface by the indigenous microorganisms present in the soil through manipulating substrates or nutrients necessary for microbial growth, and altering the flow of groundwater, thereby preventing the migration of contaminants outside the treatment area. (276, 277, 278, 279, 280)	LOW: <11	1. Limited Contact 2. PPE 3. Outdoors	1. Accelerated degradation of TCE compared to "pump and treat" method 2. Reduced worker risk (contamination never pumped above ground where exposure potential exists) 3. No generation of secondary waste streams 4. Decreased waste management costs 5. Destroys contaminants rather than transferring them to another medium	1. Site specific; requires thorough evaluation prior to design and deployment

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
Subsurface Disposal Area Un-Exploded Ordnance Site Characteriza- tion (UXO) CFA WAG 4	Deployed (Past/Present) HW Task	Characterization MW	Technology 24: Rapid Geophysical Surveyor (RGS) A measurement system that automates the collection of high spatial resolution geophysical data. The system measures and associates dense sets of magnetic data. It is a manually-maneuvered vehicle that carries cesium total field magnetometers, a data logger, and data storage hardware and software. The data are then displayed as a contour map showing the location of the buried metals or ferrous objects such as 55- gallon steel drums, USTs, and buried hazardous and radioactive wastes. (282, 283, 284, 285, 286)	LOW: <11 (1-2)	1. Limited Contact 2. Outdoors	1. Lowers the cost of the survey through higher productivity 2. Increases density of magnetic field data for enhanced images 3. Very portable; no significant mobilization costs 4. Non-intrusive characterization	NR
SRS LANL Sandia National Laboratory	Demonstrated (Past) HW Task	Characterization/ Maintenance LLRW	Technology 25: Segmented Gate System (SGS) Mechanically separates radioactively contaminated soils from clean soils using sodium iodide detectors on a conveyor belt system. Based on the sensor readings, contaminated soil is channeled through a diversion gate by conveyor and ultimately packaged and transported for disposal. Through sorting the radioactively contaminated soil into a clean stream and a contaminated stream, the volume of waste to be packaged, transported, and disposed of is reduced. (288, 289, 290, 291)	LOW: <11	1. PPE 2. Outdoors	1. Can reduce cost (based upon the volume of waste treated) 2. No chemicals or other additives are used 3. Generation of secondary waste is limited to PPE and rinse water 4. Surveys the entire volume of soil to be processed	1. System is not well suited to sort soil contaminated with more than 2 radionuclides with different gamma energies 2. Oversize rocks and cobble (>2") cannot be processed without pre-crushing
ARA-23	Deployed (Present) HW Task						

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
NR	Demonstrated (Proposed) HW Task	Maintenance/ Retrieval	Technology 26: Cooperative Telerobotic Retrieval System Allows for removal of suspected hazardous items from a buried waste site while maintaining the integrity of the containers in which the suspect items are stored or disposed. The system consists of a remote-controlled gantry crane, two robotic manipulators, a 5-ton hoist, and a vacuum system. In tandem, the manipulators and the vacuum system can selectively remove soils and debris from around an item, and retrieve that item. (293, 294, 295)	LOW: <11	1. Limited Contact 2. Remote	1. Removes workers from hazardous environments, improving worker safety 2. Reduces the need for PPE 3. Reduces costs	NR
Experimental Field Station	Demonstrated (Proposed) HW Task	Treatment	Technology 27: Bioremediation of Explosive Contaminated Soils A method for treating explosive-contaminated soils. Large sized fragments (larger than 2mm) of TNT are pretreated with acetone. The acetone breaks down the explosive chunks so that they can be added to the compost process. Microorganisms in the compost feed on the TNT and reduce the ingredients to Nitrogen rich soil. The composting also destroys the acetone. (296, 297, 298)	LOW: <11	1. Limited Contact 2. Outdoors	1. Low cost 2. Can treat areas with large chunks of TNT	NR

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
TRA-660 Facility	Deployed (Past/Present) De Task	Characterization/ Retrieval HLW/MW	Technology 28: Remote Underwater Characterization System (RUCS) A small, remotely operated submersible vehicle system designed to perform tasks such as small parts retrieval and sampling. The system provides visual and gamma radiation characterization, even in confined or limited spaces. Included on the system are underwater lights, a front color camera, a rear black & white camera, and a GM tube radiation detector. RUCS operates by a 125' neutrally buoyant tether and is capable of submerging to depths of 100 feet. (299, 300, 301, 302)	LOW: <11 (1-2 to operate system)	1. Limited Contact 2. Remote	1. Costs less than other systems with similar capabilities 2. Small size allows for simpler operation in tight access areas or where maneuvering is limited 3. Able to reach depths unattainable by conventional methods 4. Reduces the number of workers that need to be suited up, which reduces exposure and saves labor 5. Measures radiation levels 50% higher than previously known due to its ability to 'fly' right up to objects	1. RUCS not superior in all instances; baseline approach provided slightly higher quality video and could access some areas such as the inside of pipes and get some radiation data that the RUCS could not
INTEC CFA Old Sewage Treatment Facility ARA-1 NRF	Deployed (Past/Present) De Task	Maintenance LLW	Technology 29: Soft-Sided Container A large waste bag made of woven polypropylene material with integrated nylon lifting straps. The packaging system includes a 25-mil woven outer polypropylene fabric shell with a 2-mil water resistant coating and a 45-mil double layer polypropylene inner liner. The outer shell is equipped with 18 lifting straps, a loading frame to support the container while being filled, and a lifting frame that can be attached to a crane or hoist to raise it onto a transport vehicle. (304, 305, 306, 307)	LOW: <11 (3 total for setup/ filling of container)	1. Contact 2. PPE	1. Three times greater capacity than conventional boxes 2. Greater savings over wooden/metal boxes 3. Easier to load and accepts larger debris 4. Reduces void spaces and landfill subsidence	1. Waste sizing and preparation for the containers is the same as for baseline wooden boxes 2. One time cost of \$7,000 for the loading frame and lifting/ spreader bar 3. Protruding objects must be cut prior to loading to reduce puncture risk

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
INTEC	Demonstrated (Proposed) De Task	Characterization/ Retrieval LLMW	Technology 30: Pipe Explorer A remotely operated survey system that integrates radiation detectors and video cameras with an inverting membrane deployment method that utilizes a long, plastic tube to tow the instruments through the pipes. It is capable of negotiating bends and debris that obstruct up to half of the pipe's cross sectional area. The detectors have the sensitivity to make low-level measurements inside of pipes. (309, 310, 311, 312, 313)	LOW: <11 (2 operators)	1. Limited Contact 2. Remote	1. Can obtain radiological data over the entire length of the pipe 2. Can survey locations not accessible with existing technology 3. Reduces time, cost, and personnel exposure 4. Reduces cross contamination	NR
ARA-1 Old Hot Cell Facility	Deployed (Past/Present) Di Task	Dismantlement LLRW	Technology 31: Bulk Concrete Waste Disposal System A method to manage the D&D and eventual disposal of large contaminated concrete structures (LLMW). This method consists of remotely cutting the concrete into more manageable slabs, wrapping the slabs in plastic (i.e., Herculite), and directly disposing of the slabs in the RWMC Disposal Pit. (315, 316, 317, 318)	LOW: <11 (1-2 total)	1. PPE 2. Outdoors 3. Contact	1. Reduces waste container costs 2. Reduces waste volume in disposal pits 3. Reduces worker exposure to radiological contamination	1. Process requires more time (estimation for slabbing is 2 times the amount of time to rubbleize concrete)

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
FEMP Plant 1	Demonstrated (Past) Di Task	Dismantlement MW	Technology 32: Oxy-Gasoline Torch Fueled by gasoline, the oxy-gasoline torch will cut or segment larger structural components in a facility. It consists of a 3-gallon fuel tank with safety valves, a gasoline supply hose, and a cutting torch head. A built in hand pump or external source of compressed air pressurize the tank and deliver the gas (in vapor form) to the head of the torch, where it mixes with oxygen (supplied from conventional bottles) in the tip. (325, 326, 327, 328, 329)	LOW: <11 (1-2)	1. PPE 2. Contact	1. Cuts faster and cleaner with less slag 2. Significant fuel savings 3. Accelerates schedules and reduces work and radiation exposure time 4. More portable 5. Backlash is eliminated	NR
CFA TAN 620 ARA TRA	Deployed (Past/Present) Di Task						
NR	Demonstrated (Proposed) Di Task	Maintenance/ Retrieval LLMW	Technology 33: Dual Arm Work Platform (DAWP) A remotely operated robotic dismantlement system that consists of two 6-degree-of-freedom (DOF) Schilling hydraulic manipulators arms, mounted on a 5-DOF hydraulic positioning base containing lights, cameras, and dismantlement tools. Deployment occurs using a forklift or crane, and the system is readily decontaminated. (320, 321, 322, 323)	LOW: <11 (1-3 total)	1. Limited Contact 2. Remote 3. Outdoors	1. Can be mounted on different deployment devices 2. Remote operation removes workers from high-radiation areas 3. Accepts a variety of tooling configurations	1. Careful tether management needed during movement 2. Manipulator arms require high maintenance 3. Expensive to implement

Table 13.3 (Continued): Past, Present, and Future Remediation Worker Technologies at INEEL as of August 1999

Facility: INEEL, Area	Category (CW, HW, D&D Task and Past, Present, Proposed)	Tech. Title	Technology and Brief Description	Number of Workers per Tech.	Descriptive Exposure Potential	Advantages	Disadvantages
ANL-E Janus Reactor	Demonstrated (Past)	Dismantlement LLMW	Technology 34: Brokk Demolition Robot A remotely operated, electrically driven demolition system that can replace manual tools. The current system consists of a revolving table mounted on a tractor-like base. Extending from the table is a hydraulic arm, to which a variety of tools (hammers, scabblers, grapples, buckets, shears, etc.) can be attached to perform the work. Can be operated by a worker 400 foot away or in a different room with a television monitor. (331, 332, 333, 334, 335)	LOW: <11 (1-2 operators)	1. Limited Contact 2. Indoors/ Outdoors 3. Remote	1. Faster and more efficient excavation 2. Remote operation allows operators to be positioned a safe distance from hazardous areas 3. Reduces exhaust fumes in containment areas 4. Can perform a wide range of tasks due to different tools/end effectors 5. Reduces noise levels and eliminates repetitive motion injuries	NR
CFA Security Training Facility	Deployed (Present) Di Task						

14.0 Works Cited/References Overview

This following section presents the references cited within this document. The references are numbered according to appearance in the document, however, each reference kept the same 'Text Number' throughout the report. For example, if a reference was first assigned the number '12' and was cited again later in the document, the reference would remain '12'.

Page numbers used from a particular reference are presented next to the 'Text Number' within the document. For example, if page 3 of reference number 12 was cited within the text it would appear as '(12: P. 3)'. If multiple pages were cited, it would appear as '(12: Pp. 3-5)' within the text.

A total of 1114 document and web-site references, interviews and conversations / correspondences were used in the compilation of this report. Three hundred and thirty two of the references were cited in the document and 346 references were cited in the INEEL Activities Database. All 1114 references are kept within a Microsoft Access database for sorting and functionality. 'Internet and Document References' within the database is the primary table containing all references except Point of Contact (POC) conversations. Conversations are kept within the table called 'conversations'.

All references within the database were assigned a 'reference tracking number'. This number was used for filing hard copy references. All hard copy references accompany the final report released to NIOSH. The actual database is available on zip disk and the NIOSH Local Area Network (LAN) via L:LINK/SHARE/INEEL_References/idaho. Portable Document File (PDF) and Image File documents are also located within the file folder and linked to appropriate records in the references database.

14.1 Works Cited/References

1. Alexander, T.G. Initial Assessment - PBF-22 SPERT IV Leach Pond. PBF-758 2740 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-09]. September 22, 1986.
2. Paper Allied-Industrial, Chemical and Energy Workers (PACE) Local No.8-0652. Paper Allied-Industrial, Chemical and Energy Workers (PACE) Local No.8-0652. [http://home.if.rmci.net/ocaw]. February 11, 2000.
3. United States Department of Energy, Idaho Operations Office. INEEL Home Page. [http://www.inel.gov/]. January, 7 1999.
4. United States Department of Energy, Idaho Operations Office. History: INEEL. [http://www.inel.gov/about/history/08.html]. January 7, 1999.
5. United States Department of Energy, Idaho Operations Office. General History of the INEEL. [http://titanic.inel.gov:1025/plan/cflup/html/history.htm]. December 27, 1999.
6. United States Department of Energy. Criticality Accidents. [http://www.enviroweb.org/enviroissues/nuketesting/accident/critical.htm]. January 7, 1999.
7. United States Department of Energy, Office of Environmental Management, Office of Strategic Planning and Analysis. The 1996 Baseline Environmental Management Report: Volume II. DOE/EM-0290. Washington, D.C. June 1996.
8. United States Department of Energy, Idaho Operations Office. General Description of the INEEL. [http://titanic.inel.gov:1025/plan/cflup/html/description.htm]. December 27, 1999.
9. United States Department of Energy, Idaho Operations Office. INEEL Facilities. [http://titanic.inel.gov:1025/plan/cflup/html/facilities.htm]. December 27, 1999.
10. United States Department of Energy, Idaho Operations Office. INEEL Land Use. [http://titanic.inel.gov:1025/plan/cflup/html/landuse.htm]. December 27, 1999.
11. United States Department of Energy, Idaho Operations Office. Test Area North (Waste Area Group 1). [http://www.inel.gov/environment/em/ER/wag1left.html]. February 10, 1999.

12. United States Department of Energy, Idaho Operations Office. Test Area North Hot Cell Facilities. Idaho Falls, Idaho. December 15, 1998.
13. Lockheed Martin Idaho Technologies Company (LMITCO). Test Area North. Idaho Falls, Idaho. December 15, 1998.
14. United States Department of Energy, Idaho Operations Office. Test Area North. [<http://www.inel.gov/maps/tan.html>]. December 1, 1998.
15. United States Department of Energy, Idaho Operations Office. Test Reactor Area (Waste Area Group 2). [<http://www.inel.gov/environment/em/ER/wag2left.html>]. February 10, 1999.
16. United States Department of Energy, Idaho Operations Office. Test Reactor Area. [<http://www.inel.gov/maps/tra.html>]. December 1, 1998.
17. Lockheed Martin Idaho Technologies Company (LMITCO). Test Reactor Area. Idaho Falls, Idaho. December 15, 1998.
18. United States Department of Energy, Office of Oversight Environment, Safety, and Health. Idaho National Engineering and Environmental Laboratory Site Profile. [<http://tis-hq.eh.doe.gov/oversight/profiles/profiles.html>]. June 1998.
19. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Proposed Plan for Waste Area Group 3 at the Idaho Chemical Processing Plant. Idaho Falls, Idaho. October 1998.
20. United States Department of Energy, Idaho Operations Office Idaho. Chemical Processing Plant (Waste Area Group 3). [<http://www.inel.gov/environment/em/wag3left.html>]. February 10, 1999.
21. United States Department of Energy, Idaho Operations Office. Idaho Nuclear Technology & Engineering Center. [<http://www.inel.gov/maps/icpp.html>]. November 30, 1998.
22. Lockheed Martin Idaho Technologies Company (LMITCO). Idaho Nuclear Technology & Engineering Center. Idaho Falls, Idaho. December 15, 1998.
23. Lockheed Martin Idaho Technologies Company (LMITCO). Central Facilities Area. Idaho Falls, ID. December 15, 1998.

