

**DOE Reports Involving Atmospheric
Pathways/Exposure**

Prepared For:

Lincoln County Nuclear Waste Oversight Office

And

White Pine County Nuclear Waste Oversight Office

Prepared By:





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Examples of DOE Reports Involving Atmospheric Pathways/Exposure

No Date

DOE [CHAPTER 5: REGIONAL AND LOCAL EFFECTS OF LOCATING REPOSITORY AT THE SITE](#)





LSN #: DN2001528431 Participant #: ALA.20040209.8695 Document Date: 01/01/1901     The principal exposure pathway for the accident scenarios analyzed is atmospheric transport. Immersion in contaminated flood water is an exposure mechanism only for workers in the flooding scenarios.

DOE [THE PRICE-ANDERSON ACT- CROSSING THE BRIDGE TO THE NEXT CENTURY: A REPORT TO CONGRESS](#)

LSN #: DN2002046879 Participant #: ALA.20040121.2106 Document Date: 01/01/1901     Exposure would occur via two main pathways: direct radiation "shine" (i.e., external radiation) from plume immersion and ground, skin, and other deposition; and internal dose from ingestion, inhalation, and dermal absorption.





1975

DOE [MANUAL OF PROTECTIVE ACTION GUIDES AND PROTECTIVE ACTIONS FOR NUCLEAR INCIDENTS - SEPTEMBER 1975 - REVISED JUNE 1980 - \(THIS IS AN SCP REFERENCE\)](#)

LSN #: DEN001346404 Participant #: NNA.19871027.0007 Document Date: 09/01/1975     Either of these can result in whole body external exposure. sure. To translate from 17 whole body gamma exposure to whole body dose requires a correction





1980

DOE [TRANSPORTATION OF RADIONUCLIDES IN URBAN ENVIRONS: DRAFT ENVIRONMENTAL ASSESSMENT ENCLOSURE 1](#)

LSN #: DN2002049999 Participant #: ALA.20040122.3806 Document Date: 07/01/1980     Direct Inhalation Dose The consequences of radiation exposure from the direct inhalation pathway are strongly dependent on both the radioactive source term, the prevailing atmospheric conditions, and the location of the population.

1983





DOE [FINAL REPORT TO BATTELLE PROJECT MANAGEMENT DIVISION \(BPMD\) FOR THE DEPARTMENT OF ENERGY - ANALYSIS OF UNCERTAINTIES IN THE EPA ORE BODY RELEASE AND RIVER MODE EXPOSURE PATHWAY MODELS USED AS THE BASES FOR DRAFT 40 CFR 191.](#)

LSN #: DEN001447138 Participant #: HQZ.19910304.0001 Document Date: 06/10/1983     FINAL REPORT TO BATTELLE PROJECT MANAGEMENT DIVISION (BPMD) FOR THE DEPARTMENT OF ENERGY - ANALYSIS OF UNCERTAINTIES IN THE EPA ORE BODY RELEASE AND RIVER MODE





EXPOSURE PATHWAY MODELS USED AS THE BASES FOR DRAFT 40 CFR
191.. RELEASE NORMAL MECHANISM

1985

DOE [FINAL ENVIRONMENTAL ASSESSMENT VOLUME 1](#)





LSN #: DN2001479682 Participant #: ALA.20040220.5458 Document Date:
10/04/1985     The principal exposure pathway for the accident scenarios analyzed is atmospheric transport. Immersion in contaminated flood water is an exposure mechanism only for workers in the flooding scenarios.

DOE [EXPOSURES AND HEALTH EFFECTS FROM SPENT FUEL TRANSPORTATION. CODERS NOTE: INCLUDES SERIAL CARD AND OCRWM DOCUMENT TRANSMITTAL FORM.](#)

LSN #: DN2001648170 Participant #: HQZ.19871124.0085 Document Date:
11/29/1985     EXPOSURES AND HEALTH EFFECTS FROM SPENT FUEL TRANSPORTATION. CODERS NOTE: INCLUDES SERIAL CARD AND OCRWM DOCUMENT TRANSMITTAL FORM.. pathway. The dose rates to the population and selected; i-Jividuals frCM all pathways is then computed.





1986

DOE [NUCLEAR WASTE POLICY ACT SECTION 112 - RECOMMENDATION BY THE SECRETARY OF ENERGY OF CANDIDATE SITES FOR SITE CHARACTERIZATION FOR THE FIRST RADIOACTIVE-WASTE REPOSITORY \(C\)](#)

LSN #: DN2002067323 Participant #: HQZ.19890410.1228 Document Date:
05/01/1986     Thus, one concern in the region is the cumulative exposure realized by an individual. Annually the maximum individual exposure values range from 2 to 8 millirem.





