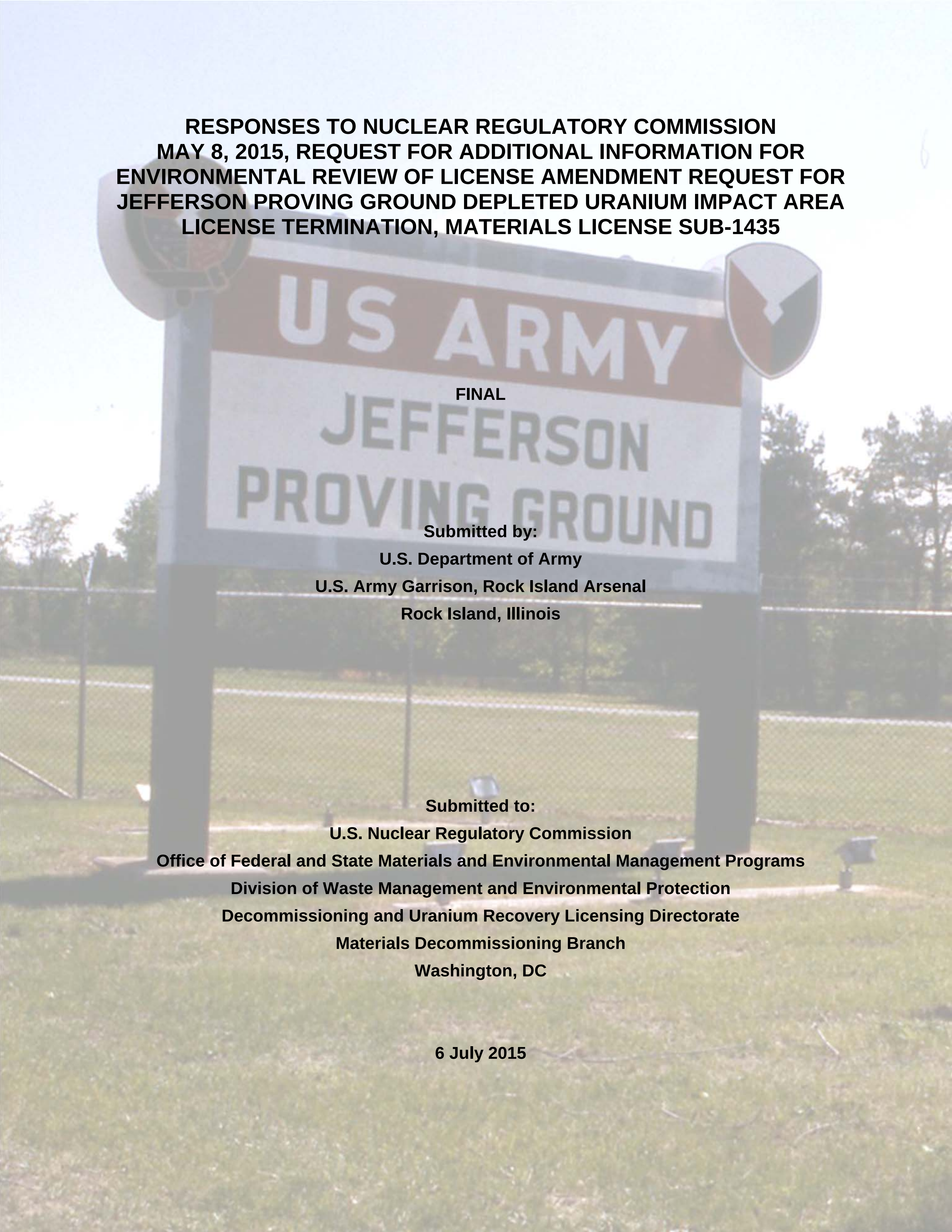

RESPONSES TO NUCLEAR REGULATORY COMMISSION MAY 8, 2015, REQUEST FOR ADDITIONAL INFORMATION FOR ENVIRONMENTAL REVIEW OF LICENSE AMENDMENT REQUEST FOR JEFFERSON PROVING GROUND DEPLETED URANIUM IMPACT AREA LICENSE TERMINATION, MATERIALS LICENSE SUB-1435

FINAL

Submitted by:

U.S. Department of Army

U.S. Army Garrison, Rock Island Arsenal

Rock Island, Illinois

Submitted to:

U.S. Nuclear Regulatory Commission

Office of Federal and State Materials and Environmental Management Programs

Division of Waste Management and Environmental Protection

Decommissioning and Uranium Recovery Licensing Directorate

Materials Decommissioning Branch

Washington, DC

6 July 2015

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INTRODUCTION

On May 8, 2015, the U.S. Nuclear Regulatory Commission (NRC) provided the U.S. Army with Requests for Additional Information (RAIs) to support NRC's evaluation of the Army's proposed license amendment application requesting termination of Materials License SUB-1435 for the Jefferson Proving Ground (JPG) Depleted Uranium (DU) Impact Area in Jefferson County, Indiana dated August 2013. The license amendment application included a Decommissioning Plan (DP)(U.S. Army 2013a) and an Environmental Report (ER)(U.S. Army 2013b). The RAIs include thirteen categories of questions about the DP and ER, as noted below:

- General (GEN) – RAI GEN-1,
- Purpose and Need (PN) – RAI PN-1,
- Regulatory Requirements (RR) – RAI RR-1,
- Alternatives (ALT) – RAIs ALT-1 and ALT-2,
- Land Use (LU) and Geology (GEO) – RAI LU/GEO-1,
- Water Resources (WR) – RAIs WR-1 to WR-9,
- Air Quality (AQ) – RAIs AQ-1 and AQ-2,
- Climate Change (CC) – RAI CC-1,
- Public and Occupational Health (POH) – RAIs POH-1 to POH-5,
- Cumulative Impacts (CI) – RAIs CI-1 to CI-5,
- Mitigation Measures (MM) – RAIs MM-1 and MM-2,
- Cost-Benefit (CB) – RAIs CB-1 to CB-5, and
- Additional information needs – Environmental Report (ER) and Decommissioning Plan (DP) figures for the Environmental Impact Statement (EIS).

Each RAI is organized as follows:

- Question – The NRC's question on the subject RAI is stated.
- Basis – This section describes NRC's basis for the question posed.
- Response – This section provides the Army's response to the question posed.
- Response References – References cited in the Army's response are detailed.

The references cited in NRC's questions and/or bases are included at the end of this document.