24. United States Department of Energy, Idaho Operations Office. Central Facilities Area. [<http://www.inel.gov/maps/cfa.html>]. November 30, 1998.
25. United States Department of Energy, Idaho Operations Office. Central Facilities Area (Waste Area Group 4). [<http://www.inel.gov/environment/em/ER/wag4left.html>]. March 17, 1999.
26. Lockheed Martin Idaho Technologies Company (LMITCO). Power Burst Facility/Waste Reduction Operations Complex. Idaho Falls, Idaho. December 15, 1998.
27. United States Department of Energy, Idaho Operations Office. Power Burst Facility. [<http://www.inel.gov/maps/pbf.html>]. December 1, 1998.
28. United States Department of Energy, Idaho Operations Office. Power Burst Facility/Auxiliary Reactor Area (Waste Area Group 5). [<http://www.inel.gov/environment/em/ER/wag5left.html>]. March 17, 1999.
29. United States Department of Energy, Idaho Operations Office. Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area (Waste Area Group 6). [<http://www.inel.gov/environment/em/ER/wag6left.html>]. March 17, 1999.
30. Lockheed Martin Idaho Technologies Company (LMITCO). Experimental Breeder Reactor-I. Idaho Falls, Idaho. December 15, 1998.
31. United States Department of Energy, Idaho Operations Office. Radioactive Waste Management Complex (Waste Area Group 7). [<http://www.inel.gov/environment/em/ER/wag7left.html>]. March 17, 1999.
32. United States Department of Energy, Idaho Operations Office. Environmental Restoration Progress. [<http://environment.inel.gov/pdf/erprgrss.pdf>]. February 1998.
33. Lockheed Martin Idaho Technologies Company (LMITCO). Radioactive Waste Management Complex. Idaho Falls, Idaho. December 15, 1998.
34. United States Department of Energy, Idaho Operations Office. Radioactive Waste Management Complex. [<http://www.inel.gov/maps/rwmc.html>]. December 1, 1998.
35. United States Department of Energy, Idaho Operations Office. Naval Reactors Facility (Waste Area Group 8). [<http://www.inel.gov/environment/em/ER/wag8left.html>]. March 17, 1999.

36. Lockheed Martin Idaho Technologies Company (LMITCO). Naval Reactors Facility. Idaho Falls, Idaho. December 15, 1998.
37. United States Department of Energy, Idaho Operations Office. Naval Reactors Facility. [<http://www.inel.gov/maps/nrf.html>]. November 30, 1998.
38. United States Department of Energy, Idaho Operations Office. Argonne National Laboratory - West (Waste Area Group 9). [<http://www.inel.gov/environment/em/ER/wag9left.html>]. March 17, 1999.
39. Lockheed Martin Idaho Technologies Company (LMITCO). Argonne National Laboratory - West. Idaho Falls, Idaho. December 15, 1998.
40. United States Department of Energy, Idaho Operations Office. Argonne National Laboratory - West. [<http://www.inel.gov/maps/anlw.html>]. November 30, 1998.
41. United States Department of Energy, Idaho Operations Office. Sitewide Area. [<http://titanic.inel.gov:1025/plan/cflup/html/sitewide.htm>]. December 29, 1999.
42. Williams, L.B. INEL News: Celebrates 40th Anniversary. [<http://ar.inel.gov/>]. May 1, 1989.
43. United States Department of Energy, Idaho Operations Office. INEEL Land and Facility Use Projections. [<http://titanic.inel.gov:1025/plan/cflup/html/projections.htm>]. December 28, 1999.
44. United States Department of Energy, Idaho Operations Office. Introduction. [<http://titanic.inel.gov:1025/plan/cflup/html/introduction.htm>]. December 28, 1999.
45. United States Department of Energy, Office of Environment, Safety, and Health, Office of Oversight. Idaho National Engineering and Environmental Laboratory, Site Profile. Washington, D.C. December 1998.
46. Environmental Science & Research Foundation. Idaho National Engineering and Environmental Laboratory Site Environmental Report for Calendar Year 1997. DOE/ID-12082(97), ESRF-030. Idaho Falls, Idaho. August 1998.
47. United States Department of Energy, Idaho Operations Office. Environmental Management at the INEEL: 1999 Progress. Vol. 8055. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=INEEL]. September 1, 1999.

48. Idaho Division of Environmental Quality (IDEQ). Hazardous Waste Management in Idaho: 1998. Boise, Idaho. December 31, 1998.
49. United States Department of Energy, Office of Environmental Management, Office of Strategic Planning and Analysis. The 1996 Baseline Environmental Management Report: Volume III. DOE/EM-0290. Washington, D.C. June 1996.
50. United States Department of Energy, Office of Environment, Safety, and Health, Office of Oversight. Argonne National Laboratory - West, Site Profile. Washington, D.C. December 1998.
51. Representatives from OCAW and Lockheed Martin. OCAW Seniority Roster. Idaho Falls, Idaho. January 21, 1999.
52. Argonne National Laboratory and Oil, Chemical, and Atomic Workers. Working Agreement between Argonne National Laboratory and Oil, Chemical, and Atomic Workers International Union and Local No. 2-652. Idaho Falls, Idaho. June 1, 1998.
53. Lockheed Martin Idaho Technologies Company and Oil, Chemical, and Atomic Workers (OCAW). Working Agreement between Oil, Chemical, and Atomic Workers International Union and Local No. 2-652 and Lockheed Martin. Idaho Falls, Idaho. July 13, 1998.
54. Chivers, Sharon. Idaho National Engineering & Environmental Laboratory. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 17, 1998.
55. McDonald, Joy. Lockheed Martin Idaho Technologies Company. Telephone Conversation. Trudi Zimmerman. January 27, 2000.
56. Lockheed Martin Idaho Technologies Company. OCAW Seniority Roster, Section 7.3 [of the current working agreement between OCAW and LMITCO]. Idaho Falls, Idaho. February 1, 1999. January 21, 1999.
57. Lockheed Martin Idaho Technologies Company. INEEL Remediation Workers 1994 - 1998, 1999; database package. Idaho Falls, Idaho. March 22, 1999.
58. Argonne National Laboratory. "NIOSH-INEEL Health Study of Cleanup Workers from 1990-1999". Data Sheet Listing Argonne National Laboratory-West's Total Number of workers. Idaho Falls, Idaho. March 15, 1999.

59. Lockheed Martin Idaho Technologies Company. Subcontractor Data Set-Numeric Sequence (Lists 1,950 contractors onsite INEEL as of July 21, 1998). Idaho Falls, Idaho. July 21, 1998.
60. Turner, Jerry. Asbestos Workers Local # 69. Telephone Conversation. Steve Davisson. October 25, 1999.
61. Crader, Terry. Boilermakers & Welders Local # 182. Telephone Conversation. Steve Davisson. October 25, 1999.
62. Hill, Peggy. Carpenters Local # 808. Telephone Conversation. Steve Davisson. October 22, 1999.
63. Espinosa, LeDawn. International Brotherhood of Electrical Workers (IBEW) Local # 449. Telephone Conversation. Steve Davisson. October 25, 1999.
64. Hogan, Brian. International Union of Operating Engineers (IUOE) Local # 370. Private e-mail message to Steve Davisson. October 8, 1999.
65. Bare, Pam. Laborers Local # 155. Telephone Conversation. Steve Davisson. October 25, 1999.
66. Norton, Willis. Iron Workers Local # 732. Telephone Conversation. Steve Davisson. October 22, 1999.
67. Obray, Dan. Painters & Glaziers Local # 764. Telephone Conversation. Steve Davisson. October 25, 1999.
68. McKnight, Bob. Plasterers & Cement Masons Local # 629. Telephone Conversation. Steve Davisson. October 22, 1999.
69. Fuger, Rod. Plumbers & Steam Fitters Local # 648. Telephone Conversation. Steve Davisson. October 25, 1999.
70. Purkett, Brett. Roofers Local # 200. Telephone Conversation. Steve Davisson. October 25, 1999.
71. Moore, Brent. Sheet Metal Workers Local # 60. Telephone Conversation. Steve Davisson. October 26, 1999.

72. Koch, Dan. Sprinklers & Fitters Local # 669. Telephone Conversation. Steve Davisson. October 26, 1999.
73. Oar, Mike. International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers Local 983. Telephone Conversation. Steve Davisson. October 25, 1999.
74. Fox, David. Oil, Chemical, and Atomic Workers International Union (OCAW) Local No. 2-652. Telephone Conversation. Steve Davisson. October 25, 1999.
75. United States Department of Energy, Idaho Operations Office. INEL Site Stabilization Agreement, Second Edition.
[<http://www.id.doe.gov/doeid/m&o/PDF/OCAW/Agreement.pdf>].
October 1, 1991.
76. Barney, Deidre. Lockheed Martin Idaho Technologies Company. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 17, 1998.
77. Janescko, Mike. Argonne National Laboratory - West. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 16, 1998.
78. Sullivan, Walt. INEEL Integrated Safety Management (ISM).
[<http://ism.inel.gov/present.html>]. June 3, 1999.
79. United States Department of Energy, Idaho Operations Office. ISMS Path Forward. February 23, 2000.
80. United States Department of Energy. Safety Management System Policy. DOE P 450.4. [<http://ism.inel.gov/what.html>]. October 15, 1996.
81. United States Department of Energy. Line Environment, Safety, and Health Oversight. DOE P 450.5. [<http://ism.inel.gov/what.html>]. June 26, 1997.
82. United States Department of Energy, Office of Worker Health & Safety. U.S. Department of Energy Voluntary Protection Program - Part IV: Onsite Review Handbook. DOE/EH-0436. Washington, D.C. July 1995.
83. United States Department of Energy, Idaho Operations Office. VPP: BBWI Voluntary Protection Program Employee Handbook.
[<http://www.inel.gov/resources/vpp/handbook.html>]. March 20, 1999.

84. United States Department of Energy, Assistant Secretary for Environment, Safety and Health, Office of the Deputy Assistant Secretary for Worker Health and Safety. Integrating Safety and Health During Decommissioning. DOE/EH-0546. [<http://www.inel.gov/environment/demolition/lessons/lessons.htm>]. September 30, 1996.
85. United States Department of Energy, Idaho Operations Office. Integrated Safety Management System: It is all about "Doing Work Safely". [<http://ism.inel.gov/vppvsism.htm>]. March 20, 1999.
86. Lockheed Martin Idaho Technologies Company. Lockheed Martin Idaho Technologies Company; Idaho National Engineering & Environmental Laboratory; Employee Handbook. GDE-10. [<http://www.id.doe.gov/doeid/M&O/PDF/gde-10.pdf>]. March 1997.
87. United States Department of Energy, Office of Environment, Safety and Health. Interim Report on the Office of Oversight Review of the Effectiveness of DOE Occupational Medicine Programs. EH2PUB/01-99/OM01. January 1999.
88. Creighton, Paul. Occupational Medicine Health Program. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 17, 1998.
89. United States Department of Energy, Office of Oversight. Independent Oversight Assessment of Radiation Protection Programs Within the Department of Energy. EH2PUB/03-99/01SR. [<http://tis.eh.doe.gov/oversight/reviews/radpro.pdf>]. May 1999.
90. Kirshner, Debra. Argonne National Laboratory - West. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 16, 1998.
91. Los Alamos National Laboratory. Chemical Safety Requirements Roadmap. [<http://csig-roadmap.lanl.gov>]. March 9, 2000.
92. United States Department of Energy, Assistant Secretary for Environment, Safety and Health, Office of the Deputy Assistant Secretary for Worker Health and Safety. Worker Involvement: Lessons Learned & Good Practices From INEEL Facility Disposition Activities. DOE/EH-0566. [<http://www.inel.gov/environment/demolition/lessons/lessons.htm>]. March 1998.

93. Marshall, Gary. Argonne National Laboratory - West. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 15, 1998.
94. McDonald, Joy. Lockheed Martin Idaho Technologies Company. Telephone Conversation. Steve Davisson. August 4, 1999.
95. Science Applications International Corporation for the United States Department of Energy, Assistant Secretary for Environment, Safety and Health, Office of Worker Health and Safety. DOE Occupational Radiation Exposure Report 1992-1994. DOE/EH-0533. Oak Ridge, Tennessee. October 1995.
96. Ruhter, Paul. Idaho National Engineering & Environmental Laboratory. Personal Interview. Ahrenholz, Steve; Bussa, Krystyn; Davisson, Steve; Taulbee, Tim; and Zimmerman, Trudi. December 16, 1998.
97. United States Department of Energy, Idaho Operations Office. RadCon's Information System 'Complex but not Complicated'. [<http://www.inel.gov/environment/stcg/archive/radcon.html>]. December 22, 1999.
98. Indus International, Inc. Indus Solution Series: PassPort. San Francisco, California. 1999.
99. Nielsen, Claude. Argonne National Laboratory - West. Private e-mail message to Trudi Zimmerman. March 27, 2000.
100. Raymond, Ron. Lockheed Martin Idaho Technologies Company. Private e-mail message to Trudi Zimmerman. March 1, 2000.
101. Raymond, Ron. Lockheed Martin Idaho Technologies Company. Private e-mail message to Trudi Zimmerman. March 1, 2000.
102. Bills, Jan. Lockheed Martin Idaho Technologies Company. Private e-mail message to Trudi Zimmerman. March 15, 2000.
103. Lockheed Martin Idaho Technologies Company. Hazard Assessment Sampling System. No. 0847. Idaho Falls, Idaho. January 6, 1999.
104. Marshall, Gary. Argonne National Laboratory - West. Trudi Zimmerman. March 28, 2000.

105. United States Department of Energy, Office of Environment, Safety, and Health. Department of Energy Occurrence Reporting Program. [<http://www.tis.eh.doe.gov/web/oeaf/orps/orps.html>]. November 19, 1998.
106. United States Department of Energy, Idaho Operations Office. INEEL: Final Occurrence Report Listing by Facility Code. [<http://www.inel.gov/orps/index.html>]. February 28, 2000.
107. United States Department of Energy. REMS Data Selection. [<http://rems.eh.doe.gov/rems/ri.htm>]. March 1998.
108. United States Department of Energy, Office of Environmental Management. REMS. [<http://rems.eh.doe.gov/>]. December 1999.
109. United States Department of Energy. Accident Incident Record Keeping and Reporting. [<http://tis-nt.eh.doe.gov/cairs/>]. August 11, 1998.
110. United States Department of Energy. Medical Surveillance Information System. [<http://www.ssds.com/doe/msishome.html>]. August 12, 1998.
111. United States Department of Energy, Office of Environment, Safety, and Health. U.S. Department of Energy Industrial Hygiene National Database Program. [<http://tis.eh.doe.gov/be/webdoc6.html-ssi>]. September 1994.
112. French, D.L., Tallman, R.E., and Taylor, K.A. Idaho National Engineering and Environmental Laboratory, Lockheed Martin Idaho Technologies Company Idaho National Engineering and Environmental Laboratory Nonradiological Waste Management Information for 1997 and Record-to-Date. DOE/ID-10057(97). Idaho Falls, Idaho. September 1998.
113. United States Department of Energy. DOE Occupational Radiation Exposure 1997 Report. DOE/EH-0575. Oak Ridge, Tennessee. October 1998.
114. United States Department of Energy. DOE Occupational Radiation Exposure Report 1998. [<http://rems.eh.doe.gov/annual/annual98.htm>]. 1998.
115. Hagemeyer, Derek. Science Applications International, Inc. Private e-mail message to Trudi Zimmerman. October 1, 1999.