1987

DOE [LOW LEVEL AND NARM RADIOACTIVE WASTE DRAFT ENVIRONMENTAL IMPACT STATEMENT, VOLUME 1.](#)





LSN #: DN2002064215 Participant #: HQO.19871020.0002 Document Date:
08/01/1987     S 8-2 Radiological exposure pathways for PRESTO-EPA-BRC scenarios CPS exposures for erosion pathway to offsite residents CPG exposures for atmospheric inhalation pathway to offsite residents CPG exposures for biointrusion pathway to onsite residents

1988

DOE [NUCLEAR WASTE POLICY ACT CONSULTATION DRAFT ACCIDENTAL RADIOLOGICAL RELEASES SITE CHARACTERIZATION PLAN YUCCA MOUNTAIN SITE, NEVADA RESEARCH AND DEVELOPMENT AREA, NEVADA VOLUME VI JANUARY 1988](#)





LSN #: DN2001476454 Participant #: ALG.20040511.9870 Document Date: 01/01/1988     The surface environment also includes longer-term pathways through which public exposure could occur after an accident. Since these pathways are amenable to protective actions such as interdiction and decontamination of

DOE [NUCLEAR WASTE POLICY ACT \(SECTION 113\) -- SITE CHARACTERIZATION PLAN, YUCCA MOUNTAIN SITE, NEVADA RESEARCH AND DEVELOPMENT AREA DOE/RW-0199 VOLUMES I - IX \(C\)](#)





LSN #: DEN000873004 Participant #: HQO.19881201.0002 Document Date: 12/01/1988     NUCLEAR WASTE POLICY ACT (SECTION 113) -- SITE CHARACTERIZATION PLAN, YUCCA MOUNTAIN SITE, NEVADA RESEARCH AND DEVELOPMENT AREA DOE/RW-0199 VOLUMES I - IX (C). Table 8.3.3.2-2. General design constraints passed to Issue 1.11

1989





DOE [METHODS OF CALCULATING THE POST-CLOSURE PERFORMANCE OF HIGH-LEVEL WASTE REPOSITORIES](#)

LSN #: DN2002062949 Participant #: HQX.19890420.0051 Document Date: 02/01/1989     The exposure pathways generally considered include: ^ drinking-water ingestion for groundwater and surface water transport pathways. This pathway may result from secondary contamination of surface waters from groundwater sources.





DOE [ENVIRONMENTAL PATHWAY ANALYSIS SCOPING STUDY FOR THE YUCCA MOUNTAIN PROJECT](#)

LSN #: DN2002074021 Participant #: HQX.19890331.0036 Document Date: 03/01/1989     A detailed listing of the values used in the EPASS can be found in Appendix A. The inhalation, immersion, and direct irradiation exposure pathways are not modeled because they can be directly evaluated.





NRC [Environmental Pathway Analysis Scoping Study For the Yucca Mountain Project.](#)

LSN #: NRC000001305 Participant #: ML032260213 Document Date: 03/31/1989     Page 9 Page 10 Page 11 A detailed listing of the values used in the EPASS can be found in Appendix A. The inhalation, immersion, and direct irradiation exposure pathways are not modeled because they can be directly evaluated.





DOE [ENVIRONMENTAL STANDARDS FOR THE MANAGEMENT, STORAGE AND LAND DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTE AND NATURALLY OCCURRING AND ACCELERATOR-PRODUCED RADIOACTIVE WASTE.](#)

LSN #: DEN001379444 Participant #: HQX.19890526.0028 Document Date: 04/06/1989     Exposure estimates are based on the release of radionuclides from regulated disposal sites into surface and ground water and into the atmosphere. Who might receive the highest exposure from a source; of radioactivity.

DOE [MEETING REPORT ON MINING REGULATIONS APPLICABILITY TO ESF DESIGN, CONSTRUCTION, AND OPERATIONS AT YUCCA MOUNTAIN REPOSITORY \(PNL-6608, 'METHODS OF CALCULATING THE POST-CLOSURE PERFORMANCE OF HIGH-LEVEL WASTE REPOSITORIES' ENCLOSED\) \(C\)](#)





LSN #: DN2002078445 Participant #: HQW.19890411.0014 Document Date: 04/11/1989     The exposure pathways generally considered include: drinking-water ingestion - for groundwater and surface water transport pathways. This pathway may result from secondary contamination of surface waters from groundwater sources.

DOE [TECHNICAL ASSESSMENT REVIEW OF THE PROJECT REQUIREMENTS DOCUMENTS, REVIEW RECORD MEMORANDUM \(RRM\) REPORT ISSUED JULY 28, 1989 \(C\)](#)





LSN #: DN2002141649 Participant #: NNA.19920211.0097 Document Date: 07/31/1989     TECHNICAL ASSESSMENT REVIEW OF THE PROJECT REQUIREMENTS DOCUMENTS, REVIEW RECORD MEMORANDUM (RRM) REPORT ISSUED JULY 28, 1989 (C). B-MECH-8-3 Benchmark #5A ^' 3. Location may be adjusted within the sequential drift mining test area so geologic

1991





DOE [ENVIRONMENTAL REGULATORY GUIDE FOR RADIOACTIVE EFFLUENT MONITORING AND ENVIRONMENTAL SURVEILLANCE](#)

LSN #: DN2001490126 Participant #: ALA.20040128.4846 Document Date: 01/01/1991     However, unique situations could arise where recreational, commercial, or industrial use of a receiving body of water might cause exposure to certain individuals.