REFERENCES

U.S. Army. 2013a. Decommissioning Plan for Materials License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

U.S. Army. 2013b. Environmental Report for License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

NRC. 2015. Request for Additional Information for Environmental Review of License Amendment Request for Jefferson Proving Ground Depleted Uranium Impact Area License Termination, Materials License SUB-1435. Letter from Lydia Chang (NRC) to Colonel Elmer Speights, Jr. (Garrison Commander – Rock Island Arsenal). May 8.

GENERAL (GEN)

RAI GEN-1

Provide annotated input/output (I/O) files in an electronic format for the following modeling described in the ER (U.S. Army, 2013a): the groundwater modeling described in Appendix B, and the surface water and sediment DU fate and transport modeling described in Appendix E.

BASIS

In its assessment of environmental impacts of the proposed action and alternatives to the proposed action in the EIS, the NRC staff will be reviewing the inputs to and outputs from all of the Army's groundwater and surface water and sediment DU fate and transport modeling to conduct quality assurance (QA) on and independently verify the results of the modeling described in the ER (U.S. Army, 2013a) and also in the DP (U.S. Army, 2013b). The staff recognizes and appreciates that the I/O files for this modeling were informally provided to the NRC by the Army following our meeting at JPG on January 12, 2015; and those files were very helpful to the staff in its preliminary reviews leading to the development of the present set of RAIs. However, the content of the I/O files is, in many instances, not transparent. In order for the NRC staff to perform its independent evaluation of the modeling results and, if necessary, to perform its own simulations, the staff needs to clearly understand the content of each of the input and output files and how these files relate to the modeling reported in the ER and DP. In addition, to properly reference the I/O files in the EIS, the NRC staff needs the Army to formally submit the requested annotated I/O files to the NRC.

RESPONSE

An annotated description of the input/output (I/O) files used for the column modeling described in Appendix B of the ER (U.S. Army 2013a) is provided in Table RAI GEN-1-1. The file names for the Base Case are provided in RAI GEN-1-1. Similar naming conventions also were used for the sensitivity runs shown in Appendix B, Table 4-6. Table RAI GEN-1-2 provides the root file names for the main input and output files for each of the column model sensitivity runs conducted using the Finite Element Heat and Mass Transfer (FEHM) model included in Appendix B. The electronic files are provided on digital versatile disk (DVD) within the folder entitled "RAI GEN-1" within the subfolder entitled "Column Model." Also note the dispersivity value was set to near zero (1×10^{-30} m) for all column model simulations.

The annotated groundwater model I/O files from the MODFLOW-SURFACT™ (HydroGeoLogic 1996) and electronic files are provided in response to RAI WR-6.

The annotated description of I/O files for the surface water modeling using Hydrological Simulation Program – Fortran (HSPF) described in Appendix E of the ER (U.S. Army 2013a) is provided in Table RAI GEN-1-3. The electronic files are provided on DVD within the folder entitled "RAI GEN-1" within the subfolder entitled "Surface Water Model." Note that Table RAI GEN-1-3 and the electronic files included here also address RAI WR-5.

Table RAI GEN-1-1. Annotated Input and Output Files for FEHM Column Model

Descriptions of FEHM Model (Version 3.2) Input and Output Files			
Input files			
File Name	**Description**	**Application**	**Report Location**
Fehm.files	Contains all input/output (I/O) files name.	I/O file information is provided to the FEHM code from this input control file.	--
JPG.geom	Contains coordinates of all model nodes.	This file provides the coordinates (X, Y, Z) of all 2,025 nodes. The model was discretized into 5 nodes by 5 nodes in the x-y plane and 81 nodes in the z(vertical) direction for 2,025 total nodes. Same geometry is used in all column model simulations.	Figure 4-3, Appendix B
JPGkd4_Kx_39_4 mPerYr.in	Contains collection of FEHM macro control statements.	The main input file that provides input, model run control, and output instructions. Following macros were used: • *node*: node numbers for output and time history for contaminates. • *airwater*: isothermal air-water input • *rlp* : relative permeability input • *sol*: solver specifications • pres: initial pressure, temperature, and saturation • *rock*: density, specific heat, and porosity • *hyco*: hydraulic conductivity • time: time step and time of simulation. • *ctrl*: program control parameters. • *flow*: flow input data • *iter*: iteration parameters • *trac*: solute simulation input • *stop*: signals the end of input	Table 4-4, Appendix B
Output files			
File Name	**Description**	**Application**	**Report**
JPGkd4_Kx_39_4 mPerYr.out	The main output file of the model.	This provides information about code version, date and time, summary of I/O files used, macro used, cpu time, head, pressure at the selected nodes, etc.	--
JPGkd4_Kx_39_4 mPerYr.trc	Contains solute concentration at different time or depth over the simulation period for the selected nodes.	The concentration over time or depth curves can be developed using this file.	Figure 4-4, Appendix B
Fehm.err	This file contains the code version number, date, and time followed by any error or warning messages issued by the code during a run.	This file is used to identify and fix the error/warning while writing the main input file.	--

Table RAI GEN-1-2. Root File Nomenclature for Column Model Sensitivity Runs Listed in Appendix B, Table 4-6 of ER

Sensitivity Run	FEHM Root File Name
1	JPGkd189_Kx_445mPerYr
2	JPGkd189_Kx_4450mPerYr
3	JPGkd189_Kx_2point2mPerYr
4	JPGkd189_Kx_39_4mPerYrRecharge12inchperyr
5	JPGkd591_Kx_39_4mPerYr
6	Run6