116. Department of Advanced Technology. Chemical Occurrences.
[<http://www.dne.bnl.gov/etd/csc/>]. August 12, 1998.
117. United States Department of Energy, Office of Environment, Safety and Health, Office of Oversight. Followup Review of Accident Investigations at the Idaho National Engineering and Environmental Laboratory.
[<http://tis-hq.eh.doe.gov/oversight/follow/ineelai/ineeloitai.html>]. October 1997.
118. United States Department of Energy, Office of Oversight Environment, Safety and Health. Type A Accident Investigation Board Report of the July 28, 1998 Fatality and Multiple Injuries Resulting from Release of Carbon Dioxide at Building 648, Test Reactor Area, Idaho National Engineering and Environmental Laboratory.
September 1998.
119. United States Department of Energy, Office of Environmental Management. Affected Sites. 1996.
120. United States Department of Energy, Office of Environment, Safety, and Health. Occupational Illness Program for Department of Energy Workers.
[<http://tis.eh.doe.gov/portal/feature/occill.html>]. March 1, 2000.
121. United States Department of Energy. DOE Openness: Human Radiation Experiments: Roadmap to the Project: Record Series Descriptions: Idaho Sites.
[<http://tis-nt.eh.doe.gov/ohre/roadmap/records/idrslis/index.html>]. March 13, 2000.
122. United States Department of Energy, Idaho Operations Office. Waste Management Progress.
[http://www.inel.gov/environment/wm/progress_may_98/wmprogressfinal3.pdf].
May 1998.
123. United States Department of Energy, Idaho Operations Office. Hazardous Waste.
[<http://www.inel.gov/environment/em/WM/haz.html>]. January 7, 1999.
124. United States Department of Energy, Idaho Operations Office. Treatment, Storage, & Disposal: Low-Level Waste. [<http://www.inel.gov/environment/em/WM/llw.html>].
January 7, 1999.
125. United States Department of Energy, Office of Environmental Management. Accelerating Cleanup: Paths to Closure - Disposition Maps: LLW (Low Level Waste), Rev.3.0.
[<http://www.em.doe.gov/closure/mapmenu.html>]. February 3, 1998.

126. British Nuclear Fuels LLP (BNFL Inc.). Advanced Mixed Waste Treatment Project (AMWTP): Incineration. Idaho Falls, Idaho. December 14, 1998.
127. British Nuclear Fuels LLP (BNFL Inc.). Advanced Mixed Waste Treatment Project (AMWTP): RCRA and the AMWTP. Idaho Falls, Idaho. December 14, 1998.
128. United States Department of Energy, Office of Environmental Management. Idaho National Engineering Laboratory, Idaho Falls, Idaho (Including Argonne National Laboratory-West). [<http://www.em.doe.gov/nsropstp/inel.html>]. February 29, 1996.
129. United States Department of Energy, Idaho Operations Office. Idaho National Engineering and Environmental Laboratory - Site Treatment Plan Summary. [<http://ineelstp.inel.gov/Default.htm>]. December 10, 1999.
130. United States Department of Energy, Idaho Operations Office. Treatment, Storage, & Disposal: Mixed Low-Level Waste. [<http://www.inel.gov/environment/em/WM/mlw.html>]. December 9, 1999.
131. United States Department of Energy, Idaho Operations Office. Treatment, Storage, & Disposal: Treatment, Storage, & Disposal. [<http://environment.inel.gov/tsd.cfm>]. September 23, 1999.
132. United States Department of Energy, Office of Environmental Management. Accelerating Paths to Closure. DOE/EM-0362. [<http://www.em.doe.gov/www/closure/final>]. November 30, 1998.
133. United States Department of Energy, Office of Environmental Management. Accelerating Cleanup: Paths to Closure - Disposition Maps: ER (Environmental Restoration), Rev. 3.0. [<http://www.em.doe.gov/closure/mapmenu.html>]. February 19, 1998.
134. United States Department of Energy, Idaho Operations Office. Environmental Disposition Baseline Disposition Map. [<http://emi-web.inel.gov/published/ERMaps1022.pdf>]. February 12, 1998.
135. United States Department of Energy, Office of Environmental Management. Accelerating Cleanup: Paths to Closure - Disposition Maps: SNF (Spent Nuclear Fuel), Rev. 3.0. [<http://www.em.doe.gov/closure/mapmenu.html>]. December 3, 1997.

136. United States Department of Energy, Idaho Operations Office. Grand Junction ER Baseline Disposition Map. [<http://emi-web.inel.gov/pdf/AllMapsF98.pdf>]. July 16, 1998.
137. United States Department of Energy, Office of Environmental Management. Accelerating Cleanup: Paths to Closure - Disposition Maps: HLW (High Level Waste), Rev. 3.0. [<http://www.em.doe.gov/closure/mapmenu.html>]. January 15, 1998.
138. Conely, D. and Corrigan, S. Idaho National Engineering Laboratory Facility Status and Progress of the INEL's WERF MLLW and LLW Incinerator. INEL-95/00549. May 22, 1996.
139. WERF MACT Feasibility Study Team. WERF MACT Feasibility Study Report. INEEL/EXT-98-01166. Idaho Falls, Idaho. November 1998.
140. Millhouse, Albert. Idaho National Engineering & Environmental Laboratory. Telephone Conversation. Aaron Moore. February 23, 2000.
141. Lockheed Martin Idaho Technologies Company. Idaho National Engineering and Environmental Laboratory Transuranic Waste Program. Idaho Falls, Idaho. December 14, 1998.
142. Miller, Bruce. Health and Safety Plan for Operable Unit 7-13/14 Subsurface Investigation. INEEL/EXT-98-00857. Idaho Falls, Idaho. May 1999.
143. DePaolo, Donald J. and Kennedy, B. Mack Evaluation of Isotopic Diagnostics for Subsurface Characterization and Monitoring: Field Experiments at the TAN and RWMC (SDA) Sites, INEEL. Idaho Falls, Idaho. March 1, 2000.
144. Crites, John T. Discipline Numbers (RWMC). Idaho Falls, Idaho. December 16, 1998.
145. Bannister, R., Rhoden, G., and Davies, G.B. Evaluation of Retrieval Activities and Equipment for Removal of Containers from the Transuranic Storage Area Retrieval Enclosure. INEL-95/0619. September 1995.
146. United States Department of Energy, Idaho Operations Office. Soil Sampling Plan for the Transuranic Storage Area Soil Overburden and Final Report. Idaho Falls, Idaho. March 1990.

147. United States Nuclear Regulatory Commission. Certificate of Compliance No. 9218, Rev. 6. March 30, 1995.
148. United States Department of Energy, Idaho Operations Office. Advanced Mixed Waste Treatment Project Draft Environmental Impact Statement. DOE/EIS-0290-D. Idaho Falls, Idaho. July 1998.
149. BNFL, Inc. What Is the Solution? Factsheet. [<http://www.amwtp.com/factsheets/factsheet6.stm>]. January 6, 2000.
150. United States Department of Energy, Idaho Operations Office. About the INEEL Spent Nuclear Fuel Program. [<http://inelsnf.inel.gov/>]. March 1, 2000.
151. United States Department of Energy, Idaho Operations Office. Treatment, Storage, and Disposal: Spent Nuclear Fuel. [<http://environment.inel.gov/wm/snf.cfm>]. January 11, 2000.
152. United States Department of Energy, Idaho Operations Office. Environmental Assessment Test Area North Pool Stabilization Project. DOE/EA-1217. August 1997.
153. Jones, Roger. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Aaron Moore. February 28, 2000.
154. Powell, F.P. Acronyms. INEL-95/0166. Idaho Falls, Idaho. April 1995.
155. United States Department of Energy, Idaho Operations Office. INEL's Spent Fuel Management Strategy. [<http://inelsnf.inel.gov/happen.htm>]. October 1996.
156. United States Department of Energy, Idaho Operations Office. DOE News: DOE Selects Foster Wheeler Team for Dry Fuel Storage. [<http://environment.inel.gov/press/contextnews.cfm?id=51>]. December 8, 1999.
157. Ehlers, Laura. Will Risk-Based Cleanup Work at Navy Facilities? Washington, D.C. August 1, 1999.
158. INEL Community Relations. Update Fact Sheet - Agencies Evaluate Groundwater (GW) Treatment. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-07A]. January 1, 1995.

159. Bartholomei, Martin. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Aaron Moore. February 16, 2000.
160. Howze, John. Bioremediation of Groundwater Plume Shows Promise. [<http://www.inel.gov/resources/newsletters/star/1999/07-06-99/0706bioremed.htm>]. January 21, 2000.
161. Swaney, George. Lockheed Martin Idaho Technologies Company. Private e-mail message to Aaron Moore. February 15, 2000.
162. Jones, Roger. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Aaron Moore. February 14, 2000.
163. Okeson, James. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Aaron Moore. February 16, 2000.
164. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Proposed Plan for Waste Area Group 9 - Argonne National Laboratory - West. [http://ar.inel.gov/ar/owa/getgif_2?F_DOC=10441&F_REV=00&F_PAGE=1&F_GOTO=1]. January 12, 1998.
165. Argonne National Laboratory - West. Argonne National Laboratory - West Current Year Work Plan Environmental Restoration (EM-40) Fiscal year 1999. [<http://environment.inel.gov/er/anl.cfm>]. January 1, 2000.
166. Marshall, Gary. Argonne National Laboratory - West. Private e-mail message to Aaron Moore. February 14, 2000.
167. United States Department of Energy, Idaho Operations Office. D&D Program Overview Page. [<http://www.inel.gov/environment/demolition/home.htm>]. March 4, 1998.
168. United States Department of Energy, Idaho Operations Office. CFA Projects: CFA STP Project Details. [<http://www.inel.gov/environment/demolition/cfastp/cfastpdet.htm>]. June 3, 1998.
169. Langlois, Mark. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Aaron Moore. February 14, 2000.

170. Gurney, L. and Haight, Robert F. Health and Safety Plan for the WAG 4 Miscellaneous Sites 1997 Non-Time-Critical Removal Action (CFA-08, -13, -15, -17, -47, and -42). INEL/EXT-97-00474. Idaho Falls, Idaho. May 1997.
171. United States Department of Energy, Idaho Operations Office. ARA Projects: ARA-III Project Brief. [<http://www.inel.gov/environment/demolition/ara/ara3.htm>]. April 15, 1999.
172. Turnage, J. Summary Report of Decommissioning and Decontamination of Central Liquid Processing Area and Hot Tasks Rooms, Argonne National Laboratory - West. September 1998.
173. United States Department of Energy, Office of Science and Technology. Subsurface Contaminants Focus Area Technology Summary. DOE/EM-0296. Oak Ridge, Tennessee. August 1996.
174. United States Department of Energy, Office of Science and Technology. Decontamination and Decommissioning Focus Area Technology Summary. DOE/EM-0300. Oak Ridge, Tennessee. August 1996.
175. United States Department of Energy, Office of Science and Technology. Mixed Waste Characterization, Treatment and Disposal Focus Area Technology Summary. DOE/EM-0293. Oak Ridge, Tennessee. August 1996.
176. United States Department of Energy, Office of Science and Technology. Radioactive Tank Waste Remediation Focus Area Technology Summary. DOE/EM-0295. Oak Ridge, Tennessee. August 1996.
177. United States Department of Energy, Office of Science and Technology. Characterization, Monitoring and Sensor Technology Crosscutting Program Technology Summary. DOE/EM-0298. Oak Ridge, Tennessee. August 1996.
178. United States Department of Energy, Office of Science and Technology. Plutonium Focus Area Technology Summary. DOE/EM-0297. Oak Ridge, Tennessee. August 1996.
179. United States Department of Energy, Office of Science and Technology. Robotics Crosscutting Program Technology Summary. DOE/EM-0299. Oak Ridge, Tennessee. August 1996.

180. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Excel Modular Scaffold.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=25].
February 10, 1999.
181. Bartlett, Inc. Excel Modular Scaffolding Product Information.
[<http://www.excelscaffold.com/page3.html>]. July 26, 1999.
182. United States Department of Energy, Idaho Operations Office. Excel Modular Scaffold Leasing Corporation Benefit Analysis.
[<http://techcatalog.inel.gov/documents/excel/excel2.pdf>]. July 26, 1999.
183. United States Department of Energy, Idaho Operations Office. Excel Scaffolding Deployment. [<http://techcatalog.inel.gov/documents/excel/ASTDFactSheet.pdf>].
July 29, 1999.
184. Williams, James. Idaho National Engineering & Environmental Laboratory.
Private e-mail message to Steve Davisson. October 4, 1999.
185. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Improved HEPA Filter for Flexible and Rigid Containment Barriers.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=10]. July 27, 1999.
186. United States Department of Energy, Idaho Operations Office. Improved HEPA Filter for Flexible and Rigid Containment Barriers, Technical Presentation.
[<http://techcatalog.inel.gov/documents/vent/hepa.pdf>]. July 27, 1999.
187. Pinson, Paul. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 28, 1999.
188. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: In Situ Beta Detector.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=38].
February 10, 1999.
189. United States Department of Energy, Idaho Operations Office. In Situ Beta Detector Overview. [http://wylie.inel.gov/tech_transfer/documents/beta/beta3.pdf].
February 10, 1999.
190. Giles, John. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 27, 1999.

191. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: In Situ Stabilization (Grouting). [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=26]. February 10, 1999.
192. United States Department of Energy, Idaho Operations Office. Grout-trapped Contaminants No Longer Free to Roam. [http://wylie.inel.gov/tech_transfer/documents/InSituStab/article.pdf]. February 10, 1999.
193. United States Department of Energy, Idaho Operations Office. In Situ Stabilization Fact Sheet. [http://wylie.inel.gov/tech_transfer/documents/InSituStab/insitustab.html]. February 10, 1999.
194. Jorgensen, Doug. Lockheed Martin Idaho Technologies Company. Telephone Conversation. Steve Davisson. September 30, 1999.
195. Jessmore, James. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. October 4, 1999.
196. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Light Duty Utility Arm (LDUA). [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=69]. February 10, 1999.
197. United States Department of Energy, Idaho Operations Office. Light Duty Utility Arm (LDUA), TFA-Tanks Focus Area Technology Description. [http://wylie.inel.gov/tech_transfer/documents/TEB/Ldua/html/ldua.html]. February 10, 1999.
198. United States Department of Energy, Idaho Operations Office. Light-Duty Utility Arm System. [http://techcatalog.inel.gov/documents/TEB/LDUA_Systems/html/ldua2.htm]. December 2, 1999.
199. United States Department of Energy, Idaho Operations Office. INEEL Light Duty Utility Arm System. [http://techcatalog.inel.gov/documents/teb/LDUA_Systems/99Deploy-LDUA.pdf]. December 1, 1999.
200. Christensen, Cal. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. October 4, 1999.

201. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Maverick (Petroleum Tank Inspection Device). [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=59]. February 10, 1999.
202. Walsh, John. Robotics Spin-off Tests Entrepreneurial Policy. [http://wylie.inel.gov/tech_transfer/documents/teb/maverickstarmar2597ext.pdf]. November 19, 1998.
203. United States Department of Energy, Idaho Operations Office. Solex Robotics Systems Opens New Facility. [http://www.inel.gov/whats_new/press_releases/1997/prsolix2.html]. February 10, 1999.
204. Solex Robotics, Inc. Solex Robotics, Maverick Demonstration. [http://www.solexrobotics.com/page6.html]. January 15, 1999.
205. Zollinger, Thor. Solex Robotics, Inc. Telephone Conversation. Steve Davisson. September 30, 1999.
206. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: TRUEX/SREX. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=70]. February 22, 1999.
207. United States Department of Energy, Idaho Operations Office. TFA-Cesium, Strontium, and Transuranic Removal from Acidic Tank Waste. [http://wylie.inel.gov/tech_transfer/documents/teb/truex_srex/html/acidic.html]. February 22, 1999.
208. Todd, Terry. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. October 4, 1999.
209. Lockheed Martin Idaho Technologies Company. SWEPP Passive/Active Neutron Drum Assay System. Idaho Falls, Idaho. October 28, 1998.
210. Lockheed Martin Idaho Technologies Company. SWEPP Gamma Ray Spectrometer System. Idaho Falls, Idaho. August 19, 1997.