DOE [YUCCA MOUNTAIN SITE CHARACTERIZATION PROGRAM BASELINE \(SCP\), VOLUMES 1 THROUGH 5](#)

LSN #: DN2002070478 Participant #: NNA.19910429.0170 Document Date: 02/21/1991     The surface environment also includes longer-term pathways through which public exposure could occur after an accident. Since these pathways are amenable to protective actions such as interdiction and decon- 8.3.5.5-4 ,





DOE [SITE CHARACTERIZATION PROGRAM BASELINE - YMP/CM-0011, REVISION 1, VOLUMES 1-5 \(C\)](#)

LSN #: DN2002078039 Participant #: MOL.19980507.0478 Document Date: 03/01/1991     The surface environment also includes longer-term pathways through which public exposure could occur after an accident. Since these pathways are amenable to protective actions such as interdiction and decon- nt 8.3.5.5-4 ,

1992

DOE [A PRELIMINARY STRATEGY FOR MODELING DOSE AT THE YUCCA MOUNTAIN SITE](#)





LSN #: DN2000030737 Participant #: ALA.20040303.4797 Document Date:

09/01/1992     Exposure occurs externally through direct contact with contaminated air, water, or ground surfaces. Inadvertent ingestion of soil may also be included as an internal exposure pathway.

1993





DOE [SANDIA REPORT, USERS GUIDE FOR GENII-S, A CODE FOR STATISTICAL AND DETERMINISTIC SIMULATIONS OF RADIATION DOSES TO HUMANS FROM RADIONUCLIDES IN THE ENVIRONMENT \(C\)](#)

LSN #: DEN001440858 Participant #: MOL.20010721.0031 Document Date:

04/01/1993     The potential routes through which people may be exposed to radionuclides or radiation are called exposure pathways. The general pathways can be thought of as external exposure, inhalation, and ingestion.

DOE [PERFORMANCE ASSESSMENT STRATEGY FOR THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT](#)





LSN #: DN2002065230 Participant #: MOL.19971124.0154 Document Date:

09/01/1993     Biosphere Transport ^ Radionuclide transport needs to be assessed along various pathways. The pathways may be aquatic, terrestrial or air pathways. Ingestion dose may result from terrestrial, aquatic or air pathways.

1994





DOE [THEORY AND CAPABILITIES MANUAL](#)

LSN #: DN2001943340 Participant #: ALA.20040328.1067 Document Date:

03/17/1994     The pathways reflect major features of the hydrologic system and are conduits through which mass transport occurs. Only after developing and documenting a conceptual model for the pathway network should the pathway data can be entered.

DOE [PERSPECTIVES ON RISKS FROM THE NEVADA TEST SITE FEASIBILITY AND METHODS FOR ASSESSING CUMULATIVE RADIOLOGICAL EXPOSURE RISKS ASSOCIATED WITH DEPARTMENT OF ENERGY ACTIVITIES AT THE NEVADA TEST SITE, PHASE I REPORT TO LINCOLN COUNTY, NEVADA, SECTION II PROJECT REPORT \(C\)](#)

LSN #: DN2001878730 Participant #: MOL.19941110.0101 Document Date:

06/01/1994     Table 2 summarizes the typology of risk by pathway, times of release and exposure, and time period in which consequences occur, listing the most significant pathways corresponding to each time division.

1995





DOE [BRIEFING PAPER TRANSPORTATION RADIOLOGICAL RISK ASSESSMENT COMPUTER PROGRAMS AND DATABASES JANUARY 1995](#)

LSN #: DN2002013313 Participant #: ALA.20040116.9908 Document Date:





01/01/1995     Figure A.1 shows the primary exposure pathways that exist for

atmospheric dispersion of radioactive materials. Mathematical models for exposure from the remaining pathways have been developed.





DOE [RISKIND - A COMPUTER PROGRAM FOR CALCULATING RADIOLOGICAL CONSEQUENCES AND HEALTH RISKS FROM TRANSPORTATION OF SPENT NUCLEAR FUEL \(C\)](#)

LSN #: DN2002065276 Participant #: MOL.20011019.0045 Document Date: 01/01/1995     C.2 PATHWAY CONSIDERATIONS In RISKIND, three pathways that would lead to human exposure following atmospheric release of radionuclides are used to determine the relative health hazards of one radionuclide versus others in the shipping cask.





DOE [DEPARTMENT OF ENERGY PROGRAMMATIC SPENT NUCLEAR FUEL MANAGEMENT AND IDAHO NATIONAL ENGINEERING LABORATORY ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT PROGRAMS FINAL ENVIRONMENTAL IMPACT STATEMENT INCLUDES USERS GUIDE, SUMMARY, RECORD OF DECISION, VOLUME 1 APPENDICES C-L, APRIL 1995 \(C\)](#)

LSN #: DN2002140852 Participant #: MOL.20010727.0193 Document Date: 04/01/1995     The RADTRAN 4 computer code evaluates six pathways for radiation exposures resulting from an accident. The neutral atmospheric condition results provide a best estimate of the risk.





DOE [MULTIMEDIA ENVIRONMENTAL POLLUTANT ASSESSMENT SYSTEM \(MEPAS\) EXPOSURE PATHWAY AND HUMAN HEALTH IMPACT ASSESSMENT MODELS](#)

LSN #: DN2001667221 Participant #: MOL.19971215.0867 Document Date: 05/01/1995     Exposure Pathway: Swimming External Radiation Radionuclides $SIF_{wer} = TE^{\wedge} FES^{\wedge} FWe ED^{\wedge} e 365.25 (A.71)$ where SIF_{wer} = summary intake factor for external exposure while swimming exposure pathway for radionuclides (h).