Table RAI GEN-1-3. Annotated Input and Output Files for HSPF Surface Water Model

JPG HSPF Surface Water Model Files	*Description*	*Application to Appendix E, Env. Report, 2013*
Basecase simulations (2006-2011)	**Calibrated Surface Water Model**	--
JPG_108_D313_040713_cali_basecase.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	Tables 3-1, 3-2, 4-2 to 4-6, and 8-1
JPG_108_D313_cali_base.out	A text output file - has flow, sediment and DU mass and flux results, etc	Table 4-8 (subbasins 5, 114)
JPG_108_cali_base.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-7 (SAET, SURO, IFWO, AGWO, PETX), and Figures 4-12, 4-13, 4-15, 4-16, 5-3, 5-4
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	Tables 4-1 and 4-7 (col 2), Figure 4-11, 4-12, 4-13, 4-14, 4-16
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
Additional subbasins printed	Same as base case, only modified flags to print output at additional subbasins	--
JPG_108_D313_041013_outp_basecase.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_D313_cali_outp.out	A text output file - has flow, sediment and DU mass and flux results, etc	Table 4-8 (subbasins 1, 2, 8, 15, 21, 110, 117, 122, 128), Tables 8.2, 8-3
JPG_108_cali_oupt.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	--
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
Sediment Yield for Various Land Uses	Similar to base case, evaluation of sediment yield from various land uses	--
JPG_108_D313_041513_sen1.uci	HSPF Basecase Project file, has i/o user control input	Tables 5-1 to 5-6 (basecase)
JPG_108_D313_cali_sen1.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_cali_sen1.wdm	contains sediment yield (SOSED, tons/ac) timeseries by Land Use (basecase)	Tables 5-7, 5-8 (basecase)
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
Long-term Basecase run (2013-2509)		--
Subbasins 110, 114, 129		--
JPG_108_D313_040613_basecase.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_basecase.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_basecase.wdm	wdm output timeseries (SAET, stage, DU dissolved, adsorbed, etc)	Figures 6-3, 6-4, 6-7, 6-8, 7-1, 7-6, 7-7, 7-8
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--
Subbasins 5, 128 printout		--
JPG_108_D313_040913_base2.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_basecase2.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_basecase2.wdm	wdm output timeseries (DU dissolved, adsorbed, etc)	Figures 6-5, 6-6, 7-3, 7-4
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--
Subbasins 15, 117 printout		--
JPG_108_D313_040913_base3.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_basecase3.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_basecase3.wdm	wdm output timeseries (DU dissolved, adsorbed, etc)	Figures 7-2, 7-5
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--

Table RAI GEN-1-3. Annotated Input and Output Files for HSPF Surface Water Model (continued)

JPG HSPF Surface Water Model Files	*Description*	*Application to Appendix E, Env. Report, 2013*
Sensitivity Simulations (2006-2011)	Sensitivity simulations pertaining to surface water flow (flow budgets and hydrograph shape)	--
INFILT sensitivity run (flow):	Infiltration Capacity	--
JPG_108_D313_040813_sens_infilt.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_sens_infilt.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_sens_infilt.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
INFILD sensitivity run (flow):	ratio of maximum to mean infiltration capacity	--
JPG_108_D313_040813_sens_infild.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_sens_infild.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_sens_infild.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
INFEXP sensitivity run (flow):	Exponent in infiltration equation (higher value results in higher peak runoff hydrograph)	--
JPG_108_D313_040813_sens_infexp.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_sens_infexp.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_sens_infexp.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
LZSN sensitivity run (flow):	Lower Zone Nominal Storage	--
JPG_108_D313_040813_LZSN.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_sens_research.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_LZSN.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10, Figure 4-18
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
AGWRC sensitivity run (flow):	Basic groundwater recession rate	--
JPG_108_D313_040913_agwrc.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_agwrc.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_agwrc.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10, Figure 4-17
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
IRC sensitivity run (flow):	Interflow recession parameter	--
JPG_108_D313_040913_irc.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_irc.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_irc.wdm	A wdm file- output timeseries (flow, stage, sediment, DU, etc)	Table 4-10, Figure 4-17
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
UZSN sensitivity run (flow):	Upper zone nominal storage	--
JPG_108_D313_040913_uzsn.uci	HSPF Project file, has subbasin/reach parameters, i/o user control input	--
JPG_108_uzsn.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_uzsn.wdm	A wdm file - output timeseries (flow, stage, sediment, DU, etc)	Table 4-10, Figure 4-18
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--

Table RAI GEN-1-3. Annotated Input and Output Files for HSPF Surface Water Model (continued)

JPG HSPF Surface Water Model Files	*Description*	*Application to Appendix E, Env. Report, 2013*
Sensitivity Simulations (2006-2011)	Sensitivity simulations pertaining to surface water flow (flow budgets and hydrograph shape)	
Sediment transport sensitivity simulations		
JRER sensitivity Sediment Transport run (2006-2011)	Rainfall intensity power function exponent	--
JPG_108_D313_041513_sen2.uci	HSPF Basecase Project file, has i/o user control input	--
JPG_108_D313_cali_sen2.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_cali_sen2.wdm	sediment yield (SOSED, tons/ac) timeseries by Land Use (JRER sensitivity)	Table 5-8 (JRER)
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
KRER sensitivity Sediment Transport run (2006-2011)	Rainfall intensity power function intercept	--
JPG_108_D313_041513_sen3.uci	HSPF Basecase Project file, has i/o user control input	--
JPG_108_D313_cali_sen3.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_cali_sen3.wdm	sediment yield (SOSED, tons/ac) timeseries by Land Use (KRER sensitivity)	Table 5-8 (KRER)
JPG_20121109.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
test_001.wdm	A wdm file - DU source timeseries (used only for testing DU source)	--
Long-term Sensitivity runs (2013-2509)		--
Kd=429 sensitivity run		--
JPG_108_D313_040613_429Kd.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_429Kd.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_429Kd.wdm	wdm output timeseries (DU dissolved, adsorbed, etc)	Figures 6-7, 6-8
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--
Kd=7004 sensitivity run		--
JPG_108_D313_040613_7004Kd.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_7004Kd.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_7004Kd.wdm	wdm output timeseries (DU dissolved, adsorbed, etc)	Figures 6-7, 6-8
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--
Long-term Sensitivity runs (2013-2114)		
Dissolution rate sensitivity run		--
JPG_108_D313_041513_dissolution.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_dissolution.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_dissolution.wdm	wdm output timeseries (DU dissolved, adsorbed, etc)	Figures 6-9, 6-10
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--
Climate Change sensitivity run		--
JPG_108_D313_040713_Climate_change.uci	HSPF Project file, has i/o user control input	--
JPG_108_D313_Climate.out	A text output file - has flow, sediment and DU mass and flux results, etc	--
JPG_108_Climate.wdm	wdm output timeseries (SAET, stage, DU dissolved, etc)	Figures 7-6, 7-7, 7-8
JPG_20130211.wdm	wdm file - input timeseries (PREC, ATEM, PEVT,flow, stage, etc)	--
JPG_20130405.wdm	wdm file - input timeseries (ATEM, PEVT,etc), for climate change	--
DU_003.wdm	A wdm file - DU source timeseries (used only for testing)	--

PURPOSE AND NEED (PN)

RAI PN-1

Provide additional information and justification relevant to the Army's proposed discontinuation of the Environmental Radiation Monitoring (ERM) program upon license termination, including – but not limited to – data from other, similar sites.