211. Lockheed Martin Idaho Technologies Company. Real Time Radioscopic (RTR) System. Idaho Falls, Idaho. September 17, 1997.
212. Lockheed Martin Idaho Technologies Company. Drum Vent System. Idaho Falls, Idaho. August 27, 1998.
213. Associated Press. National Conference to Highlight OSHA's Future, Nation's Safest Worksites. [<http://www.vpppa.org>]. August 23, 1999.
214. United States Department of Energy, Idaho Operations Office. ID's Agreements & Commitments. [<http://www.id.doe.gov/doeid/commitme.htm>]. August 27, 1999.
215. State of Idaho, Division of Environmental Quality. Hazardous Waste Management in Idaho 1998. [http://www2.state.id.us/deq/haz/HazWaste_98.pdf]. August 27, 1999.
216. Menkhous, Daniel. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. October 19, 1999.
217. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Gamma Spectroscopy Logging System. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=9]. February 10, 1999.
218. United States Department of Energy, Idaho Operations Office. In-Situ Radionuclide Measurements. [http://wylie.inel.gov/tech_transfer/documents/gamma/gamma2.pdf]. February 10, 1999.
219. United States Department of Energy, Idaho Operations Office. High-Resolution Gamma Spectroscopy Logging System. [http://wylie.inel.gov/tech_transfer/documents/gamma/gamma.pdf]. February 10, 1999.
220. United States Department of Energy, Idaho Operations Office. FY 1998 Technology Deployment in Environmental Management, Solution of the Future at the INEEL. [http://wylie.inel.gov/tech_transfer/documents/gamma/gamma4.pdf]. February 10, 1999.

221. United States Department of Energy, Idaho Operations Office. IRAS In Situ Radionuclide Assay System.
[<http://techcatalog.inel.gov/documents/gamma/gamma3.pdf>]. September 7, 1999.
222. United States Department of Energy, Idaho Operations Office. PHOTO Images: Lowering the Gamma Spectroscopy Logging System and Fully Equipped Mobile System.
[http://ar.inel.gov/ar/owa/getimage_2?F_PAGE=1&F_DOC=5860&F_REV=00]. September 7, 1999.
223. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Personal Ice Cooling System (PICS) Coolsuit.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=37]. February 10, 1999.
224. United States Department of Energy, Idaho Operations Office. Preferring Innovative Proven Technologies Over Currently Used Baseline Methods Through Erie Integrated Decontamination and Decommissioning Project.
[http://wylie.inel.gov/tech_transfer/documents/Pics?PICSabstract.pdf]. February 10, 1999.
225. United States Department of Energy, Fernald LSTD Program. Personal Ice Cooling System (PICS), Fact Sheet.
[<http://www.fernald.gov/Technology%20Programs/lstd/ice.htm>]. February 10, 1999.
226. United States Department of Energy, Idaho Operations Office. Personal Ice Cooling System Deployment.
[<http://techcatalog.inel.gov/documents/Pics/Picsfactsheet.pdf>]. September 2, 1999.
227. Prochaska, Marty. Fernald Environmental Management Project. Telephone Conversation. Steve Davisson. September 28, 1999.
228. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Internal Duct Characterization System.
[<http://techcatalog.inel.gov/searchreportresults.asp?id=110>]. December 1, 1999.
229. United States Department of Energy, Idaho Operations Office. IDCS.
[http://techcatalog.inel.gov/documents/teb/Internal_Duct_Characterization_System/html/idcs2.htm]. December 1, 1999.

230. United States Department of Energy, Idaho Operations Office. Internal Duct Characterization System.
[http://techcatalog.inel.gov/documents/teb/Internal_Duct_Characterization_System/IDCS_FS.pdf]. December 1, 1999.
231. United States Department of Energy, Idaho Operations Office. Internal Duct Characterization System.
[http://techcatalog.inel.gov/documents/teb/Internal_Duct_Characterization_System/idcs_rbcs_rb3-5.pdf]. August 1996.
232. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Utilivac Vacuum Excavation System.
[<http://techcatalog.inel.gov/searchreportresults.asp?id=72>]. November 30, 1999.
233. United States Department of Energy, Idaho Operations Office. Utilivac Vacuum Excavation System.
[<http://techcatalog.inel.gov/documents/Utilivac/99Deploy-Utilivac.pdf>]. November 30, 1999.
234. Swisher, Eric. Faster, Safer, Cheaper New Excavation Technology Being Used at the INEEL. [<http://techcatalog.inel.gov/documents/Utilivac/Html/Utilivac.htm>]. December 1, 1999.
235. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Crossflow Filtration.
[<http://techcatalog.inel.gov/searchreportresults.asp?id=127>]. November 30, 1999.
236. United States Department of Energy, Idaho Operations Office. Crossflow Filtration Technology Summary. DOE/EM-0370.
[http://techcatalog.inel.gov/documents/teb/crossflow_filtration/cfloitsr.pdf]. December 1, 1999.
237. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Reduced Access Characterization System.
[<http://techcatalog.inel.gov/searchreportresults.asp?id=113>]. December 1, 1999.
238. United States Department of Energy, Idaho Operations Office. Reduced Access Characterization Subsystem.
[http://techcatalog.inel.gov/documents/teb/Reduced_Access_Characterization_Subsystem/RACS_FS.pdf]. December 1, 1999.

239. United States Department of Energy, Idaho Operations Office. Reduced Access Characterization Subsystem.
[http://techcatalog.inel.gov/documents/teb/Reduced_Access_Characterization_Subsystem/racs_rb3-6.pdf]. August 1996.
240. United States Department of Energy, Idaho Operations Office. Reduced Access Characterization Subsystem (RACS).
[http://techcatalog.inel.gov/documents/teb/Reduced_Access_Characterization_Subsystem/html/RACS.html]. December 1, 1999.
241. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Biodecontamination of Concrete.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=73]. February 9, 1999.
242. United States Department of Energy, Idaho Operations Office. Biodecontamination: A Technology for Biologically Removing Radionuclide Contaminated Concrete Surfaces. [http://wylie.inel.gov/tech_transfer/documents/biodecon/biodecon.pdf]. February 9, 1999.
243. United States Department of Energy, Idaho Operations Office. INEEL Biodecontamination of Concrete Summary Slides.
[http://wylie.inel.gov/tech_transfer/documents/biodecon/biodeconposter.pdf]. February 9, 1999.
244. United States Department of Energy, Idaho Operations Office. Biodecontamination: A Technology for Biologically Removing Radionuclide Contaminated Concrete Surfaces. [<http://techcatalog.inel.gov/documents/biodecon/biodecon.pdf>]. December 1, 1999.
245. Hamilton, Melinda. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. October 8, 1999.
246. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Advanced Tensiometer.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=50]. February 9, 1999.

247. In-Situ, Inc. Advanced Tensiometers.
[<http://www.in-situ.com/New98/products/ProductPages/AT.htm>].
February 9, 1999.
248. United States Department of Energy, Idaho Operations Office. Analog Site for Fractured Rock Characterization. [<http://www-esd.lbl.gov/ERT/inel/inel.html>].
February 9, 1999.
249. Sinclair, Mark. Commercialized Technologies Trace Underground Contaminants.
[<http://www.inel.gov/resources/newsletters/star/1997/05-06-97/19970505star2.html>]. May 6, 1997.
250. United States Department of Energy, Environmental Management Office. Tensiometer for Understanding Vadose Zone Processes.
[<http://www.em.doe.gov/llw/atweb.html>]. November 24, 1998.
251. Sisson, James. Lockheed Martin Idaho Technologies Company. Telephone Conversation. Steve Davisson. September 27, 1999.
252. Hubbell, Joel. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. October 4, 1999.
253. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Planar In Situ Vitrification (ISV).
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=34].
February 10, 1999.
254. United States Department of Energy, Idaho Operations Office. GeoMelt Fact Sheet, System Description.
[http://wylie.inel.gov/tech_transfer/documents/PlanarISV/isvfctshntf.htm].
February 10, 1999.
255. GeoSafe Corporation. Introducing Geosafe Corporation.
[<http://www.geomelt.com/geointro.htm>]. January 22, 1999.
256. Farnsworth, Richard. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. October 7, 1999.

257. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Lead Brick Volumetric Radioassay.
[<http://techcatalog.inel.gov/searchreportresults.asp?id=139>]. November 30, 1999.
258. United States Department of Energy. Phytoremediation.
[http://www.frtr.gov/matrix2/section4/4_5.html]. February 26, 1999.
259. Lee, Scott. Argonne National Laboratory - West. Telephone Conversation. Steve Davisson. September 29, 1999.
260. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Dig Face Trolley.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=43]. February 10, 1999.
261. United States Department of Energy, Idaho Operations Office. Dig Face Characterization.
http://wylie.inel.gov/tech_transfer/documents/teb/dig_face_trolley/dig_face_tech_card.pdf. November 19, 1998.
262. United States Department of Energy, Idaho Operations Office. Safe Cleanups Concern DOE.
[http://wylie.inel.gov/tech_transfer/documents/teb/dig_face_trolley/dig_face_characterization_wpi.pdf]. November 19, 1998.
263. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Warthog.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=44]. February 22, 1999.
264. United States Department of Energy, Idaho Operations Office. Dig-face Characterization Assumes Warthog Identity. [<http://www.wpi.org/initiatives/init/feb97/update.htm>]. February 22, 1999.
265. Carpenter, Micheal. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. September 28, 1999.
266. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: In Situ Sampler.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=36]. February 10, 1999.
267. United States Department of Energy, Idaho Operations Office. In Situ Sampler.
[<http://techcatalog.inel.gov/documents/sampler/sam4.pdf>]. February 10, 1999.

268. Simpson, Erik. Sampling Device Gives Researchers Better View of Groundwater Contamination. [<http://204.134.132.62/documents/sampler/html/starsamp.htm>]. July 27, 1999.
269. Dooley, Kirk. Idaho National Engineering & Environmental Laboratory. Telephone Conversation. Steve Davisson. October 5, 1999.
270. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Combination Well (Inside-Out Well). [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=56]. February 10, 1999.
271. Hubbell, Joel. "Inside-Out" Well for Simultaneous Soil Vapor and Ground Water Sampling. [http://wylie.inel.gov/tech_transfer/documents/teb/combination_well/combination_well-EPA_tech_trends.pdf]. October 1998.
272. United States Department of Energy, Idaho Operations Office. "Inside-Out" Well Developed to Sample Water and Vapor In Aquifer. [http://wylie.inel.gov/tech_transfer/documents/teb/combination_well/combination_well-DOE_news.pdf]. April 7, 1998.
273. United States Department of Energy, Idaho Operations Office. INEEL Technology Transfer-Description, Status, Contact for Inside-Out Well. [http://wylie.inel.gov/tech_transfer/documents/teb/combination_well/combination_well_tto.pdf]. September 7, 1999.
274. United States Department of Energy, Office of Environmental Management. "Inside-Out" Well Simultaneously Samples Groundwater and Soil Vapor at Waste Disposal Sites. [<http://online.awma.org/em/june/wstmgmt.htm>]. November 23, 1998.
275. Hubbell, Joel. Idaho National Engineering & Environmental Laboratory. Telephone Conversation. Steve Davisson. August 2, 1999.
276. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Enhanced In Situ Bioremediation. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=68]. February 10, 1999.

277. Tucker, Linda. Scientists Study Use of Bacteria to Clean Up Groundwater Contamination. [http://wylie.inel.gov/tech_transfer/documents/teb/enhanced_in_situ-bioremediation_19971202Star.htm]. December 2, 1997.
278. Howze, John. Test at TAN-Bioremediation of Groundwater Plume Shows Promise. [http://techcatalog.inel.gov/docume...emediation/html/bioremediation.htm]. September 7, 1999.
279. United States Department of Energy, Idaho Operations Office. EPA CLU-IN Fact Sheet: Demonstration Sites-INEEL Environmental Remediation Technology. [http://techcatalog.inel.gov/documeà_situ_bioremediation/html/inel.htm]. September 7, 1999.
280. United States Department of Energy, Idaho Operations Office. Technologies-Fact Sheet for Bioremediation Consortium: Remedial Technologies Development Forum (RTDF). [http://techcatalog.inel.gov/docume..._situ_bioremediation/html/rtdf.htm]. September 7, 1999.
281. Sorenson, Kent. Idaho National Engineering & Environmental Laboratory. Private e-mail message to Steve Davisson. September 22, 1999.
282. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Rapid Geophysical Surveyor. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=42]. February 10, 1999.
283. United States Department of Energy, Idaho Operations Office. Rapid Geophysical Surveyor (RGS). [http://wylie.inel.gov/tech_transfer/documents/Teb/rapid_geophysical_surveyor/rgs_tech_card.pdf]. February 10, 1999.
284. United States Department of Energy, Idaho Operations Office. DOE Sensing Technology Use at Little Bighorn. [http://wylie.inel.gov/tech_transfer/documents/Teb/rapid_geophysical_surveyor/rgs_at_little_bighorn.pdf]. February 10, 1999.
285. United States Department of Energy, Idaho Operations Office. Rapid Geophysical Surveyor Spin-Off Company--Sage Earth Science. [http://wylie.inel.gov/tech_transfer/documents/tb/rapid_geophysical_surveyor/rgs_sage_spinoff.pdf]. November 19, 1998.

286. Sage Earth Sciences. Sage Earth Science, Environmental and Engineering Geophysical Services. [<http://www.srv.net/~ses/SES.HTM>]. September 7, 1999.
287. Blackmore, Carolyn. Lockheed Martin Idaho Technologies Company. Telephone Conversation. Steve Davisson. September 28, 1999.
288. United States Department of Energy, Office of Science and Technology. Gate System Sorts Out "Clean" Dirt. [<http://www.wpi.org/initiatives/init/summer98/gatesys.htm>]. February 26, 1999.
289. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Segmented Gate System. [<http://techcatalog.inel.gov/searchreportresults.asp?id=144>]. December 7, 1999.
290. United States Department of Energy, Idaho Operations Office. Segmented Gate System Technology Description. [http://techcatalog.inel.gov/documents/SegGate/Tech_descrip.pdf]. December 7, 1999.
291. United States Department of Energy, Idaho Operations Office. Segmented Gate System Technology Deployment. [<http://techcatalog.inel.gov/documents/SegGate/SGSsuccess998.pdf>]. December 7, 1999.
292. Kimbrall, Joseph. ThermoRetechn Nuclear Services Group. Private e-mail message to Steve Davisson. September 29, 1999.
293. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Cooperative Telerobotic Retrieval. [<http://techcatalog.inel.gov/searchreportresults.asp?id=115>]. December 1, 1999.
294. United States Department of Energy, Idaho Operations Office. Cooperative Telerobotic Retrieval (CTR). [http://techcatalog.inel.gov/documents/teb/Cooperative_Telerobotic_Retrieval/html/ctr.html]. December 1, 1999.
295. United States Department of Energy, Idaho Operations Office. Cooperative Telerobotic Retrieval. [http://techcatalog.inel.gov/documents/teb/Cooperative_Telerobotic_Retrieval/ctr_scfa_rb5-6.pdf]. December 1, 1999.
296. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog: Bioremediation of Explosive Contaminated Soils. [<http://techcatalog.inel.gov/searchreportresults.asp?id=40>]. December 21, 1999.