NRC [INITIAL ANALYSIS OF SELECTED SITE-SPECIFIC DOSE ASSESSMENT PARAMETERS AND EXPOSURE PATHWAYS APPLICABLE TO A GROUNDWATER RELEASE SCENARIO AT YUCCA MOUNTAIN](#)





LSN #: NRC000020729 Participant #: ML003746421 Document Date: 09/30/1995     INITIAL ANALYSIS OF SELECTED SITE-SPECIFIC DOSE ASSESSMENT PARAMETERS AND EXPOSURE PATHWAYS APPLICABLE TO A GROUNDWATER RELEASE SCENARIO AT YUCCA MOUNTAIN.

DOE [REPOSITORY INTEGRATION PROGRAM, RIP PERFORMANCE ASSESSMENT AND STRATEGY EVALUATION MODEL THEORY MANUAL AND USER'S GUIDE](#)

LSN #: DN2002197535 Participant #: MOL.19970515.0101 Document Date: 11/01/1995     The pathways reflect major features of the hydrologic system and are conduits through which mass transport occurs. Only after developing and





documenting a conceptual model for the pathway network should the pathway data be entered.

DOE [RIP REPOSITORY PERFORMANCE ASSESSMENT AND STRATEGY EVALUATION MODEL: USER'S GUIDE VERSION 4.04](#)





LSN #: DN2001588230 Participant #: ALA.20040321.4374 Document Date: 11/16/1995     The pathways reflect major features of the hydrologic system and are conduits through which mass transport occurs. Only after developing and documenting a conceptual model for the pathway network should the pathway data be entered.

1996





DOE [ACCIDENT ASSESSMENTS FOR NEVADA TEST SITE FACILITIES AND OFF-SITE LOCATIONS](#)

LSN #: DN2002313549 Participant #: MOL.20061019.0254 Document Date: 06/01/1996     RSAC-5 calculates an effective dose' equivalent (EDE) for the external exposure pathways (immersion in plume, from ground surface contamination) and a 50-year CEDE for the internal exposure pathways (inhalation, ingestion).





DOE [TRANSPORTATION ANALYSIS METHODS FOR NAVAL SPENT NUCLEAR FUEL](#)

LSN #: DN2001632351 Participant #: HQO.19961003.0011 Document Date: 08/20/1996     The RADTRAN 4 computer code evaluates six pathways for radiation exposures resulting from an accident. The total radiation exposure for the accident is equal to the sum of the exposure for each pathway.

DOE [FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT, INCLUDES SUMMARY, VOLUME 1 AND VOLUME 2 \(C\)](#)

LSN #: DN2002018093 Participant #: MOL.20010802.0028 Document Date: 09/01/1996     GENII is a general purpose computer code used to model dispersion, transport, and long-term exposure effects of specific radionuclides and pathways.

DOE [NAVAL SPENT FUEL TRANSPORTATION ANALYSIS](#)

LSN #: DEN001382725 Participant #: MOL.19990319.0152 Document Date: 10/01/1996     The RADTRAN 4 computer code evaluates six pathways for radiation exposures resulting from an accident. The total radiation exposure for the accident is equal to the sum of the exposure for each pathway.




DOE [C-14 ATMOSPHERIC RELEASE - 20 KM WITH STOCHASTIC METEOROLOGY ALL PATHWAYS ANALYSIS; C14-20](#)

LSN #: DN2001816115 Participant #: ALC.20050315.6779 Document Date:

10/29/1996    C-14 ATMOSPHERIC RELEASE - 20 KM WITH STOCHASTIC METEOROLOGY ALL PATHWAYS ANALYSIS; C14-20




1997

DOE [BOUNDING HUMAN HEALTH IMPACTS RESULTING FROM THE NO-ACTION ALTERNATIVE](#)




LSN #: DN2002010537 Participant #: ALA.20040321.0476 Document Date: 05/07/1997    Analysis Assumptions - General 1. The analysis estimated bounding human health impacts for releases of radionuclides to the atmospheric and surface-water environmental transport pathways.

1998




DOE [INADVERTENT INTRUSION OF SURFACE-STORED WASTE-FARMER SCENARIO; scenario description](#)

LSN #: DN2001444223 Participant #: ALJ.20050308.3081 Document Date: 02/17/1998    Individuals were assumed to be exposed directly through air and groundwater pathways. Groundwater was not considered as a direct exposure pathway for populations because it is not a substantial water source for the populations considered.




DOE [COMPOSITE ANALYSIS FOR LOW-LEVEL WASTE DISPOSAL IN THE 200 AREA PLATEAU OF THE HANFORD SITE](#)

LSN #: DN2002218160 Participant #: MOL.20060213.0038 Document Date: 03/01/1998    The transport and exposure pathways considered in the Composite Analysis are illustrated in Figure 4.1. Radiological doses from the subsurface transport pathway were analyzed for each source site considered in the Composite Analysis.