BASIS

In EPA Region 5's EIS scoping comments (EPA, 2014), on page 2 under the *Site Safety* section, the EPA stated, "If environmental monitoring is not proposed, the draft EIS should provide rationale for the decision not to monitor, preferably using data from other, similar sites...." (emphasis added). Because the Army's proposed action, as described in the ER and DP, includes discontinuation of the ERM program upon license termination, the NRC staff needs the requested information to provide complete and adequate justification for this action in the NRC's EIS and to fully address EPA Region 5's concern about the discontinuation of environmental monitoring. The EIS also needs to adequately address public and stakeholder concerns about the Army's proposed discontinuation of the ERM program upon license termination, as documented in Section 13.4 and Appendix G of the DP (U.S. Army, 2013b) and the transcript of the NRC's EIS Public Scoping Meeting held on December 3, 2014 (NRC, 2014). Thus, EPA Region 5 and stakeholders will be expecting a detailed discussion of this matter to be included in the NRC's EIS.

RESPONSE

A comprehensive environmental monitoring program has been employed at JPG from initiation of DU testing to the present day that evaluates soil, sediment, surface water, and groundwater. Samples have been collected and analyzed semiannually for total uranium and, often, the isotopic composition of uranium, from 1984 to 1994. Sampling conducted since 2000 has not identified increasing or decreasing trends and all results are below action levels (CHPPM 2001; 2002a,b; U.S. Army 2003, 2013a,b). The environmental data indicate that the expected concentrations of uranium or DU are significantly less than the derived concentration guideline (DCGL) of 35 pCi/g for soil and 150 picocuries per liter (pCi/L) for surface water and groundwater (U.S. Army 2000). In addition, uranium activity contained in surface water and groundwater samples are present at concentrations that are a small percentage of the applicable 150 pCi/L action level (i.e., 50 percent of the water effluent standards specified in 10 CFR 20, Appendix B [U.S. Army 1996]). Results from only four samples exceeded USEPA's 30 µg/L (9 pCi/L) Safe Drinking Water Act (SDWA) maximum contaminant level (MCL). Results from the following samples collected from standing pools of water (i.e., limited or no water flow) where overland flow from the 500 Center trench intersects with Big Creek (JP-W-05) exceeded the MCL: July 2008 at 22 ± 4.4 (filtered) and 20 ± 4.1 (unfiltered) pCi/L and October 2008 at 18 ± 3.5 (filtered) and 20 ± 3.8 (unfiltered) pCi/L.

The approach to discontinue monitoring also is supported by the technical analysis performed by NRC staff to understand impacts of disposal of large quantities of DU. The technical analysis documented in SECY-08-0147, which is entitled "Response to Commission Order CLI-05-20 Regarding Depleted Uranium" (October 8, 2008), supports the protectiveness of quantities of DU that significantly exceed the source term at JPG. Although technical observations of this evaluation include the fact that "the groundwater pathway is limiting at humid sites," groundwater sampling data and modeling results for JPG indicates that DU migration downgradient from the DU Impact Area at JPG is generally non-detectable. The disposal site source term is also notable in that it is much greater than that at JPG (i.e., 700,000 metric tons from U.S. Department of Energy [DOE] and 700,000 metric tons from the operation of commercial uranium enrichment facilities versus a source term in the JPG DU Impact Area at JPG of about 73,500 kilograms [73.5 metric tons]). The much lower source term at JPG in

combination with site-specific hydrological and geochemical conditions serve to limit the potential for significant environmental migration and to negate the value of continued environmental monitoring.

With respect to data from other, similar sites, the U.S. Department of Defense (DOD) has performed soft impact testing of DU munitions at Aberdeen Proving Ground in Maryland, Jefferson Proving Ground in Indiana, and Yuma Proving Ground in Arizona. Although this testing has involved similar objectives, operations, and munitions, the sites at which the testing has been performed involve different environmental conditions. For example, Aberdeen Proving Ground is located in an area adjacent to the Chesapeake Bay and Yuma Proving Ground is located in a hot, arid climate. As such, conditions at these facilities are not similar to those at JPG. In addition, review of approximately 20 additional DOD installations that possessed DU generally indicates that:

- The magnitude of the source term differed significantly from that at JPG;
- Other sites do not pose UXO issues comparable to those at JPG;
- Other sites commonly lend themselves to decommissioning to 10 CFR 20, Subpart E, unrestricted use criteria;
- Some sites commonly involve hard impact testing;
- Some sites involve indoor range facilities; and
- Other sites involve much different environmental conditions.

As a result, data from other sites are of limited value when trying to assess whether the ERM Program should be discontinued.

In light of results from ERM sampling and given that the maximum radiation dose to the average member of the critical group within and downgradient of the DU Impact Area equates to only 27.3 mrem, even in the event of loss of institutional controls, the Army had not considered the continuation of sampling under the ERM Program necessary during the development of the Decommissioning Plan (U.S. Army 2013c) and Environmental Report (U.S. Army 2013d). However, the Army recognizes continued sampling may be necessary to monitor potential future releases of DU to ensure protection of human health and the environment.

REFERENCES

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CHPPM. 2002a. Industrial and Environmental Radiation Survey No. 26-MF-8260-R2-01, U.S. Army Jefferson Proving Ground, Madison, Indiana, 22-23 October 2001. 2 January.

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U.S. Army. 2013a. Radiation Monitoring Report for License SUB-1435, Jefferson Proving Ground, Summary of Results for the March-April 2012 Sampling Event. Final. Submitted to U.S. Department of Army, U.S. Army Garrison, Rock Island Arsenal, Rock Island, Illinois. Prepared by Science Applications International Corporation, McLean, Virginia. January.

U.S. Army. 2013b. Radiation Monitoring Report For License SUB-1435, Jefferson Proving Ground, Summary of Results for October 2012 Sampling Event. Final. Prepared by SAIC for U.S. Army. April.

U.S. Army. 2013c. Decommissioning Plan for Materials License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

U.S. Army. 2013d. Environmental Report for License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

REGULATORY REQUIREMENTS (RR)

RAI RR-1

Provide a description of the applicable U.S. Department of Defense (DOD), Army, and other Federal, State, and/or local statutory and regulatory authorities, requirements, programs, roles and responsibilities, and oversight roles that apply to the DU Impact Area and the DU within it and to the unexploded ordnance (UXO) and related munitions constituents within and surrounding the DU Impact Area at JPG. With regard to DU, the NRC is interested in any potential statutory and regulatory responsibilities separate from any related to the NRC license and associated NRC regulation and oversight.

BASIS

The NRC staff could not find any description in the ER of the DOD's and Army's statutory and regulatory responsibilities, or of any other Federal (non-NRC), State, and local regulatory and oversight authority over DU and the DU Impact Area and over UXO and the related munitions constituents at JPG. This information is needed to support the NRC staff's description and evaluation of applicable statutory and regulatory requirements and of cumulative impacts in the NRC's EIS. Such information, to the extent that it is available, is needed for the NRC staff to describe all applicable statutory and regulatory requirements in the EIS, as required in Section 5.1.4 on page 5-4 of the NRC's "*Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*" (NUREG-1748) (NRC, 2003). (NMSS is the NRC's Office of Nuclear Materials Safety and Safeguards.)