297. Simpson, Erik. INEEL Tests Composting Process to Remediate TNT-Contaminated Soils. [<http://techcatalog.inel.gov/documents/ExplSoil/html/composting.htm>]. December 21, 1999.
298. United States Department of Energy, Idaho Operations Office. Bioremediation of Explosives. [<http://techcatalog.inel.gov/documents/ExplSoil/Fact.PDF>]. December 21, 1999.
299. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Remote Underwater Characterization System (RUCS). [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=39]. February 10, 1999.
300. United States Department of Energy, Idaho Operations Office. Remote Underwater Characterization System (RUCS). [<http://techcatalog.inel.gov/documents/Rucs/TkCpDfPv.htm>]. February 10, 1999.
301. United States Department of Energy, Idaho Operations Office. Remote Underwater Characterization System (RUCS). [http://wylie.inel.gov/tech_transfer/documents/Rucs/TkCpSsPv.htm]. February 10, 1999.
302. United States Department of Energy, Idaho Operations Office. Remote Underwater Characterization System (RUCS). [http://wylie.inel.gov/tech_transfer/documents/Rucs/Rucs.pdf]. February 10, 1999.
303. Willis, Walter "Dave". Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 23, 1999.
304. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Soft Sided Container. [http://wylie.inel.gov/tech_transfer/documents/Rucs/Rucs.pdf]. February 22, 1999.
305. United States Department of Energy, Idaho Operations Office. Soft-Sided Waste Packaging System. [http://wylie.inel.gov/tech_transfer/documents/Bag/sheet.pdf]. February 22, 1999.
306. United States Department of Energy, Idaho Operations Office. Organizations Cooperate in Using Soft-sided Containers to Remediate Soil, Debris. [<http://www.inel.gov/environment/stcg/archive/soft-side.html>]. September 8, 1999.

307. United States Department of Energy, Idaho Operations Office. Soft-Sided Containers Deployment. [<http://techcatalog.inel.gov/documents/bag/Factsheet.pdf>]. July 29, 1999.
308. Thiel, Tom. Idaho National Engineering & Environmental Laboratory. Telephone Conversation. Steve Davisson. October 4, 1999.
309. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Pipe Explorer. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=67]. February 10, 1999.
310. United States Department of Energy, Idaho Operations Office. Pipe Explorer Uses. [http://wylie.inel.gov/tech_transfer/documents/teb/pipe_explorer/pipe_explorer_vendor_desc.pdf]. February 10, 1999.
311. United States Department of Energy, Idaho Operations Office. Characterization of Radioactive Contamination Inside Pipes With The Pipe Explorer System. [http://wylie.inel.gov/tech_transfer/documents/teb/pipe_explorer/html/2_2.html]. February 10, 1999.
312. United States Department of Energy, Idaho Operations Office. Pipe Explorer Squeezes Into Tight Spots. [http://techcatalog.inel.gov/documents/teb/pipe_explorer/html/pipe.html]. February 1996.
313. Federal Energy Technology Center. Characterization of Radioactive Contamination Inside Pipes with the Pipe Explorer System. [http://techcatalog.inel.gov/documents/teb/pipe_explorer/pipe_explorer_fetc_fs.pdf]. September 1998.
314. Winston, Philip. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 23, 1999.
315. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Bulk Concrete Waste Disposal System. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=63]. February 10, 1999.

316. United States Department of Energy, Idaho Operations Office. Bulk Concrete Waste Disposal System.
[http://wylie.inel.gov/tech_transfer/documents/Bulk_Concrete/deploy98.pdf].
February 10, 1999.
317. United States Department of Energy, Idaho Operations Office. Bulk Concrete Waste Disposal System, Technology Opportunity Fact Sheet.
[http://techcatalog.inel.gov/documents/Bulk_Concrete/Sheet.pdf].
February 10, 1999.
318. United States Department of Energy, Idaho Operations Office. ALARA News Article: Bulk Concrete Waste Disposal System.
[http://techcatalog.inel.gov/documents/Bulk_Concrete/News.pdf].
February 10, 1999.
319. Meservey, Richard. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. October 4, 1999.
320. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Dual Arm Work Platform (DAWP).
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=24].
February 10, 1999.
321. United States Department of Energy, Idaho Operations Office. Dual Arm Work Platform.
[<http://techcatalog.inel.gov/documents/teb/dawp/deploy.pdf>]. February 10, 1999.
322. United States Department of Energy, Idaho Operations Office. Dual-Arm Work Platform.
[http://wylie.inel.gov/tech_transfer/documents/teb/dawp/dawp_wpi_fs.pdf].
December 3, 1998.
323. United States Department of Energy, Idaho Operations Office. Dual-Arm Work Platform.
[http://wylie.inel.gov/tech_transfer/documents/teb/dawp/DAWP.html].
February 10, 1999.
324. Willis, Walter. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 27, 1999.
325. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Oxy-Gasoline Torch.
[http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=33].
February 10, 1999.

326. United States Department of Energy, Idaho Operations Office. FY 1998 Technology Deployment in Environmental Management: Solution of the Future at the INEEL. [<http://techcatalog.inel.gov/documents/torch/deploy.pdf>]. February 10, 1999.
327. United States Department of Energy, Idaho Operations Office. Oxy-Gasoline Torch Description. [<http://wylie.inel.gov/documents/Torch/TorchDesc.pdf>]. February 10, 1999.
328. United States Department of Energy, Idaho Operations Office. The Oxy-Gasoline Cutting Torch: A Fernald Plant 1 Large Scale Technology (LSTD) Demonstration Triumph. [http://www.petrogen.com/X-Change'97_Highlights.html]. February 23, 1999.
329. United States Department of Energy, Idaho Operations Office. Oxy-Gasoline Torch Deployment. [<http://techcatalog.inel.gov/documents/Torch/OxyGas1.pdf>]. September 2, 1999.
330. Merservey, Richard. Lockheed Martin Idaho Technologies Company. Private e-mail message to Steve Davisson. September 29, 1999.
331. United States Department of Energy, Idaho Operations Office. INEEL STCG Technology Catalog Report: Brokk Demolition Robot. [http://wylie.inel.gov/tech_transfer/searchreportresults.asp?id=42]. February 10, 1999.
332. United States Department of Energy, Idaho Operations Office. Preferring Innovative, Proven Technologies Over Currently Used Baseline Methods Through Erie Integrated Decontamination and Decommissioning Project. [<http://techcatalog.inel.gov/documents/brokk/astd2.pdf>]. February 10, 1999.
333. United States Department of Energy, Idaho Operations Office. Technology Demonstration Summary Sheet: Remote Controlled Concrete Demolition System. [<http://techcatalog.inel.gov/documents/BROKK/BrokkFactSheet.PDF>]. February 10, 1999.
334. Foster, Leslie. Brokk Performs Smashingly. [wysiwg://95/http://www.inel.gov/eàment/stcg/spotlight/spotlight.html]. August 6, 1999.
335. United States Department of Energy, Idaho Operations Office. BROKK BM 250 Deployment. [<http://techcatalog.inel.gov/documents/BROKK/BrokkFactSheet.pdf>]. September 2, 1999.

336. Bossart, Steven. Federal Energy Technology Center. Private e-mail message to Steve Davisson. September 23, 1999.
337. Lockheed Martin Idaho Technologies Company. Work Discipline Code Dictionary, Nonexempt Technician Disciplines. Idaho Falls, Idaho. March 22, 1999.
338. Argonne National Laboratory. Position Description: Reactor Operator Sr-CS. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
339. Argonne National Laboratory. Position Description: Engineering Technician Sr. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
340. Argonne National Laboratory. Position Description: Yard and Mobile Equipment Supervisor. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
341. Argonne National Laboratory. Position Description: Maintenance Mechanic (Yardman). [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
342. Argonne National Laboratory. Position Description: Chief Technician I. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
343. Argonne National Laboratory. Position Description: Health Physics Technician III. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
344. Argonne National Laboratory. Position Description: Health Physics Technician IV. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.
345. Argonne National Laboratory. Position Description: Health Physics Technician Sr. [<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>]. March 11, 1999.

346. Argonne National Laboratory. Position Description: Engineering Technician II.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
347. Argonne National Laboratory. Position Description: Equipment Operator (Reports to Materials Services Supervisor).
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
348. Argonne National Laboratory. Position Description: Equipment Operator (Reports to Warehouse Supervisor).
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
349. Argonne National Laboratory. Position Description: Material Handler.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
350. Argonne National Laboratory. Position Description: Instrument & Control Technician III.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
351. Argonne National Laboratory. Position Description: Instrument & Control Sr.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
352. Argonne National Laboratory. Position Description: Engineering Technician Sr.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
353. Argonne National Laboratory. Position Description: Chief Technician II-CS.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.

354. Argonne National Laboratory. Position Description: Nuclear Facility Operator II.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
355. Argonne National Laboratory. Position Description: Nuclear Facility Operator III.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
356. Argonne National Laboratory. Position Description: Nuclear Facility Operator IV.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
357. Argonne National Laboratory. Position Description: Nuclear Facility Operator Senior.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
358. Argonne National Laboratory. Position Description: Operations Specialist.
[<http://www.hr.anl.gov/positions/positions/newsource/summary.asp>].
March 11, 1999.
359. Lockheed Martin Idaho Technologies Company. 1999 LMITCO Salary Grade Structure, Parent Job Family Structures, Non-exempt. Idaho Falls, Idaho. March 22, 1999.
360. United States Department of Energy, Idaho Operations Office. INEEL EM Technology Catalog. [<http://techcatalog.inel.gov/catalogList.asp?r=stcg>]. December 20, 1999.
361. United States Department of Energy, Idaho Operations Office. Technology List (INEEL).
[<http://ost.em.doe.gov/tms/Find/TkFiLi.asp?Context=Kw&uSPID=&uAction=New>]. December 20, 1999.
362. United States Department of Energy, Idaho Operations Office. Technology List (Idaho).
[<http://ost.em.doe.gov/tms/Find/TkFiLi.asp?Context=Kw&uSPID=&uAction=New>]. December 20, 1999.

363. Lee, S.D., Rohe, M.J., Rood, A.S., Stepan, I.E. Comprehensive Remedial Investigation/Feasibility Study for Argonne National Laboratory-West Operable Unit 9-04 at the Idaho National Engineering and Environmental Laboratory (FINAL) - Volume 1 Idaho Falls, ID. December 1997.
364. United States Environmental Protection Agency Record of Decision (ROD) Abstracts. [<http://www.epa.gov/superfund/sites/rodsites/1000305.htm>]. July 28, 1999.
365. Saint-Louis, M.L. Initial Assessment - IET-05 Foam Stabilization Tank TAN-317 2617. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 23, 1986.
366. Saint-Louis, M.L. Initial Assessment - IET-06 Injection Well 2618. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 25, 1986.
367. Alexander, T.G. Initial Assessment - Loft-03 Rubble Pit South of Loft Disposal Pond 2237. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. January 12, 1988.
368. Saint-Louis, M.L. Initial Assessment - Loft-07 Foam Solution Tank 2756. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 23, 1986.
369. Saint-Louis, M.L. Initial Assessment - Loft 11 Cryogen Pits 3 East of TAN-629 2760. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 24, 1986.
370. Saint-Louis, M.L. Initial Assessment - TSF-01 Diesel Tank & Spill West of TAN-607 2704. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 24, 1986.
371. Saint-Louis, M.L. Initial Assessment - TSF-04 Gravel Pit - Acid Pit 2707. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. August 1, 1986.
372. Saint-Louis, M.L. Initial Assessment - TSF-11 Three Clarifier Pits East of TAN-604 2732. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 24, 1986.
373. United States Department of Energy, Idaho Operations Office. Track 1 - TSF-42, TAN-607A Room 161, Contaminated Pipe - Recommended for OU 1-01 RI/FS - Decision Documentation Package 5563. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 24, 1993.
374. United States Department of Energy, Idaho Operations Office Track 1 for the Radioactive Parts Security Storage Area (RPSSA) Pads - Determination to be Made in WAG Wide RI/FS 5681 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. April 13, 1994.

375. United States Department of Energy, Idaho Operations. Office Track 1 - No Further Action Determination for the Transite (Asbestos) Contamination - Decision Documentation Package 5556.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 24, 1993.
376. United States Department of Energy, Idaho Operations Office Track 1 - No Further Action Determination for the Loft Buried Asbestos Pit - Decision Documentation Package 5558. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. September 21, 1993.
377. United States Department of Energy, Idaho Operations Office. Track 1, No Further Action Determination for the Loft Asbestos Piping - Decision Documentation Package 5286. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-01]. May 21, 1993.
378. Saint-Louis, M.L. Initial Assessment - Loft-08 Tank in Borrow Pits TAN-110 2757.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
379. Saint-Louis, M.L. Initial Assessment - Loft-06 Slop Tanks East of TAN-621 2755.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
380. Saint-Louis, M.L. Initial Assessment - Loft-05 Fuel Tanks 2 TAN-109 A & B 2754.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
381. Saint-Louis, M.L. Initial Assessment - TSF-13 Gasoline Tank North of TAN-610 2730.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
382. Saint-Louis, M.L. Initial Assessment - TSF-14 Fuel Oil Tank Northwest of TAN-603 2729. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
383. Saint-Louis, M.L. Initial Assessment - TSF-33 T-11 Fuel Tank East of TAN-602 2703.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
384. Saint-Louis, M.L. Initial Assessment - TSF-32 Oil Tank TAN-775 South of TAN-601 Between Gatehouse & Substation 2702.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
385. Saint-Louis, M.L. Initial Assessment - TSF-15 Fuel Oil Tank TAN-777 West of TAN-603 2728. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 24, 1986.

386. Saint-Louis, M.L. Initial Assessment - TSF-25 Fuel Tank Corner of TAN-607 2695.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 24, 1986.
387. Saint-Louis, M.L. Initial Assessment - TSF-24 Oil Sump TAN-609 2694.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 24, 1986.
388. Saint-Louis, M.L. Initial Assessment - WRRTF-10 Gasoline Tank TAN-644 2632.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
389. Saint-Louis, M.L. Initial Assessment - WRRTF-09 Diesel Fuel Tank TAN-103 2631.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
390. Saint-Louis, M.L. Initial Assessment - IET-01 Gasoline Storage Tank TAN-318 2614.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
391. Saint-Louis, M.L. Initial Assessment - IET-09 Lube Oil Tank TAN-316 2613.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 23, 1986.
392. United States Department of Energy, Idaho Operations Office Track 1 - No Further Action Determination for the IET Heating Oil Underground Storage Tank (UST) 5561. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 24, 1993.
393. United States Department of Energy, Idaho Operations Office Track 1 - No Further Action Determination for IET Diesel Fuel Underground Storage Tank (UST) - Decision Documentation Package 5560.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 21, 1993.
394. United States Department of Energy, Idaho Operations Office Track 1 - No Further Action for the WRRTF Fuel Underground Storage Tank (UST) TAN-1706 - Decision Documentation Package 5555.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-02]. September 20, 1993.
395. Meyer, T. J. Summary Report for TSF-38 Bottle Site Removal Action INEL-95/0195.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-03]. April 1, 1995.
396. Saint-Louis, M.L. Initial Assessment - TSF-03 Burn Pit 2706.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-03]. September 24, 1986.
397. Saint-Louis, M.L. Initial Assessment - TSF-02 Service Station Spill TAN-664 2705.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-03]. September 24, 1986.