DOE [MODELS USED IN THE ENVIRONMENTAL IMPACT STATEMENT PRE-DECISIONAL DRAFT - EIS RELATED INFORMATION; Models Used in EIS-5](#)

LSN #: DN2002026020 Participant #: ALG.20040615.5339 Document Date: 06/24/1998    MODELS USED IN THE ENVIRONMENTAL IMPACT STATEMENT PRE-DECISIONAL DRAFT - EIS RELATED INFORMATION; Models Used in EIS-5 . MODELS USED IN THE ENVIRONMENTAL IMPACT STATEMENT The following models are used in the preparation of the Environmental Impact





DOE [PREDECISIONAL DRAFT TOTAL SYSTEM PERFORMANCE ASSESSMENT & VIABILITY ASSESSMENT OF A REPOSITORY AT YUCCA MOUNTAIN; V30381checked](#)

LSN #: DN2001223484 Participant #: ALA.20050222.7022 Document Date: 07/05/1998    For example, one pathway is from well water to soil via irrigation, from soil to dust via resuspension, from dust to human lungs via inhalation. The external exposure pathway results from proximity to a radiation source that is external to the body.





DOE [DRAFT: CONTINUED STORAGE ANALYSIS REPORT \(CSAR\), REVISION 0G](#)

LSN #: DN2002065053 Participant #: MOL.19981125.0170 Document Date: 10/09/1998     DRAFT: CONTINUED STORAGE ANALYSIS REPORT (CSAR), REVISION 0G. o0i^ d 0 1 w CD C w CD 0. 0 w 0 0 a Source Transport Pathways Exposure Routes Receptors Atmospheric Airborne Pathway Inhalation Overland Pathway Surface Soil Ingestion : Offsite & Onsite





DOE [INFORMATION REQUESTED FOR USE IN THE YUCCA MOUNTAIN REPOSITORY ENVIRONMENTAL IMPACT STATEMENT \(EIS\) - TECHNICAL SUPPORT DOCUMENT FOR TRANSPORTATION ANALYSES FOR NAVAL SPENT NUCLEAR FUEL AND SPECIAL CASE WASTE FOR YUCCA MOUNTAIN ENVIRONMENTAL IMPACT STATEMENT \(C\)](#)

LSN #: DEN001434942 Participant #: MOL.19990105.0186 Document Date: 11/23/1998     This code evaluates the following six pathways for radiation exposures resulting from an accident. The total radiation exposure for the accident is equal to the sum of the dose for each pathway.





DOE [SITE CHARACTERIZATION PLAN \(SCP\) WORKING FILES. \(C\)](#)

LSN #: DN2002075009 Participant #: NNA.19890531.0003 Document Date: 12/01/1988     Exposure of essential workers is controlled by design features and is therefore in the domain of the repository system element. The surface environment also includes longer-term pathways through which public exposure could occur after an accident.

DOE [VIABILITY ASSESSMENT OF A REPOSITORY AT YUCCA MOUNTAIN, TOTAL SYSTEM PERFORMANCE ASSESSMENT VOLUME 3 \(C\)](#)





LSN #: DEN001449216 Participant #: MOL.19981007.0030 Document Date: 12/01/1998     A pathway is the route taken by a contaminant through the biosphere from its source until it interacts with a human. The external exposure pathway results Go in proximity to a radiation source that is external to the body.

DOE [RADIOLOGICAL ASSESSMENTS FOR CLEARANCE OF EQUIPMENT AND MATERIALS FROM NUCLEAR FACILITIES MAIN REPORT; nureg1640V1](#)

LSN #: DN2001024631 Participant #: ALD.20040617.5634 Document Date: 12/01/1998     Inhalation exposure to airborne radionuclides--This pathway includes inhalation of material resuspended from surfaces during handling, processing, and disposal activities; atmospheric releases from refineries; and selected product use activities.


1999

DOE [WASTE RESEARCH STRATEGY \(C\)](#)


LSN #: DN2002341551 Participant #: MOL.20070110.0212 Document Date: 02/01/1999     Research on Indirect Pathway RiskA assessment Methods is

needed to develop, validate, and refine a methodology that estimates exposures from, combustion facilities via indirect (non-inhalation) exposure pathways.


DOE [THIS LETTER PROVIDES NEW TRANSPORTATION ANALYSIS DATA AND SUPERSEDES THE TECHNICAL SUPPORT DOCUMENT FOR TRANSPORTATION ANALYSES FOR NAVAL SPENT NUCLEAR FUEL AND SPECIAL CASE WASTE FOR THE YUCCA MOUNTAIN ENVIRONMENTAL IMPACT STATEMENT SUBMITTED ON NOVEMBER 23, 1998 \(C\)](#)

LSN #: DEN001279411 Participant #: MOL.20000417.0591 Document Date: 05/14/1999  This code evaluates the following six pathways for radiation exposures resulting from an accident. The total radiation exposure for the accident is equal to the sum of the dose for each pathway.

DOE [CHAPTER 9 YUCCA MOUNTAIN EXPOSURE SCENARIOS AND COMPLIANCE ASSESSMENT ISSUES; ch9fnl](#)


LSN #: DN2001337083 Participant #: ALR.20040612.8219 Document Date: 08/31/1999  Due to the ease with which gaseous contaminants are distributed in the atmosphere, human exposure would not be limited to the nearfield population but could extend to the world at large.