In EPA Region 5's EIS scoping comments (EIS, 2014), on page 2 under the *Compliance with other Laws & Statutes* section, the EPA stated, "The draft EIS should list all required permits associated with the proposed action, and explain how compliance with other laws and statutes will occur."

The requested information is also needed to support the NRC staff's evaluation of cumulative impacts in the EIS. The presence of the UXO left in place by the Army and that will be remaining in place at JPG within and surrounding the DU Impact Area would be considered a past, a present, and a reasonably foreseeable future action in relation to the proposed action, which must be addressed by the NRC staff in the cumulative impact analysis in the EIS. (See the Cumulative Impacts RAIs presented later for the basis/justification of the needs for additional information from the Army for the EIS cumulative impacts analysis.) Understanding the applicable statutory and regulatory authorities, requirements, programs, roles/responsibilities, and oversight roles that apply to UXO and related munitions constituents within and surrounding the JPG DU Impact Area is an important part of evaluating the potential environmental impacts because these factors can affect the nature and magnitude of impacts that are possible, whether or not potential environmental impacts are monitored so they can be identified, and whether or not response actions would need to be taken to mitigate any identified impacts.

RESPONSE

This RAI to be addressed in conjunction with RAIs related to CI from UXO, MCs, and non-radiological impacts from DU. The Army plans to provide response to RAI RR-1 by October 1, 2015.

ALTERNATIVES (ALT)

RAI ALT-1

Provide any official Army or other DOD documentation of the decision to leave the DU in place in the DU Impact Area at JPG. Also, provide any official Army or other DOD documentation of the decision to leave the UXO in place at JPG. In addition, provide copies of any letters, other correspondence, or written agreements between the Army (or DOD) and the Governor of Indiana and/or between the Army (or DOD) and other Federal, State, or local agencies regarding the Army's plans to leave the DU and UXO in place at JPG.

BASIS

Under the Army's proposed action described in Section 2.1.2 starting on page 2-1 of the ER (U.S. Army, 2013a), the NRC would terminate Material License SUB-1435 under restricted conditions, and the DU (and UXO) would be left in place within the DU Impact Area. The NRC staff understands that the Army's decision to leave the UXO in place at the DU Impact Area directly results in the Army's decision to leave the DU in place as well (due to the hazards and expense of having to remove the UXO prior to removing the DU). The NRC staff further understands that the Army plans to leave the UXO in place in the other areas of JPG north of the firing line. The requested documentation regarding the Army's plans to leave the DU and UXO in place at JPG is needed to support the NRC staff's assessment of the acceptability of the proposed action and reasonable alternatives to the proposed action in the EIS.

The requested information regarding the UXO is also needed to support the NRC staff's evaluation of cumulative impacts in the EIS. The presence of the UXO left in place by the Army and that will be remaining in place at JPG within and surrounding the DU Impact Area would be considered a past, a present, and a reasonably foreseeable future action in relation to the proposed action, which must be addressed by the NRC staff in the cumulative impact analysis in the EIS. (See the Cumulative Impacts RAIs presented later for the basis/justification of the needs for additional information from the Army for the EIS cumulative impacts analysis.) Understanding the Army's/DOD's decision to leave the UXO and related munitions constituents in place within and surrounding the JPG DU Impact Area is an important part of evaluating the potential environmental impacts.

RESPONSE

On October 8, 1940, the U.S. Army Chief of Ordnance acknowledged a need for the construction of an additional proving ground to carry out simultaneously and without interruption the many activities relative to proof work of the ordnance manufacturing program. In December 1940, the site acquisition committee decided on an approximate 55,000 acre (230 km²) tract of land in southern Indiana because of its proximity to surrounding industry and land availability. Construction began immediately and the first round was fired at U.S. Army Jefferson Proving Ground (JPG) on May 10, 1941. JPG is located in Jefferson, Jennings and Ripley Counties in southeastern Indiana approximately eight miles north of the Indiana-Kentucky border.

As JPG was developed, a firing line with 268 gun positions was created to perform production and post-production tests of conventional ammunition components and other ordnance items and to conduct tests of propellant ammunition/weapons systems and components for the U.S. Army line military munitions for acceptance. In April 1953, JPG reached a pinnacle of employment and activity, with 1,774 employees and a testing rate of 175,000 rounds fired monthly. The firing line acted as a point of separation/division for JPG. That portion of JPG north of the firing line (approximately 51,000 acres) was where the main/principal fired/tested munition impact areas were located. The portion of JPG south of the firing line (approximately 4,000 acres) was the location of the administrative, housing, storage, and infrastructure support for the facility.

As part of its munitions testing program, the Army test fired non-explosive tank depleted uranium

(DU) projectiles at JPG. The DU proof test firings were conducted under Nuclear Regulatory Commission (NRC) Materials License SUB-1435. The test firing of DU projectiles at JPG began on March 18, 1984 and concluded on May 2, 1994. Individual penetrators were fired from 105-millimeter (mm) tank guns each round weighing approximately 8.5 pounds (lbs) (3.9 kilograms [kg]). Penetrators were also fired from 120-mm tank guns each round weighing approximately 10.7 lbs (4.9 kg).

Approximately 220,462 lbs (100,000 kg) of DU projectiles were fired from three JPG gun positions on the firing line at soft targets spaced at 1,000 meter intervals into the 2,080 acre JPG DU Impact Area north of the firing line. Approximately 58,423 lbs (26,500 kg) of DU projectiles and projectile fragments were recovered during periodic (approximately every 6 months) surface sweeps of the DU Impact Area under the escort/supervision of explosive ordnance disposal (EOD) technicians.

On May 3, 1988 pursuant to existing law (Federal Advisory Committee Act), Secretary of Defense Frank Carlucci established the Defense Secretary's Commission of Base Realignment and Closure. Congress shortly thereafter enacted Public Law (P.L.) 100-526 (Defense Authorization Amendments and Base Closure and Realignment Act, specifically Title II, Sections 201 through 209) on October 24, 1988.

The Base Realignment and Closure (BRAC) committee created by P.L. 100-526 subsequently identified 77 military bases for closure and 6 bases for realignment. In accordance with P.L. 100-526, JPG was one of the 77 bases identified for closure not later than September 30, 1995.