398. Saint-Louis, M.L. Initial Assessment - WRRTF-01 Burn Pit 2623.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-03]. September 24, 1986.
399. Saint-Louis, M.L. Initial Assessment - TSF-12 Acid Neutralization Tanks North End of TAN-602 2731. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04].
September 23, 1986.
400. Saint-Louis, M.L. Initial Assessment - TSF-17 Two Neutralization Pits North of TAN-649 2688. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04]
September 23, 1986.
401. Saint-Louis, M.L. Initial Assessment - TSF-31 Acid Pit West of TAN-647 2701.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04]. September 24, 1986.
402. Saint-Louis, M.L. Initial Assessment - TSF-20 Two Neutralization Pits North of TAN-607 2691. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04].
September 24, 1986.
403. Saint-Louis, M.L. Initial Assessment - TSF-19 Caustics Tank V-4 South of TAN-616. 2690. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04]. September 24,
1986.
404. Saint-Louis, M.L. Initial Assessment - Loft-02 Disposal Pond TAN-750 2748.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04]. September 25, 1986.
405. Saint-Louis, M.L. Initial Assessment - TSF-29 Acid Pond (TAN-735) 2699.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-04]. October 9, 1986.
406. Saint-Louis, M.L. Initial Assessment - TSF-06 TAN - TSF-1 Area 2709.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 23, 1986.
407. Saint-Louis, M.L. Initial Assessment - TSF-26 PM 2 Tanks TAN-710 A and B 2696.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 23, 1986.
408. Saint-Louis, M.L. Initial Assessment - WRRTF-04 Radioactive Liquid Waste Tank TAN-735 2626. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05].
September 23, 1986.
409. Saint-Louis, M.L. Initial Assessment - IET-07 Hot Waste Tank TAN-319 2621.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 23, 1986.
410. Saint-Louis, M.L. Initial Assessment - TSF-10 Drainage Pond TAN-782 2733.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 24, 1986.

411. Saint-Louis, M.L. Initial Assessment - TSF-09 Intermediate Level Waste Disposal System 2726. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 24, 1986.
412. Saint-Louis, M.L. Initial Assessment - TSF-18 Contaminated Tank South East of Tank V-3 2689. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 24, 1986.
413. Saint-Louis, M.L. Initial Assessment - IET-04 Stack Rubble Site 2616. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. September 24, 1986.
414. Alexander, T.G. Initial Assessment - TSF-21 IET Valve Pit 2236. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-05]. July 6, 1987.
415. Saint-Louis, M.L. Initial Assessment - TSF-07 Disposal Pond 2710. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-06]. September 25, 1986.
416. Saint-Louis, M.L. Initial Assessment - TSF-08 HTRE III Mercury Spill Area 2745. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-06]. September 24, 1986.
417. Saint-Louis, M.L. Initial Assessment - Loft-01 Diesel Fuel Spills at TAN-629 2749. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-06]. September 24, 1986.
418. Saint-Louis, M.L. Initial Assessment - Loft-10 Sulfuric Acid Spill TAN-771 2759. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-06]. September 24, 1986.
419. Saint-Louis, M.L. Initial Assessment - TSF-28 Sewage Treatment Plant TAN-623 2698. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-08]. September 24, 1986.
420. Saint-Louis, M.L. Initial Assessment - WRRTF-05 Injection Well TAN-331 2627. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-08]. October 8, 1986.
421. Alexander, T.G. Initial Assessment - TSF-22 Railroad Turntable 2235. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-08]. July 6, 1987.
422. Klassy, C.E. Hazard Classification for Mercury Removal Action at the TAN Mercury Spill Sites 13B & 13C EGG-ER-11315. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-08]. June 1, 1994.
423. Saint-Louis, M.L. Initial Assessment - WRRTF-03 Evaporation Pond 2625. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-09]. September 23, 1986.

424. Saint-Louis, M.L. Initial Assessment - WRRTF-06 Sewage Lagoon 2628.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-09]. September 25, 1986.
425. Saint-Louis, M.L. Initial Assessment - WRRTF-02 Phase Pond TAN-763 2624.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-09]. September 25, 1986.
426. United States Department of Energy, Idaho Operations Office Track 1 Decision Documentation Package - Continued to a Track 2, TSF-37 Contaminated Well Water Spill 5566. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-09]. September 24, 1993.
427. United States Department of Energy, Idaho Operations Office No Further Action Determination for the Track 1 Investigation of the TAN-603 French Drain 5589. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-09]. December 1, 1993.
428. Jantz, A.E. Explanation of Significant Differences (ESD) from Record of Decision (ROD) for TSF Injection Well (TSF-05) & Surrounding Groundwater Contamination (TSF-23) & Miscellaneous No Action Sites, Final Remedial ction (RA) INEEL/EXT-97-00931.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-07B]. November 1, 1997.
429. Lockheed Martin Idaho Technologies Company Preliminary Scoping Track 2 Summary Report for Operable Unit (OU) 1-08 INEL-94/0170.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1-08]. September 1, 1995.
430. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency Proposed Plan for Waste Area Group 1 - Test Area North. [http://environment.inel.gov/plan_rod/tanpp.pdf]. November 1998.
431. Alexander, T.G. Initial Assessment - IET-02 Burial Pit NE of IET 2238.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. January 12, 1988.
432. Saint-Louis, M.L. Initial Assessment - Loft-04 Injection Well 2753.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 25, 1986.
433. Saint-Louis, M.L. Initial Assessment - IET-08 Septic Tank TAN-710 & Filter Bed 2612.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.
434. Saint-Louis, M.L. Initial Assessment - WRRTF-07 Septic Tank TAN-737 & Sandfilters 2630. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.

435. Saint-Louis, M.L. Initial Assessment - TSF-30 Septic Tank East of TAN-602 2700.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.
436. Saint-Louis, M.L. Initial Assessment - TSF-16 Brine Pit North of TAN-608 2727.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.
437. Saint-Louis, M.L. Initial Assessment - Loft-09 Septic Tank & Drainfield TAN-762 2758.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.
438. Saint-Louis, M.L. Initial Assessment - Loft-13 Dry Well TAN-333 2761.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. September 24, 1986.
439. Findley, J.E. No Action Site - TSF Rubble Piles SW of WRRTF 5153.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. May 15, 1992.
440. Findley, J.E. No Action Site - TSF Scrap Yard South 5154.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. May 15, 1992.
441. Findley, J.E. No Action Site - TSF Fuel Tank 607S 5152.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=1/NA]. May 15, 1992.
442. Alexander, T.G. Initial Assessment - TRA-02 Paint Shop Ditch TRA-606 2859.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-01]. September 16, 1986.
443. Alexander, T.G. Initial Assessment - TRA-18 Inactive Gasoline Tank at TRA-619 2875.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-02]. October 3, 1986.
444. Alexander, T.G. Initial Assessment - TRA-17 Inactive Gasoline Tank at TRA-616 2873.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-02]. October 3, 1986.
445. Alexander, T.G. Initial Assessment - TRA-21 Inactive Tank, North Side of MTR-643 2857. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-02]. October 3, 1986.
446. Alexander, T.G. Initial Assessment - TRA-22 Inactive Diesel Fuel Tank at ETR-648 2856. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-02]. October 3, 1986.
447. Alexander, T.G. Initial Assessment - TRA-11 French Drain at TRA-645 2868.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-03]. October 3, 1986.
448. Alexander, T.G. Initial Assessment - TRA-12 Fuel Oil Tank Spill TRA-727B 2869.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-03]. October 3, 1986.

449. Alexander, T.G. Initial Assessment - TRA-20 Brine Tank TRA-731 at TRA-631 2879. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-03]. October 3, 1986.
450. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency Track 2 Decision Statement for OU 2-03 Track 2 Summary Report for TRA-01, TRA-11, TRA-12, TRA-20, TRA-40, & TRA-614 - No Further Action Determination 5855. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-03]. January 19, 1995.
451. Sherwood, J.A. Preliminary Scoping Track 2 Summary Report for OU 2-03 EGG-ER-10736. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-03]. August 1, 1993.
452. Alexander, T.G. Initial Assessment - TRA-09 Spills at TRA Loading Dock TRA-722 2866. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-04]. September 11, 1986.
453. Alexander, T.G. Initial Assessment - TRA-34 North Storage Area 2844. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-04]. July 8, 1987.
454. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 2-04 Track 2 Summary Report for TRA - TRA-653, TRA-626, TRA-619, PW-13, TRA-09, TRA-670, & TRA-627 - No Further Action Determination 5861. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-04]. January 19, 1995.
455. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 2-05 Track 2 Summary Report for Test Reactor Area (TRA) TRA-16, TRA-15, TRA-19, TRA-603/605 Tank - No Further Action Determination 5858 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-05]. January 19, 1995.
456. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 2-06 Track 2 Summary Report for TRA-30, TRA-31, & TRA-35 - No Further Action Determination 5856. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-06]. January 19, 1995.

457. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 2-07 Track 2 Summary Report for the ETR Cooling Tower, MTR Cooling Tower, ATR Cooling Tower, & TRA-653 - No Further Action Determination 5857 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-07]. January 19, 1995.
458. Alexander, T.G. Initial Assessment - TRA-36 ETR Cooling Tower Basin TRA-751 2254. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-07]. January 11, 1988.
459. Alexander, T.G. Initial Assessment - TRA-38 ATR Cooling Tower TRA-771 2239. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-07]. January 12, 1988.
460. Alexander, T.G. Initial Assessment - TRA-39 Cooling Tower N of TRA-607 2215. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-07]. January 12, 1988.
461. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 2-08 Track 2 Summary Report for TRA MTR Canal - No Further Action Determination 5854. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-08]. January 19, 1995.
462. Alexander, T.G. Initial Assessment - TRA-08 Cold Waste Disposal Pond TRA-702 2865. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-09]. September 12, 1986.
463. Alexander, T.G. Initial Assessment - TRA-13 Final Sewage Leach Ponds (2) by TRA-732 2870. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-09]. October 3, 1986.
464. Alexander, T.G. Initial Assessment - TRA-07 Sewage Treatment Plant TRA-732 & Sludge Pit TRA-732 2864. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-09]. October 3, 1986.
465. Alexander, T.G. Initial Assessment - TRA-05 Waste Disposal Well, Sampling Pit 764 Sump 703 2862. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-11]. September 11, 1986.
466. Alexander, T.G. Initial Assessment - TRA-04 Warm Waste Retention Basin TRA-712 2861. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-11]. September 11, 1986.

467. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. New Site Identification (NSI) - Abandoned Buried Acid Line TRA-631 to TRA-671 - Site TRA-59 10579
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-14]. March 9, 1999.
468. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. New Site Identification (NSI) - Abandoned Buried Fuel Oil Lines 10578.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-14]. March 9, 1999.
469. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. New Site Identification (NSI) - TRA Acid Transfer Line from TRA-631 to TRA-645 10576
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2-14]. March 9, 1999.
470. Alexander, T.G. Initial Assessment - TRA-10 MTR Construction Excavation Pile 2867.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
471. Alexander, T.G. Initial Assessment - TRA-23 ETR Excavation Site Rubble Pile 2855.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
472. Alexander, T.G. Initial Assessment - TRA-24 Guardhouse Construction Rubble Pile 2854. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
473. Alexander, T.G. Initial Assessment - TRA-25 Sewer Plant Settling Pond Rubble Pile 2853. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
474. Alexander, T.G. Initial Assessment - TRA-26 Rubble Site by USGS Observation Well 2852. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
475. Alexander, T.G. Initial Assessment - TRA-27 North Storage Area Rubble Pile 2851.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
476. Alexander, T.G. Initial Assessment - TRA-28 North Landfill Rubble Site 2850.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
477. Alexander, T.G. Initial Assessment - TRA-29 ATR Construction Rubble 2849.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
478. Alexander, T.G. Initial Assessment - TRA-32 West Road Rubble Pile 2846.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.

479. Alexander, T.G. Initial Assessment - TRA-33 West Staging Area - Drainage Ditch Rubble Site 2845. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=2/NA]. October 3, 1986.
480. Lapray, B.C. No Action Site - Track 1 - CPP-49 PCB Transformer Yard (CPP-705); CPP-50 (CPP-731); CPP-51 PCB Staging Area West of CPP-660; CPP-61 PCB Spill in CPP-718 Transformer Yard 5201 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-01]. January 4, 1993.
481. WINCO. Initial Assessment - CPP CFSGP Fly Ash Pit 5430. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
482. WINCO. Initial Assessment - CPP Sewage Plant Lagoons 5429. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
483. WINCO. Initial Assessment - Solid Waste Storage Bin South of CPP-601 5385. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
484. WINCO. Initial Assessment - Gas Storage Building 5382. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
485. WINCO. Initial Assessment - Contaminated Paint Chips and Pad South of CPP-603 5376. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
486. WINCO. Initial Assessment - Soil Contamination NW of CPP-642 5371. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 7, 1986.
487. WINCO. Initial Assessment - Fire Training Pits Between CPP-602 & CPP-603 5405. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 15, 1986.
488. WINCO. Initial Assessment - Hexone Spill by CPP-660 5428. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02] October 16, 1986.
489. WINCO. Initial Assessment - Hexone Spill by CPP-710 5427. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.
490. WINCO. Initial Assessment - Mercury Contaminated Area Near CPP TB-4 5426. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.
491. WINCO. Initial Assessment - Paint Shop at Present Location of CPP-645 5424. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.

492. WINCO. Initial Assessment - Sulfuric Acid Spill East of CPP-606 5421.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.
493. WINCO. Initial Assessment - Mercury Contaminated Area South of CPP T-15 5419.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.
494. WINCO. Initial Assessment - Drum Storage Area West of CPP-660 5418.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02] October 16, 1986.
495. WINCO. Initial Assessment - Paint and Paint Solvent Area South of CPP-697 5417
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. October 16, 1986.
496. WINCO. Initial Assessment - Abandoned Gasoline Tank CPP-VES-UTI-652 5432.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. July 8, 1987.
497. WINCO. Track 2 Summary Report for CPP-23 CPP Injection Well: CPP-37 Gravel Pit 1 & Pit 2 & CPP-59 Kerosene Tank Overflow West of CPP-633, Rev. 02 5804
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-02]. August 5, 1994.
498. United States Department of Energy, Idaho Operations Office. Track 1 Investigation - CPP Percolation Ponds #1 & #2 Site Should Be Scoped Under the CPP Comprehensive RI/FS, Rev. 03 5734
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-03]. June 7, 1994.
499. WINCO. Initial Assessment - Friable Transite on CPP-601, CPP-603, CPP-603, CPP-604, CPP-605, CPP-606, CPP-640, CPP-644, and CPP-648 5402.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-04]. October 14, 1986.
500. WINCO. Initial Assessment - Sewage Treatment Plant South of CPP-664 5378.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-05]. October 7, 1986.
501. WINCO. Track 1 Decision Documentation Package - WAG-3 OU 3-06 Continue to Track 2 Scoping, Rev. 02 5304.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-06]. June 1, 1993.
502. United States Department of Energy, Idaho Operations Office. Track 1 Investigation for the Lime Pit at the Base of the CPP-601 Berm & French Drain - No Further Action Determination, Rev. 01 5732.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-06]. June 7, 1994.
503. Lapray, B.C. No Action Site - Track 1 Decision Documentation Package - Pilot Plant Storage Area West of CPP-620, Rev. 01 5198.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-06]. September 14, 1992.