DOE [JASON CALCULATION PACKAGE FOR 'ANALYSIS OF ACCIDENTS IN TRANSPORTING SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE FROM 77 GENERATOR SITES TO YUCCA MOUNTAIN,' DATED: OCTOBER 29, 1999 \(C\)](#)


LSN #: DN2001667415 Participant #: MOL.20000209.0119 Document Date: 10/29/1999  The analysis assumed the exposures would be through the pathways of ingestion, groundshine, and resuspension following deposition of radioactive materials from a passing plume.

2000




DOE [REEXAMINATION OF SPENT FUEL SHIPMENT RISK ESTIMATES MAIN REPORT; NUREG-CR 6672.tif](#)

LSN #: DEN001415762 Participant #: ALA.20040610.1426 Document Date: 02/01/2000  REEXAMINATION OF SPENT FUEL SHIPMENT RISK ESTIMATES MAIN REPORT; NUREG-CR 6672.tif . Ir 0 U U N a) 0 4) a) 4-4 O O a 10-1 10-2 10-3 10-4 10-5 10.6 10.7 10-8 10⁹ 10.10 10-11 10-12 10-13 10-14 10-15 10-16 10-17 1 1 I ~ i- 1`- i ~ Y`L I 1 4 I`- i }`

DOE [3. DEVELOPMENT OF TOTAL SYSTEM PERFORMANCE ASSESSMENT; Section 3.0 ICN 01B 2.14Q Review](#)




LSN #: DN2001050853 Participant #: ALA.20040617.1496 Document Date: 11/01/2000  The external-exposure pathway results from 21 proximity to a radiation source that is external to the body. The only external-exposure pathway 22 considered in the biosphere model is exposure to radiation in contaminated soil.

DOE [FINAL TECHNICAL REPORT FOR GRANT DE-FGO1-96EW56093 NEVADA RISK ASSESSMENT/MANAGEMENT PROGRAM \(NRAMP\); finalreport](#)




LSN #: DN2001825148 Participant #: ALB.20050307.4047 Document Date: 06/12/2000    FINAL TECHNICAL REPORT FOR GRANT DE-FGO1-96EW56093 NEVADA RISK ASSESSMENT/MANAGEMENT PROGRAM (NRAMP); finalreport . Table 2. Matrix translating stakeholder risk issues into a technical framework. Source Contaminants Transport Receptors Time Frame

2001




DOE [COMPOSITE ANALYSIS FOR THE AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE AT THE NEVADA TEST SITE, NYE COUNTY, NEVADA, DOE/NV-594, REFERENCE FOR NTS AIR CALCULATION/ANALYSIS DOCUMENTATION IN SUPPORT FOR THE FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE YUCCA MOUNTAIN REPOSITORY, CAL-MGR-ND-000020 \(C\)](#)

LSN #: DN2001678720 Participant #: MOL.20020211.0176 Document Date: 09/01/2001    The atmospheric dispersion is modeled with a Gaussian plume model assuming time-averaged atmospheric conditions. Input atmospheric conditions are annual average frequencies of wind direction, wind speed, and atmospheric stability class.

DOE ['REFERENCE BIOSPHERES' FOR SOLID RADIOACTIVE WASTE DISPOSAL: VOLUME II- BIOMASS METHODOLOGY FOR CREATING ASSESSMENT AND REFERENCE BIOSPHERES BIOMASS THEME 1: FINAL OUTPUT VERSION 3.0, 11/XX/2001; BIOMASS Theme I Volume II](#)





LSN #: DN2001066015 Participant #: ALD.20040618.2062 Document Date: 11/01/2001    Further explanation and details are provided in Annex B, including possibilities for combining exposure pathways to determine exposure group doses. There are, potentially, a great many activities that could lead to human radiation exposures.

84% **DOE** [YUCCA MOUNTAIN SCIENCE AND ENGINEERING REPORT \(PRELIMINARY PREDECISIONAL DRAFT B\), DI: DOE/RW-0539-1, REVISION 1, DECEMBER 2001 \(C\)](#)

LSN #: DN2002388212 Participant #: MOL.20020520.0281 Document Date: 12/01/2001    Inhalation and direct exposure from surface contamination are intensified by the significant outdoor activity of a farming lifestyle.

DOE [YUCCA MOUNTAIN SCIENCE AND ENGINEERING REPORT, TECHNICAL INFORMATION SUPPORTING SITE RECOMMENDATION CONSIDERATION, DOE/RW-0539-1, REVISION 1, DRAFT C, JANUARY 2002, REFERENCE CHECK COPY \(C\)](#)





LSN #: DN2002138993 Participant #: MOL.20020729.0083 Document Date:

12/18/2001     Ibis water cord then eventually reach the earth's surface through tile pumping of well water (CRW MS M&O 20006(1, Section Potential cooler. welter future climate (glacial-Iran- position) could fleet biosphere pathways and performance assessment.

2002





DOE [FINAL ENVIRONMENTAL IMPACT STATEMENT FOR A GEOLOGIC REPOSITORY FOR THE DISPOSAL OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE AT YUCCA MOUNTAIN, NYE COUNTY, NEVADA, DOE/EIS-0250, FINAL VERSION \(C\)](#)

LSN #: DN2002069980 Participant #: MOL.20020524.0316 Document Date:



02/01/2002     Figure K-6 shows the potential exposure pathways. The assumed configuration for the K-14 , x 0 0 Source Transport pathways Exposure routes Receptors Atmospheric Airborne pathway The following sections discuss the method for each pathway.