Pursuant to P.L. 100-526, Section 204 (b), "Management and Disposal of Property. (1) The Administrator of General Services shall delegate to the Secretary, with respect to excess and surplus real property and facilities located at a military installation closed or realigned under this title – (A) the authority of the Administrator to utilize excess property under section 202 of the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 483); (B) the authority of the Administrator to dispose of surplus property under section 203 of that Act (40 U.S.C. 484); (C) the authority of the Administrator to grant approvals and make determinations under section 13(g) of the Surplus Property Act of 1944 (50 U.S.C. App. 1622 (g))."

The distinction between "excess" and "surplus" Federal real property is of importance regarding the issue of transfer/disposal. The Base Reuse Implementation Manual (BRIM) (DoD 4165.66-M) dated December 1997 defined "excess" and "surplus" property as follows:

- "Excess property – Any property under the control of a Military Department that the Secretary concerned determines is not required for the needs of the Department of Defense."
- "Surplus property – Any excess property not required for the needs and the discharge of the responsibilities of all Federal agencies. Authority to make this determination, after screening with all Federal agencies, rests with the Military Departments."

While the BRIM was not formally issued until December 1997, the working definitions for real property categories were utilized during the property screening process at JPG in 1995 (as were the "excess" and "surplus" property definitions of the Federal Property Administrative Services Act of 1949, see 40 United State Code Sections 483 and 484 (40 U.S.C. 483 and 484) for additional and almost identical definitions for "excess" and "surplus" property that were in effect at the time of the JPG "Determination of Surplus."

Additionally, under the requirements of P.L. 100-526, Section 204 (b)(2)(D), "Before any action may be taken with respect to the disposal of any surplus real property or facility located at any military installation to be closed or realigned under this title, the Secretary shall consult with the Governor of the State and the heads of the local governments concerned for the purpose of considering any plan for the use of such property by the local community concerned."

A "Determination of Surplus" for JPG was drafted by the Chief of the Department of Army (DA) BRAC Office, Real Estate Division on November 15, 1994, and approved by Mr. Paul W. Johnson

(Deputy Assistant Secretary of the Army [Installations and Logistics, Environment]) on November 29, 1994 (Enclosure 1). This "Determination of Surplus" was incorporated into a "Notice of Surplus Determination Government Property" issued on March 9, 1995 (Enclosure 2). As indicated in this Notice of Surplus Determination Government Property, page 2, "All property north of Parcel 1, including the northernmost 2,200 acres more or less of Parcel 1, is potentially contaminated with varying amounts of unexploded ordnance (UXO). Due to excessive costs and limited technology, the Army will not clear Parcels 2, 3, 4, 5 and the northernmost part of Parcel 1 of UXO, including the area requested by the U.S. Fish and Wildlife Service. Any development/use of the property north of Parcel 1 is permanently subject to the Department of Defense Explosive Safety Board's policies and regulations. Property in Parcel 1 south of the firing line will be cleared of UXO by the Army." It should be noted that the parcels identified in this "Determination of Surplus" (Parcels 1 – 5) total 9,942.46 acres, leaving approximately 45,311 acres of JPG that remained defined as "excess" real property under the ownership of the Army. With this "Determination of Surplus" (November 29, 1994) (Enclosure 1), the Army announced that it would not be removing/clearing the UXO north of the firing line at JPG on all of the property north of Parcel 1, including the northern most 2,200 acres more or less of Parcel 1.

The real property screening process for JPG was conducted as indicated in the "Determination of Surplus" property (Enclosure 1), "This property was screened against the needs of the Department of Defense from 26 August 1989 to 25 September 1989 with negative results. The property was then screened against the needs of Federal agencies from 1 August 1992 to 1 September 1992, whereby, formal interest was received from the Department of Interior, Fish and Wildlife Service for transfer of 53,000 acres, area north of the firing range, for wildlife refuge." The U.S. Fish and Wildlife Service (FWS) provided a written formal JPG property request letter dated March 28, 1994 (Enclosure 3).

However, upon further review, in a letter dated April 19, 1995, the Department of Interior, FWS withdrew their request for the approximate 53,000 acres of property at JPG for the reasons specified in this letter (Enclosure 4). One of the specific reasons for the withdrawal of the request for property at JPG was, "Since the Army has determined that most UXO cleanup north of the firing line is not financially or technically feasible, we believe that all UXO liability and full responsibility for public safety related to UXO should remain with the Army. The Service is unwilling to assume responsibility for the unknown and potentially large tort risk."

Specific to the matter of the JPG restricted release license termination/decommissioning, the NRC published a proposed rule ("Radiological Criteria for Decommissioning") in the Federal Register (FR) on August 22, 1994 to address among other issues the matter of restricted release license termination (see 59 FR 43200 - 43232) with a public comment period for the proposed rule ending on December 20, 1994.

Subsequent to the NRC proposed rule of August 22, 1994, and public comment period (December 20, 1994), the Army on February 16, 1995 (Enclosure 5) sent a letter to the NRC regarding the issue of DU at JPG. As indicated in this letter, paragraph three, "For that portion of NRC license SUB-1435 associated with the impact area, JPG is requesting an exemption under 10 CFR 40.14 for a restricted reuse termination. This request is based upon the presence of a high concentration of Unexploded Ordnance in the impact area, the high cost, environmental damage and extreme personnel safety concerns any remediation in this area would create." Further on in paragraph three the letter states, "In addition, under the proposed NRC rule, "Radiological Criteria for Decommissioning" found at Volume 59 Federal Register (FR) notice, page 43200 (59 FR 43200) et seq, issued August 22, 1994, JPG reserves the right to request a termination of that portion of license SUB-1435 applicable to the impact area under this restricted reuse criteria upon promulgation of a final rule." The NRC issued a Final rule, "Radiological Criteria for License Termination" on July 21, 1997 (see 62 FR 39058) that addressed the subject of restricted release license termination for NRC licensees. It is clear from the Army letter of February 16, 1995 to the NRC just after the NRC's proposed rule to address restricted

release license termination comment period that the Army informed the NRC of its intent to leave the DU and UXO in place at JPG.

To further identify those areas of JPG with the potential for the presence of UXO, the Army developed an Archive Search Report for JPG (USACE 1995). The *Archives Search Report for Ordnance and Explosive Waste, Volume I, Appendix D* (USACE 1995) provides a comprehensive list of ammunition tested at JPG. In Section 6.2 (Recommendations) of Volume III of the Archives Search Report – North of the Firing Line (North of K Road/Main Impact Area), June 1995, page 6-1, states "No areas north of the firing line were identified in this study that would not warrant further action prior to release from the government for civilian use."