504. WINCO. Track 1 Investigation of CPP-34, Soil Storage Area in the NE Corner of ICPP - Action Determination, Track 2 Treatability Study (TS) 5756.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-06A]. June 27, 1994.
505. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Decision Statement Track 2 Summary Report OU 3-07 Tank Farm Area Rev. 02 05/08/93 CPP-16, CPP-20, CPP-24, CPP-25, CPP-30, CPP-32E No Further Action Determination - CPP-26, CPP-28 5809.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-07]. October 26, 1994.
506. WINCO. Initial Assessment - Contaminated Soil from Leak in Line from CPP WM-181 to Pew 5380. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-07]. October 7, 1986.
507. WINCO. Initial Assessment - Contaminated Soil in the Tank Farm Area Near WL-102 NE of CPP-604 5397. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-08]. October 14, 1986.
508. WINCO. Idaho Chemical Processing Plant (ICPP) Sampling & Analysis Plan (SAP) for OU 3-07 Tank Farm Area (Draft) 4413.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-08A]. February 28, 1992.
509. WINCO. Track 1 Action Determination, Proceed to Scoping Session to Determine Course of Action - CPP-601 Tunnel Drain Leak (VT-300) 5266.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-08A]. April 9, 1993.
510. WINCO. Initial Assessment - Abandoned Liquid Radioactive Waste Storage Tank CPP-VES-SFE-20 5433. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
511. WINCO. Initial Assessment - Particulate Air Release South of CPP-603 5386.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
512. WINCO. Initial Assessment - CPP-603 to CPP-604 Line Leak 5383.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
513. WINCO. Initial Assessment - Soil Storage Area South of CPP Peach Bottom Fuel Storage Area 5381. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
514. WINCO. Initial Assessment - CPP-603 Sludge and Water Release 5375.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.

515. WINCO. Initial Assessment - CPP-603 Plastic Pipeline Break 5374.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
516. WINCO. Initial Assessment - Soil Contamination Near the NE Corner of CPP-603 S. Basin 5373. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
517. WINCO. Initial Assessment - CPP-08, CPP-603 Basin Filter System Line Failure 5372.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
518. WINCO. Initial Assessment - Trench E. of CPP-603 Fuel Storage Basin 5370.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
519. WINCO. Initial Assessment - Contaminated Soil Around CPP-603 Settling Basin 5369.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
520. WINCO. Initial Assessment - Contaminated Soil Around CPP-603 Settling Tank 5368.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
521. WINCO. Initial Assessment - Temporary Storage Area SE of CPP-603 5367.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
522. WINCO. Initial Assessment - French Drain W. of CPP-603 5366.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09]. October 7, 1986.
523. WINCO. Initial Assessment - Contaminated Soil West of CPP-693 East of Dry Fuel Storage Area 5442. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-09].
October 16, 1986.
524. Lockheed Martin Idaho Technologies Company (LMITCO). Track 2 Draft Final Scoping Summary Report Operable Unit (OU) 3-10 - Sites & References INEL-96/0197; Rev. 02. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-10]. July 1, 1994.
525. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Decision Statements for Track 2 Summary Report for OU 3-11, CPP-621 Area Spills, Rev. 02, No Further Action for CPP-45; CPP-58 Should Be Included in OU 3-13 RI/FS 5769
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-11]. June 8, 1994.
526. United States Department of Energy, Idaho Operations Office. Track 1 Investigation for the Abandoned CPP-637 & CPP-620 VOG Line - No Further Action Determination, Rev. 02 5735.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-12]. June 7, 1994.

527. United States Department of Energy. New Site Identification - Tank Farm Interstitial Soils - CPP-96 16750. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-14]. October 16, 1998.
528. United States Department of Energy. New Site Identification (NSI) - Operable Unit (OU) 3-14 Tank Farm Remedial Investigation Feasibility Study (RI/FS) 17265. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-14]. May 11, 1999.
529. WINCO. No Action Site - CPP-77 Seepage Pit and Cesspool North of CPP-662 3582. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
530. WINCO. No Action Site - CPP-75 Septic Tank and Cesspool West of CPP-603 3581. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
531. WINCO. No Action Site - CPP-74 Seepage Pit West of CPP-626 3580. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
532. WINCO. No Action Site - CPP-73 Leaching Cesspool East of CPP T-5 3579. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
533. WINCO. No Action Site - CPP-72 CPP-758 Cesspool East of CPP-651 3578. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
534. WINCO. No Action Site - CPP-70 Septic Tank East of CPP-655 and CPP-71 Seepage Pits West of CPP-656 3577. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
535. WINCO. No Action Site - CPP-52 Pickling Shed East of CPP-631 3576. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
536. United States Department of Energy, Idaho Operations Office. No Action Site - CPP-43 Grease Pit South of CPP-637 3575. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
537. WINCO. No Action Site - CPP-76 Septic Tank and Cesspool West of CPP-659 - No Action Determination Package 3103. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3/NA]. September 9, 1991.
538. United States Department of Energy, Idaho Operations Office. Proposed Plan for Waste Area Group 3 at the Idaho Chemical Processing Plant, INEEL 10542 [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-13]. October 1, 1998.

539. United States Department of Energy, Idaho Operations Office. Proposed Plan for Waste Area Group 2 - Test Reactor Area, INEEL 10408.
[http://ar.inel.gov/ar/owa/getimage_2?F_PAGE=1&F_DOC=10408&F_REV=00]
. March 1997.
540. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Decision Statement for the Track 2 Summary Report, OU 3-08 Tank farm Area II Rev. 03 07/16/93 CPP-15 CPP-29 No Further Action Determination CPP-13 CPP-27 CPP-35 CPP-36 Should Be 5810.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=3-08]. October 26, 1994.
541. Alexander, T.G. Initial Assessment - CFA-11 French Drain Containing 5" Shell North of CFA-633 2516. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-01].
October 8, 1986.
542. Alexander, T.G. Initial Assessment - CFA-09 Central Gravel Pit 2514.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-01]. October 8, 1986.
543. Landis, J. A. Central Facilities Area Contaminated Soil Removal Action Summary Report - Operable Units 4-02, 4-05, and 4-09 INEEL/EXT-97-01462.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-02]. June 1, 1998.
544. United States Department of Energy, Idaho Operations Office. Decision Documentation Package Cover Sheet; prepared in accordance with Track 1 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL 10179.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-02]. February 29, 1996.
545. United States Department of Energy, Idaho Operations Office. Initial Assessment - CFA-16 Dry Well South of CFA-682 Pumphouse 2527.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-02]. October 8, 1986.
546. Alexander, T.G. Initial Assessment - CFA-36 Gasoline Tank CFA-680 2540.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
547. Alexander, T.G. Initial Assessment - CFA-37 Diesel Tank CFA-681 South Side 2539.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
548. Alexander, T.G. Initial Assessment - CFA-38 Fuel Oil Tank, CFA-683 2538.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03}. October 8, 1986.
549. Alexander, T.G. Initial Assessment - CFA-35 Sulfuric Acid Tank CFA-674 (West Side) 2535. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.

550. Alexander, T.G. Initial Assessment - CFA-34 Diesel Tank at CFA-674 South 2534.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
551. Alexander, T.G. Initial Assessment - CFA-31 Waste Oil Tank at CFA-754 Active 2531.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
552. Alexander, T.G. Initial Assessment - CFA-30 Waste Oil Tank CFA-665, Active 2530.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
553. Alexander, T.G. Initial Assessment - CFA-29 Waste Oil Tank CFA-664 2529.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
554. Alexander, T.G. Initial Assessment - CFA-28 Fuel Oil Tank at CFA-674 West 2528.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
555. Alexander, T.G. Initial Assessment - CFA-27 Fuel Oil Tank CFA-669 (CFA-740) 2522.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
556. Alexander, T.G. Initial Assessment - CFA-25 Fuel Oil Tank CFA-656 North Side 2520.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
557. Alexander, T.G. Initial Assessment - CFA-24 Fuel Tank Nevada Circle 2 South by CFA-629 2519. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
558. Alexander, T.G. Initial Assessment - CFA-23 Fuel Oil Tank CFA-641 2518.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
559. Alexander, T.G. Initial Assessment - CFA-22 Fuel Oil Tank CFA-640 2517.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
560. Alexander, T.G. Initial Assessment - CFA-21 Fuel Tank at Nevada Circle 1 South by CFA-629 2508. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
561. Alexander, T.G. Initial Assessment - CFA-20 Fuel Oil Tank at CFA-609, CFA-732 2506.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
562. Alexander, T.G. Initial Assessment - CFA-33 Fuel Tank CFA-667 South Side 2504.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.

563. Alexander, T.G. Initial Assessment - CFA-19 Gasoline Tanks (2) East of CFA-606 2503. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
564. Alexander, T.G. Initial Assessment - CFA-32 Fuel Tank CFA-667 (Northside) 2501. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
565. Alexander, T.G. Initial Assessment - CFA-18 Fire Department Training Area, Oil Storage Tanks 2500. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 8, 1986.
566. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. CFA-45, Former Location of UST CFA-605W Action Determination, Move to Operable Unit (OU) 4-09, Track 2 Scoping 5512. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-03]. October 26, 1994.
567. Alexander, T.G. Initial Assessment - CFA-39 Drum Dock CFA-771 2537. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-04]. July 6, 1987.
568. Alexander, T.G. Initial Assessment - CFA-40 Returnable Drum Storage South of CFA-601 2536. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-04]. July 6, 1987.
569. Alexander, T.G. Initial Assessment - CFA-41 Excess Drum Storage South of CFA-674 2533. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-04]. July 6, 1987.
570. United States Department of Energy, Idaho Operations Office. Action Determination for CFA-04, CFA-17, & CFA-47 - To Be Evaluated in OU 4-13 Remedial Investigation Feasibility Study (RI/FS) Baseline Risk Assessment (BRA) - No Further Action Determination for CFA-50 in Operable Unit (OU) 4-05 10401. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-05]. March 12, 1997.
571. United States Department of Energy, Idaho Operations Office. Track 2 Decision Statement for OU 4-06 - To Be Further Evaluated in OU 4-13 RI/FS - Action Determination 10279. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-06]. May 23, 1996.
572. United States Department of Energy, Idaho Operations Office. Action Determination for CFA-07 & CFA-12 (South Drain Only) - To Be Evaluated in OU 4-13 RI/FS Baseline Risk Assessment (BRA) and No Further Action Determination for CFA-48 & CFA-12 (North Drain) for Operable Unit (OU) 4-07 10402. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-07]. March 12, 1997.

573. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Track 2 Decision Statement for OU 4-08 - To Be Further Evaluated in Baseline Risk Assessment (BRA) of OU 4-13 RI/FS 10280. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-08]. May 23, 1996.
574. Dudziak, A.J. Relationship Between Operable Unit (OU) 4-10 and 4-12 Central Facilities Area (CFA) Landfills Track 2 Decision Statement 10145. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-10]. September 29, 1995.
575. Alexander, T.G. Initial Assessment - CFA-05 Motor Pool Pond 2510. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-11]. October 8, 1986.
576. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Proposed Plan for Operable Unit (OU) 4-12 Central Facilities Area (CFA) Landfill I, II, and III 10012. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-12]. April 1, 1995.
577. INEEL Community Relations. Proposed Plan for Operable Unit (OU) 4-13A Interim Action (IA) Waste Area Group 4 (WAG-4) Central Facilities Area (CFA) INEEL 10669. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=4-13A]. August 1, 1999.
578. Alexander, T.G. Initial Assessment - ARA-19 Detention Tank for Fuel Oil - Radionuclides ARA-719 2997. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. September 15, 1986.
579. Alexander, T.G. Initial Assessment - ARA-18 Radionuclide Tank ARA-736 2996. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. September 15, 1986.
580. Alexander, T.G. Initial Assessment - ARA-17 Drain From ARA-626 2995. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. September 15, 1986.
581. Alexander, T.G. Initial Assessment - ARA-15 Radionuclide Tank ARA-735 2993. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. September 15, 1986.
582. Alexander, T.G. Initial Assessment - ARA-16 Radionuclide Tanks ARA-729 2994. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. October 1, 1986.
583. Alexander, T.G. Initial Assessment - ARA-05 Evaporation Pond to North East ARA-744 2983. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-01]. October 1, 1986.
584. Alexander, T.G. Initial Assessment - PBF-21 SPERT III Large Leach Pond 2741. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-02]. September 22, 1986.

585. Alexander, T.G. Initial Assessment - PBF-06 Reactor Area Blowdown Pit for Boiler by PBF-621 2716. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-03]. September 19, 1986.
586. Alexander, T.G. Initial Assessment - PBF-24 SPERT IV Blowdown Pit Adjacent to PBF-716 2739. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-03]. September 22, 1986.
587. Alexander, T.G. Initial Assessment - PBF-07 Reactor Area Oil Drum Storage PER-T-13 2717. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-03]. July 6, 1987.
588. United States Department of Energy, Idaho Operations Office. Track 1 Decision Documentation Package - PBF Cooling Tower Area and Drainage Ditch at PBF Reactor Area PBF-28 OU 5-03 5324. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-03]. June 22, 1993.
589. Alexander, T.G. Initial Assessment - PBF-04 Control Area Oil Tank at PBF-608 Substation Outside PBF Fence 2714. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-04]. September 19, 1986.
590. Alexander, T.G. Initial Assessment - PBF-19 SPERT III Inactive Fuel Oil Tank at PBF-609 West Side of WERF 2747. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-04]. September 22, 1986.
591. Alexander, T.G. Initial Assessment - PBF-14 SPERT II Inactive Fuel Oil Tank Front of PBF-612 2724. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-04]. September 22, 1986.
592. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Record of Decision (ROD) for Stationary Low Power Reactor 1 (SL-1) OU 5-05 & Borax I Burial Grounds OU 6-01 & 10 (Ten) No Action Sites (OU 5-01, 5-03, 5-04 and 5-11). INEL-95/0282. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-05]. January 9, 1996.
593. United States Department of Energy, Idaho Operations Office. Track 2 Decision Statement for the Operable Unit (OU) 5-06 ARA-III ARA-12 Site & ARA-IV ARA-20 Site - Action Determination 10412. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-06]. February 29, 1996.
594. Alexander, T.G. Initial Assessment - PBF-15 Reactor Area Corrosive Waste Injection Well PBF-302 2725. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-08]. September 19, 1986.

595. Alexander, T.G. Initial Assessment - PBF-11 SPERT I Seepage Pit PBF-750 2721.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-08]. September 19, 1986.
596. Alexander, T.G. Initial Assessment - PBF-05 Reactor Area Warm Waste Injection Well PBF-301 2715. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-08].
September 19, 1986.
597. Alexander, T.G. Initial Assessment - PBF-16 SPERT II Leach Pond 2743.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-09]. September 22, 1986.
598. Alexander, T.G. Initial Assessment - PBF-20 SPERT III Small Leach Pond 2742.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-09]. September 22, 1986.
599. Alexander, T.G. Initial Assessment - PBF-22 SPERT IV Leach Pond PBF-758 2740.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-09]. September 22, 1986.
600. INEL Community Relations. Record of Decision (ROD) for the Auxiliary Reactor Area ARA-I Chemical Evaporation Pond Operable Unit (OU) 5-10 5232.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-10]. December 1, 1992.
601. United States Department of Energy, Idaho Operations Office. Track 1 Decision Documentation Package - ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740) 5325. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-11].
June 21, 1993.
602. INEEL Community Relations. Proposed Plan for Waste Area Group 5 (WAG-5) Power Burst Facility Auxiliary Reactor Area (PBF/ARA) INEEL 17237.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-12]. May 1, 1999.
603. Holdren, K.J. Waste Area Group 5 (WAG-5) Operable Unit (OU) 5-12 Comprehensive Remedial Investigation Feasibility Study (RI/FS) DOE/ID-10607.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-12]. January 1, 1999.
604. Alexander, T.G. Initial Assessment - PBF-08 Reactor Area Corrosive Waste Disposal Sump Brine Tank PBF-731 2718.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-13]. September 19, 1986.
605. Alexander, T.G. Initial Assessment - PBF-10 Reactor Area Evaporation Pond PBF-733 2720. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-13].
September 19, 1986.