DOE [YUCCA MOUNTAIN SCIENCE AND ENGINEERING REPORT TECHNICAL INFORMATION SUPPORTING SITE RECOMMENDATION CONSIDERATION; SER.PDF](#)

LSN #: DN2002046869 Participant #: ALB.20040622.2041 Document Date:



02/01/2002     Inhalation and direct exposure from surface contamination are Parameters associated with the ingestion intensified by the significant outdoor activity of a pathway for the current climate updated and farming lifestyle.



NRC [Chapter 3 of Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, Volume I - Impact Analyses.](#)

LSN #: NRC000015191 Participant #: ML032690357 Document Date: 02/28/2002  

  Persons can be exposed to radiation from nuclear power reactors through atmospheric and aquatic pathways. The total dose commitments from both pathways for individual sites varied from a high of 3.7 person-rem to a low of 0.0015 person-rem.





NRC [Evaluation of the Proposed High-Level Radioactive Waste Repository at Yucca Mountain Using Total System Performance Assessment Phase 6.](#)

LSN #: NRC000014981 Participant #: ML033460402 Document Date: 02/28/2002  

  However, radioactive vapour, gas or aerosol within the atmosphere can represent an inhalation hazard, which can potentially be a significant exposure pathway for some radionuclides


DOE [APPENDIX K LONG-TERM RADIOLOGICAL IMPACT ANALYSIS FOR THE NO-ACTION ALTERNATIVE; EIS_K_BM.PDF](#)

LSN #: DN2002058913 Participant #: ALB.20040622.1816 Document Date:

03/04/2002     Figure K-6 shows the potential exposure pathways. Potential


exposure pathways associated with degradation of spent nuclear fuel and high-level radioactive waste. The following sections discuss the method for each pathway.

DOE [6.2 BIOSPHERE MODEL FOR THE GROUNDWATER RELEASE EXPOSURE SCENARIO; Biosphere Model Groundwater 7_23_02](#)


LSN #: DN2001760372 Participant #: ALD.20040618.2011 Document Date: 07/23/2002  The latter exposure pathway applies to the exhalation of ²²²Rn from soil followed by its decay in the atmosphere through a series of short-lived progeny and to gaseous evasion of ¹⁴C from soil.

2003


DOE [PRECLOSURE SAFETY ANALYSIS GUIDE; PSAG_RIC_formatted+s.doc](#)

LSN #: DN2000965810 Participant #: ALD.20040610.9739 Document Date: 07/01/2003  Dose calculations consider potential exposure pathways, including inhalation, ingestion, air submersion, and groundshine.

DOE [YMP FEP DATABASE REPORT \(DTN 4.000\) CHANGES FOR DTN 6.000; ChangesforDTN6_4](#)


LSN #: DN2001829579 Participant #: ALC.20040824.6402 Document Date: 07/28/2003  YMP FEP DATABASE REPORT (DTN 4.000) CHANGES FOR DTN 6.000; ChangesforDTN6_4 . Deposition of surficial materials can occur by a variety of means, including fluvial, aeolian, and lacustrine deposition and redistribution of soil through weathering and

DOE [YMP FEP DATABASE REPORT -- 07/31/2003 \(DTN 4.000\); Appendix FEP List from 07_31_03](#)


LSN #: DN2001294398 Participant #: ALZ.20040617.8469 Document Date: 07/31/2003  Existing practices may play a significant role in determining exposure pathways and dose. 2.4.09.02.0A Animal farms and Domestic livestock or fish could become contaminated Bio fisheries through the intake of contaminated feed, water, or soil.

2004

DOE [YMP FEP DATABASE REPORT; DTNLA_diffs.txt](#)


LSN #: DN2002071847 Participant #: ALA.20041227.6783 Document Date: 05/17/2004  Exposure pathways might be influenced by building materials and location. Existing practices may play a significant role in determining exposure pathways and dose.

DOE [3.6 UNSATURATED ZONE TRANSPORT; Section 3 Part3 no figs](#)


LSN #: DN2001170363 Participant #: ALA.20040617.2065 Document Date: 06/10/2004  The inhalation pathways involves breathing dust during outdoor

activities such as farming and recreation. The external exposure pathway results from proximity to a radiation source that is external to the body.


DOE [CHAPTER 8 RADIOLOGICAL PATHWAYS THROUGH THE BIOSPHERE: yucca bid 060501_ch8](#)

LSN #: DN2001817359 Participant #: ALC.20040824.2779 Document Date: 06/25/2004  Air Pathway from Abandoned Borehole In addition to the ground water pathway, an uncapped, abandoned borehole that penetrates into the repository could provide a path for waste materials to be released to the atmosphere.


DOE [YMP FEP DATABASE REPORT- - 8/25/2004 REPORT GENERATED BY: FREEZEG ON WBS-00133 TMRB-2004-061 INITIAL CONTROL VERSION- DERIVED FROM DTN: MO0407SEPFELA.000 WITH CHANGES; LA FEP List DTNLAPlusTMRB 08-20-03](#)

LSN #: DN2002077586 Participant #: ALA.20050323.4938 Document Date: 08/25/2004  Included (Bio) Bio water, foodstuffs and drugs Consumption of food, water, soil, drugs, etc., will affect human exposure to radionuclides.