Additionally, in September 1995 the Army issued the Final Environmental Impact Statement (EIS) Disposal and Reuse of the Jefferson Proving Ground Madison (U.S. Army 1995). As indicated in this EIS, page 4-42, Figure 4-12, the JPG DU Impact Area has an estimated UXO concentration of 85 high explosive rounds of UXO per acre. Put into perspective, this JPG DU Impact Area estimated UXO concentration equates to over 11 high explosive UXO rounds per 6,000 square feet (the size of a typical residential housing lot).

Using the Consumer Price Index inflation calculator (BLS 2015) and inputting the $7.87 Billion dollars (1992 dollars) that an unrestricted cleanup of the entire JPG facility was estimated to cost from the Final Study Cleanup and Reuse Options U.S., Army Jefferson Proving Ground Madison, Indiana, October 15, 1992 (Mason and Hanger 1992), Executive Summary, page ES-2 and Section 7 (Summary and Conclusions), page 7-1, results in a cost adjusted for inflation since 1992 of approximately $13.27 billion dollars. As Mason and Hanger (1992) estimated it would take up to 25 years to complete this cleanup, it can therefore be assumed that the $13.27 billion dollars would increase significantly again, approaching $20 billion dollars by the completion of the cleanup.

The State of Indiana is a non-agreement state with the NRC. Indiana has not entered into any agreement with the NRC to exercise any regulatory authority over byproduct, source, or special nuclear materials transferred from the NRC to the State of Indiana in accordance with the Atomic Energy Act of 1954, section 274. In addition, even if Indiana were an agreement state with regulatory authority over by product, source, or special nuclear materials within the state of Indiana, "Any applicant, other than a Federal agency or Federally recognized Indian tribe, who wishes to possess or use licensed material in one of these Agreement States should contact the responsible officials in that State for guidance on preparing an application" (NRC 2015a). Also see NRC Jurisdictional Determination (NRC 2015b), Section III.C.1.a., "Reservations and General Precedents, Section 274b Agreement, as implemented by 10 CFR Part 150, does not transfer regulatory authority to the States over the following: Activities of Federal Agencies located in Agreement States." Since Indiana is a non-agreement state, and JPG is part of the U.S. Army, which is a Federal agency, no such contact or notification between the Army for JPG and the State of Indiana was or is required by NRC regulations with regards to the possession/use of DU at JPG.

A search of the NRC web site for any letters/correspondence between the State of Indiana and the NRC regarding the issue of Indiana obtaining Agreement state status for byproduct, source, or special nuclear materials (NRC 2015c) results in a "no letters found" result, indicating further that the State of Indiana has had no correspondence with the NRC regarding the assumption of regulatory authority for byproduct, source, or special nuclear materials in the State of Indiana. However, the Army did provide a courtesy "Copy furnished" copy of the February 16, 1995 Army letter (Enclosure 5) to the NRC to the State of Indiana, specifically the Indiana Department of Environmental Management (Mr. John Manley) and the Indiana Department of Public Health (Ms. Jane Smith). Thus, the State of Indiana was informed of the intent of the Army to not cleanup the DU or UXO at JPG as of February 16, 1995.

REFERENCES

1. BLS (U.S. Department of Labor Bureau of Labor Statistics). 2015. BLS Consumer Price Index (CPI) Inflation Calculator. http://www.bls.gov/data/inflation_calculator.htm.
2. NRC (U.S. Nuclear Regulatory Commission). 2015a. "Directory of Agreement State and Non-Agreement State Directors and State Liaison Officers," http://nrc-stp.ornl.gov/asdirectory.html.
3. NRC. 2015b. Agreement State Program Letters and Documents, http://nrc-stp.ornl.gov/procedures/sa500.pdf.
4. NRC. 2015c. FSME (former Office of Federal and State Materials and Environmental Management Programs was merged with the Office of Nuclear Material Safety and Safeguards [NMSS] effective October 5, 2014) Letters. https://scp.nrc.gov/asletters/.
5. USACE (U.S. Army Corps of Engineers). 1995. Archives Search Report for Ordnance and Explosive Waste, Chemical Warfare Materials, Jefferson Proving Ground, Madison, Indiana; Volume 1 – Records Review and Interviews. Prepared by U.S. Army Corps of Engineers, St. Louis District. June.
6. U.S. Army. 1995. Final Environmental Impact Statement for Disposal and Reuse of the Jefferson Proving Ground. U.S. Army Materiel Command (AMCSO). Alexandria, Virginia. September.
7. Mason and Hanger, Silas Mason Co., Inc. 1992. Final Study Cleanup and Reuse Options, Jefferson Proving Ground, Madison, Indiana. 15 October.
8. Enclosure 1 (provided on DVD within folder entitled "RAI ALT-1"): Determination of Surplus (excess Real Property and Related Personal Property): Approved November 29, 1994, Date report of excess accepted: November 30, 1994.
9. Enclosure 2 (provided on DVD within folder entitled "RAI ALT-1"): Notice of Surplus Determination Government Property Issued: March 9 1995.
10. Enclosure 3 (provided on DVD within folder entitled "RAI ALT-1"): Department of Interior, U.S. Fish and Wildlife Service written formal request letter of March 28, 1994.
11. Enclosure 4 (provided on DVD within folder entitled "RAI ALT-1"): Department of Interior, U.S. Fish and Wildlife Service written formal withdrawal of request for property at JPG of April 19, 1995.
12. Enclosure 5 (provided on DVD within folder entitled "RAI ALT-1"): Army letter of February 16, 1995 to NRC regarding in part the Army's "right to request a termination of that portion of license SUB-1435 applicable to the impact area under this restricted reuse criterial upon promulgation of a final rule."

RAI ALT-2

Provide additional information/clarification concerning the Army's plans to discontinue maintenance of the barricades (i.e., the pad locked metal swing gates) on improved and unimproved roads accessing the DU Impact Area. This information should include: (i) whether the metal gates will be left in place or removed if NRC Materials License SUB-1435 is terminated; (ii) if the metal swing gates are removed, whether any other institutional measure(s) will be implemented by the Army or some other agency to control and restrict access to the DU Impact Area via the roads (and if implemented, what the control measure(s) will be); and (iii) if the metal gates are left in place or replaced with some alternate control measure(s) following license termination, whether the U.S. Fish and Wildlife Service (USFWS) and/or the Indiana National Air National Guard (INANG)/U.S. Air Force (USAF) will be responsible for maintaining the metal gates or alternate control measure(s) under the Memorandum of Agreement (MOA) between the Army, USFWS, and USAF (provided in Appendix B of the DP [U.S. Army, 2013b]), or under some other agreement.