606. Alexander, T.G. Initial Assessment - PBF-09 Reactor Area Septic Tank & Drainfield PBF-728 2719. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 19, 1986.
607. Alexander, T.G. Initial Assessment - PBF-03 Control Area Septic Tank for PBF-632 & Seepage Pits PBF-745 thru 748 2713. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 19, 1986.
608. Alexander, T.G. Initial Assessment - Borax-04 Borax Trash Dumps 2767. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-02]. October 3, 1986.
609. Alexander, T.G. Initial Assessment - Borax-03 AEF Septic Tank AEF-703 2766. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-02]. October 3, 1986.
610. Alexander, T.G. Initial Assessment - EBR-14 EBR-1 Gasoline Tank EBR-717 2645. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
611. Alexander, T.G. Initial Assessment - EBR-13 EBR-1 Gasoline Tank EBR-708 2644. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
612. Alexander, T.G. Initial Assessment - EBR-12 EBR-1 Diesel Tank EBR-707 2643. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
613. Alexander, T.G. Initial Assessment - EBR-10 EBR-1 WMO-750 Gasoline Tank 2641. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
614. Alexander, T.G. Initial Assessment - EBR-09 EBR-1 WMO-704 Fuel Oil Tank at WMO-601 2640. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
615. Alexander, T.G. Initial Assessment - EBR-08 EBR-1 WMO-703 Fuel Oil Tank, Soon Inactive 2639. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
616. Alexander, T.G. Initial Assessment - EBR-07 EBR-1 AEF-704 Fuel Oil Tank at AEF-603 (Map Says Diesel) 2638. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
617. Alexander, T.G. Initial Assessment - EBR-11 EBR-1 Fuel Oil Tank EBR-706 2633. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 1, 1986.
618. Alexander, T.G. Initial Assessment - Borax-07 Inactive Fuel Oil Tank by AEF-601 3003. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 3, 1986.

619. Alexander, T.G. Initial Assessment - Borax-05 Fuel Oil Tank, Southwest of AEF-602 2768. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-03]. October 3, 1986.
620. Alexander, T.G. Initial Assessment - EBR-05 EBR-1 Cesspool, Septic Tank EBR-709 & Seepage Pit EBR-713 2770. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6/NA]. September 23, 1999.
621. Alexander, T.G. Initial Assessment - EBR-02 - EBR-1 Septic Tank (AEF-702) & Seepage Pit (AEF-703) 2765. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6/NA]. October 1, 1986.
622. Alexander, T.G. Initial Assessment - EBR-06 - EBR-1 Septic Tank (EBR-714) & Seepage Pit (EBR-716) 2637. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6/NA]. October 1, 1986.
623. Alexander, T.G. Initial Assessment - EBR-04 EBR-1 Septic Tank WMO-701 2635. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6/NA] October 1, 1986.
624. Alexander, T.G. Initial Assessment - EBR-03 EBR-1 Seepage Pit WMO-702 2634. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6/NA]. October 1, 1986.
625. Green, L.A. Track 2 Decision Statement for OU 7-01 Soil Vault Rows, Subsurface Disposal Area (SDA) RWMC - to be Included in a Future RI/FS 10035. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-01] March 15, 1995.
626. Jorgensen, D.K. WAG-7 OU 7-02 Acid Pit Track 2 Summary Report EGG-ERD-10242. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-02] April 1, 1994.
627. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Action Determination for Operable Unit (OU) 7-04 Air Pathway Track 2 Preliminary Scoping Package 10017. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-04]. April 20, 1995.
628. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Action Determination for Draft Final Scoping Track 2 Summary Report for Operable Unit (OU) 7-05: Surface Water Pathways and Surficial Sediments 5864. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-05]. April 14, 1994.
629. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Action Determination OU 7-07 Vadose Zone Radionuclides and Metals Track 2 Preliminary Scoping Package 10004. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-07]. February 8, 1995.

630. United States Department of Energy, Idaho Operations Office. Action Determination Proceed to RI/FS for Track 1 Investigation of Non-TRU Pits & trenches 5592. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-03]. December 3, 1993.
631. INEL Community Relations. Proposed Plan for Operable Unit (OU) 7-08, Organic Contamination in the Vadose Zone (OCVZ) 5642. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-08]. March 1, 1994.
632. Lugar, R.M. Track 1 Investigation for TSA Releases - Additional Activities Should be Initiated for this Site 5689. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-09]. April 12, 1994.
633. Alexander, T.G. Initial Assessment - RWMC-01 Drainage and Septic Tank for WMF-613 New Facility Not Operational Yet 2736. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-11]. October 1, 1986.
634. Alexander, T.G. Initial Assessment - RWMC-02 Septic Tank and Drain Field for WMF-601 and WMF-604 2735. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-11]. October 1, 1986.
635. Alexander, T.G. Initial Assessment - RWMC-03 Septic Tank & Drainfield for Swepp 2734. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-11] October 1, 1986.
636. INEL Community Relations. Proposed Plan for PAD-A at the Radioactive Waste Management Complex (RWMC). Idaho National Engineering Laboratory (INEL) 5342. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-12]. July 1, 1993.
637. United States Department of Energy, Idaho Operations Office. Remediation Plans for Radioactive Waste Management Complex (RWMC) at INEEL DOE/ID-10670; Rev. 09. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-13]. April 1, 1999.
638. Hutchison, M.E. Proposed Plan for Waste Area Group 8 (WAG-8) Naval Reactors Facility (NRF) 10440. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8-08]. January 1, 1998.
639. Newbry, R.D.E. No Action Site - NRF-60, Old Incinerator 5848. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
640. Newbry, R.D.E. No Action Site - NRF-57, S1W Gravel Pit 5847. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
641. Newbry, R.D.E. No Action Site - NRF-46, Kerosene Spill 5846. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.

642. Newbry, R.D.E. No Action Site - NRF-39, Old Radiography Area 5845.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
643. Newbry, R.D.E. No Action Site - NRF-34, Old Parking Lot Landfill 5844.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
644. Newbry, R.D.E. No Action Site - NRF-30, Gatehouse Transformer 5843.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
645. Newbry, R.D.E. No Action Site - NRF-27, Main Transformer Yard 5842.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
646. Newbry, R.D.E. No Action Site - NRF-25, Chemical Waste Storage Pad 5841.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
647. Newbry, R.D.E. No Action Site - NRF-24, NRF Demineralizer and Neutralization Facility 5840. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA].
January 20, 1995.
648. Newbry, R.D.E. No Action Site - NRF-07, East Landfill 5838.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
649. Newbry, R.D.E. No Action Site - NRF-05 West Landfill 5839.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
650. Newbry, R.D.E. No Action Site - NRF-04, Top Soil Pit Area 5837.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
651. Newbry, R.D.E. No Action Site - NRF-67, Old Transformer Yard 5849.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8/NA]. January 20, 1995.
652. Argonne National Laboratory - West. Initial Assessment - Waste Retention Tank 783 (Never Used) 5476. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA].
September 9, 1986.
653. Argonne National Laboratory - West. Initial Assessment - Dry Well by 768 5479.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 15, 1986.
654. Argonne National Laboratory - West. Initial Assessment - TREAT Control Building 721 Septic Tank and Leach Field 5496.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.

655. Argonne National Laboratory - West. Initial Assessment - Plant Services Degreasing Unit 5491. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.
656. Argonne National Laboratory - West. Initial Assessment - Interior Building Coffin Neutralization Tank 5489. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.
657. Argonne National Laboratory - West. Initial Assessment - Lab and Office Acid Neutralization Tank 5488. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.
658. Argonne National Laboratory - West. Initial Assessment - Septic Tank and Drain Field by 789 (Removed 1979) 5482. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.
659. Argonne National Laboratory - West. Initial Assessment - Dry Wells by 759 (2) 5480. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. September 30, 1986.
660. Argonne National Laboratory - West. Initial Assessment - TREAT Suspect Waste Tank and Leaching Field (Nonradioactive) 5485. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 2, 1986.
661. Argonne National Laboratory - West. Initial Assessment - TREAT Control Building 721 Septic Tank and Seepage Pit (Removed 1978) 5497. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 3, 1986.
662. Argonne National Laboratory - West. Initial Assessment - TREAT Suspect Waste Tank and Leaching Field 5486. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 3, 1986.
663. Argonne National Laboratory - West. Initial Assessment - Critical Systems Maintenance Degreasing Unit 5490. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 5, 1986.
664. Argonne National Laboratory - West. Initial Assessment - TREAT Seepage Pit and Septic Tank W. of 720 (Filled 1980) 5487. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 5, 1986.
665. Argonne National Laboratory - West. Initial Assessment - Septic Tank and Leach Field by 793 5484. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 5, 1986.

666. Argonne National Laboratory - West. Initial Assessment - Septic Tank and Leaching Pits (2) by 753 (Tank Removed 1979) 5478.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 5, 1986.
667. Argonne National Laboratory - West. Initial Assessment - Dry Well by 720 5481.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 6, 1986.
668. Argonne National Laboratory - West. Initial Assessment - Dry Wells Between T-1 and ZPPR Mound 5475. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 8, 1986.
669. Argonne National Laboratory - West. Initial Assessment - Sodium Cleanup Pad and Suspect Waste Retention Tank 793 (Removed 1979) 5477.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=9/NA]. October 14, 1986.
670. Burns, D.E. Work Plan for Waste Area Group 6 & 10, Operable Unit 10-04 Comprehensive Remedial Investigation Feasibility Study.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10-04]. April 1, 1999.
671. Saint-Louis, M.L. Initial Assessment - ARVFS-01 Containers of Contaminated NAK 3001. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. October 14, 1984.
672. Alexander, T.G. Initial Assessment - EOCR-05 Blowdown SUMP EOCR-719 2611.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. September 18, 1986.
673. Alexander, T.G. Initial Assessment - EOCR-04 Septic Tank 2610.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. September 18, 1986.
674. Alexander, T.G. Initial Assessment - EOCR-02 Injection Well 2608.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. September 18, 1986.
675. Alexander, T.G. Initial Assessment - EOCR-01 Leach Pond 2607.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. September 18, 1986.
676. Saint-Louis, M.L. Initial Assessment - ARVFS-02 Tank Containing Low Level Rad Waste (Under White Bldg) 3002.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. October 14, 1986.
677. Pigott, W.R. Initial Assessment - ZPPR-1 Disposal Area 579.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. February 2, 1989.

678. Pigott, W.R. Initial Assessment - Dairy Farm - Disposal Pit DF-1 1146.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. February 8, 1989.
679. Haney, T.J. Field Sampling Plan (FSP) for OU 10-04 Organic Moderated Reactor Experiment (OMRE) Soil and Groundwater DOE/ID-10621 Rev.00.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10-04]. June 1, 1999.
680. Burns, D.E. Workplan for Waste Area Group 6 & 10 Operable Unit 10-04 Comprehensive Remedial Investigation Feasibility Study DOE/ID-10554 Rev. 00.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10-04]. April 1, 1999.
681. Rood, S.M. Engineering Evaluation Cost Analysis (EE/CA) for Operable Unit 10-06 Radionuclide Contaminated Soils Removal Action at INEL INEL-95/0259, Vol.01 Rev.00. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10-06]. June 1, 1995.
682. Alexander, T.G. Initial Assessment - PBF-12 SPERT I Leach Pond 2722.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-02]. September 19, 1986.
683. Alexander, T.G. Initial Assessment - PBF-26 SPERT IV Lake Adjacent to PBF-758 2737.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-02]. September 22, 1986.
684. Alexander, T.G. Initial Assessment - PBF-13 Reactor Area Rubble Pit 2232.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-03]. January 12, 1988.
685. United States Department of Energy, Idaho Operations Office. Track 2 Decision Statement for the Operable Unit (OU) 5-06 ARA-III ARA-12 Site & ARA-IV ARA-20 Site - No Further Action Determination 10413.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-06]. February 29, 1996.
686. Pickett, S.L. Track 2 Summary Report for Operable Unit (OU) 5-07: ARA-1 Sites ARA-02 and ARA-03 & Review Comments EGG-ER-10593.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5-07]. May 1, 1993.
687. Alexander, T.G. Initial Assessment - ARA-14 Septic Tank and Drainfield ARA-739 2992.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 15, 1986.
688. Alexander, T.G. Initial Assessment - PBF-02 Control Area Septic Tanks PBF-738, PBF-739 and Seepage Pit PBF-736 2712.
[http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 19, 1986.

689. Alexander, T.G. Initial Assessment - PBF-01 Control Area Septic Tank PBF-724 Seepage Pit PBF-735 2711. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 19, 1986.
690. Alexander, T.G. Initial Assessment - PBF-27 SPERT III Septic Tank PBF-726 & Seepage Pit 2762. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 22, 1986.
691. Alexander, T.G. Initial Assessment - PBF-17 SPERT II Septic Tank & Seepage Pit PBF-725 2746. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 22, 1986.
692. Alexander, T.G. Initial Assessment - PBF-25 SPERT IV Septic Tank & Leach Pit PBF-727 & PBF-757 2738. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. September 22, 1986.
693. Alexander, T.G. Initial Assessment - ARA-22 Control Area Septic Tank and Leach Pit No. 3 ARA-617 3000. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
694. Alexander, T.G. Initial Assessment - ARA-21 Test Area Septic Tank and Leach Pit No. 2 2999. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
695. Alexander, T.G. Initial Assessment - ARA-11 Septic Tank West ARA-606 2989. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
696. Alexander, T.G. Initial Assessment - ARA-10 Septic Tank East ARA-613 2988. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
697. Alexander, T.G. Initial Assessment - ARA-09 Septic Tank ARA-738 2987. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
698. Alexander, T.G. Initial Assessment - ARA-08 Seepage Pit to West ARA-720B 2986. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.
699. Alexander, T.G. Initial Assessment - ARA-04 Sewage Treatment Facility ARA-737 2982. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=5/NA]. October 1, 1986.

700. INEL Community Relations. Revised Proposed Plan for a Cleanup of Pit 9 at the RWMC, INEL 5203. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-10]. October 1, 1992.
701. INEEL Community Relations. INEEL Community Relations Plan (CRP) Update Fact Sheet - Agencies Outline Contingency Plan for Pit 9 Cleanup 16785. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=7-10]. June 1, 1998.
702. Richardson, A.N. Waste Area Group 8 Remedial Design Remedial Action (RD/RA) Scope of Work (SOW) NR:/TBO-98/161 Rev. 00. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=8-08]. December 18, 1998.
703. Alexander, T.G. Initial Assessment - EOCR-03 Oxidation Pond 2609. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=10/NA]. September 18, 1986.
704. United States Department of Energy, Idaho Operations Office, & United States Environmental Protection Agency. Borax-09 (Borax V Reactor Building) Track 1 to be Included in WAG-6 & WAG-10 Comprehensive Remedial Investigation Feasibility Study (RI/FS) - Decision Documentation Package 10030. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-02]. June 2, 1995.
705. Cotten, G.B. Stationary Low Power Reactor-1 (SL-1) & Boiling Water Reactor Experiment I (Borax I) Burial Grounds Engineered Barriers Project Remedial Design Remedial Action (RD/RA) Workplan (Parson's #ES.28.06.23). DOE/ID-10532. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-01]. April 1, 1996.
706. Alexander, T.G. Initial Assessment - Borax-01 Borax-II-V Leach Pond 2763. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-02]. October 3, 1986.
707. Pigott, W.R. Initial Assessment - EBR-1 Radioactive Soil Contamination EBR-15 576. [http://ar.inel.gov/ar/owa/select_by_ou_2?F_OU=6-04]. February 8, 1989.

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