DOE [RIT BDCF-Sensitivity-REV 00A29](#)


LSN #: DN2001837645 Participant #: ALD.20050321.1589 Document Date: 09/08/2004  Pathway Contributions for the Groundwater Exposure Scenario and Present-Day Climate Pathway Contributions for the Groundwater Exposure Scenario and Future Climate Uncertainty Associated with the Major Exposure Pathways for Selected Radionuclides

DOE [FINAL BACKCHECK COPY AND DIRS, BIOSPHERE DOSE CONVERSION FACTOR IMPORTANCE AND SENSITIVITY ANALYSIS, ANL-NBS-MD-000014, REVISION 00, DRAFT H \(C\)](#)

LSN #: DN2001907968 Participant #: MOL.20041201.0271 Document Date: 10/12/2004  Pathway Contributions for the Groundwater Exposure Scenario and Present-Day Climate Pathway Contributions for the Groundwater Exposure Scenario and Future Climate Uncertainty Associated with the Major Exposure Pathways for Selected Radionuclides

2005




DOE [YMP Draft Positions 02-01 Rev 2](#)

LSN #: DN2001805792 Participant #: ALA.20050411.3446 Document Date: 02/18/2005  These equations are appropriate for the exposure pathways that the staff routinely considers in its evaluations. Position 5 is applicable except for dose limits for liquid pathways.




2006

DOE [DESIGN DOCUMENT \(DD\) FOR GENII V2.02 \(C\)](#)




LSN #: DN2002386633 Participant #: MOL.20060907.0165 Document Date:

08/21/2006    EXPOSURE PATHWAYS MODULES Three exposure pathway modules are provided in the GENIIv.2.02 software package. The chronic exposure component allows evaluation of exposure from routine releases to air or water.




DOE [MODELING THE INHALATION EXPOSURE PATHWAY IN PERFORMANCE ASSESSMENT OF GEOLOGIC RADIOACTIVE WASTE REPOSITORY AT YUCCA MOUNTAIN \(MARK-UP\) \(C\)](#)

LSN #: DN2002284867 Participant #: MOL.20061017.0087 Document Date: 08/21/2006    MODELING THE INHALATION EXPOSURE PATHWAY IN PERFORMANCE ASSESSMENT OF GEOLOGIC RADIOACTIVE WASTE REPOSITORY AT YUCCA MOUNTAIN (MARK-UP) (C) In this paper, the use of the enhancement factor in the inhalation exposure models is discussed.

DOE [NEA_FEPS](#)




LSN #: DN2002279296 Participant #: ALA.20060921.0558 Document Date: 08/30/2006    NEA_FEPS . I 049" "Weather (hurricanes and tornadoes)",(WIDEMEMO),"I 057" "Colloid formation (natural and vault generated)",(WIDEMEMO),"I 058" "Concrete (influence on vault chemistry)",(WIDEMEMO),"I 061" , "Concrete (incorrect structural

DOE [A PRELIMINARY STRATEGY FOR MODELING DOSE AT THE YUCCA MOUNTAIN SITE](#)




LSN #: DN2000030737 Participant #: ALA.20040303.4797 Document Date: 09/01/1992    Exposure occurs externally through direct contact with contaminated air, water, or ground surfaces. Inadvertent ingestion of soil may also be included as an internal exposure pathway.

2007

DOE [RADIONUCLIDE SCREENING SCI-PRO-003 CONCURRENCE COPY \(C\)](#)

LSN #: DN2002409320 Participant #: LLR.20070501.0223 Document Date: 02/01/2007    The eruptive volcanic event bypasses the groundwater and releases radioactive effluents directly into the atmosphere. In contrast, the eruptive volcanic event bypasses the groundwater and injects radionuclides directly into the atmosphere.

DOE [GENII VERSION 2 SOFTWARE DESIGN DOCUMENT \(C\)](#)

LSN #: DN2002370842 Participant #: MOL.20070314.0030 Document Date: 03/01/2007    Transport may be via the atmosphere, surface water, or groundwater media. Exposure pathways linked to the chronic exposure model are those associated with air exposure (inhalation and external exposure), contact with soil 12 ,


90% **DOE** [DESIGN DOCUMENT FOR GENII VERSION 2.05 \(VERIFICATION COPY\) \(C\)](#)

LSN #: DN2002406485 Participant #: MOL.20070529.0266 Document Date: 03/14/2007    EXPOSURE PATHWAYS MODULES Three exposure pathway

modules are provided in the GENIIv.2.05 software package. Exposure pathways in the acute exposure model include: 1. Air Exposure (inhalation)

 [RADIONUCLIDE SCREENING FINAL CHECK COPY \(C\)](#)

LSN #: DN2002409666 Participant #: LLR.20070501.0225 Document Date: 03/20/2007

 The eruptive volcanic event bypasses the groundwater and releases radioactive effluents directly into the atmosphere. In contrast, the eruptive volcanic event bypasses the groundwater and injects radionuclides directly into the atmosphere.