BASIS

In Section 3.2 on page 3-6 of the ER (U.S. Army, 2013a), the Army states, "Upon license termination, the Army will no longer maintain the swing gates approaching the DU Impact Area because these barricades are a requirement of the license…." Although the Army plans to discontinue maintenance of the swing gates on the roads accessing the DU Impact Area if the materials license is terminated, it is unclear if these barricades will be left in place, removed, or replaced with some alternate control measure(s); and if left in place or replaced, if the gates or alternate control meaure(s) will be maintained by the USFWS and/or the INANG/USAF under the MOA or some other agreement. Specifically, the MOA states, "All roads approaching the DU area shall be barricaded and marked with radiation safety signs" (see page 1, number 3 of MOA Enclosure 5 – Air Force Infrastructure Maintenance Responsibilities). The Army needs to clarify whether the barricades would be left in place, removed, or replaced; and left in place or replaced, which agency would be responsible for maintenance. The NRC staff needs the requested information to understand whether or not institutional controls will be implemented to control or restrict access to the DU Impact Area following license termination, and what those institutional controls would consist of if implemented. This information is needed to supplement the staff's description of the proposed action in the EIS.

RESPONSE

As noted in Section 1.3.2 of the ER (U.S. Army 2013a), institutional controls proposed by the Army include "Continued maintenance of the locked road barricades north of the firing line in accordance with the MOA (U.S. Army 2000)." In addition, the following selected excerpts from the DP (U.S. Army 2013b) are provided:

- Section ES.7 of the DP (i.e., "Restrictions Used to Limit Doses"), notes that "Additional access controls are applied to the DU Impact Area, including locked barricades on access roads and signs around the perimeter…"
- Section 2.1 (page 2-3) of DP states that "INANG also maintains the barricades on access roads to the footprint of the PGM range and interior areas north of the firing line."
- Section 2.2 (Transportation) of the DP indicates, "All roads approaching the DU Impact Area remain barricaded with pad locked metal swing gates."
- Section 2.11.7.1 of the DP states that "Institutional controls for JPG include…maintenance of barricades on interior roads accessing the DU Impact Area."
- Although not explicitly stated in the DP, the Army will maintain the "CAUTION RADIOACTIVE MATERIAL" signs on the barricades and along the perimeter of the DU Impact Area.

In summary, the U.S. Army, as property owner, will continue to maintain barricades on improved and unimproved roads accessing the DU Impact Area after license termination. Required maintenance

may be detailed in future revisions of the Memorandum of Agreement (MOA) between the U.S. Army, FWS, and INANG/U.S. Air Force or in similar agreements with other organizations, as appropriate. In addition, although formal five-year reviews are not contemplated, the Army will include site security during institutional control oversight.

REFERENCES

U.S. Army. 2000. “Standard Operating Procedure (SOP). Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program, JPG, Indiana.” SOP No. OHP 40-2. 10 March.

U.S. Army. 2013a. Environmental Report for License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

U.S. Army. 2013b. Decommissioning Plan for Materials License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

LAND USE (LU) AND GEOLOGY (GEO)

RAI LU/GEO-1

Provide the geographical coordinates (Latitude, Longitude, Universal Transverse Mercator (UTM), or other coordinate system) of the area delineating the DU Impact Area as described in the ER (U.S. Army, 2013a).

BASIS

The geographical coordinates defining the DU Impact Area are needed by the NRC staff to accurately evaluate the land use, geologic, and water resource conditions in this area and to prepare various maps and illustrations for the EIS. Further, the geographical coordinates are needed by the NRC staff to accurately define the extent of the area affected by DU and to accurately compare data on land use, geologic conditions, and water resources presented by the Army and others to conditions in the DU Impact Area.

RESPONSE

The coordinates for the four corners of the JPG DU Impact Area projected into the UTM coordinate system are provided in Table LU-GEO-1-1. These coordinates are located in UTM Zone 16N based on the North American Datum (NAD) 1983.

Table RAI LU/GEO-1-1. Latitudes and Longitudes for JPG DU Impact Area Corners

Latitude	Longitude
636510.5625	4308299.500
638134.3288	4308353.321
638240.2955	4303076.344
636619.6040	4303032.791

WATER RESOURCES (WR)

RAI WR-1

Provide the results of additional uranium transport modeling using the vadose zone soil column model described in Section 4 of Appendix B (Groundwater Modeling) of the ER (U.S. Army, 2013a), which extend until the time of peak simulated concentrations at the base of the soil column. In addition, perform and provide the results of sensitivity analyses/tests to determine the effect of the uranium distribution coefficient (K_d) on the time to peak concentration using the full range of K_ds based on rainwater sorption and desorption (R_d) values reported in Table 4-3 of ER Appendix B. Include simulations in the sensitivity analyses in which the upper 7.5 feet (ft) of the soil column consists of Cincinnati/Rossmoyne soil. Also include in the sensitivity analyses the case where the annual recharge rate is as high as 0.3 meters/year (m/yr) [12 inches/year (in/yr)] (ER Appendix B, page 4-11).

All simulations and sensitivity analyses requested in this RAI should be performed assuming that essentially all of the uranium from the DU penetrators has been released to the soil during the approximately 100-year period shown in Figure 4-1 of ER Appendix B. Provide a written report detailing the parameters and boundary conditions used in the requested simulations and sensitivity analyses and graphs or tables showing the time histories of relative concentrations in the effluent from the column models and uranium concentrations in the soil.

BASIS

The Army provided simulations of uranium transport through the soil column in the DU Impact Area in Appendix B of the ER (U.S. Army, 2013a). These simulations were performed for a period of 1,000 years assuming a constant source of uranium in the surficial soil. Based on the distribution coefficient K_ds for uranium used in these simulations, the average travel time of uranium in the loess-derived soil comprising the upper 0.6 meter (m) (2 ft) of the column model would be greater than 1,000 years; thus, the Army concluded that the concentration of dissolved uranium reaching the water table during the 1,000-year simulation period would be *de minimis* except for the case where the depth to the water table was 0.6 m (2 ft).

However, the 1,000-year timeframe used by the Army in the simulations described above does not apply to the NRC staff's assessment of environmental impacts in the EIS in accordance with the NRC's guidance for implementing the requirements of NEPA. As discussed in Section 4.2.5.1 on page 4-12 of the NUREG-1748 (NRC, 2003), "The impacts should be assessed [in an EIS] over the expected lifetime of the action (e.g., expected duration of the site) and beyond." Also, in Section 4.2.5 on page 4-11 of NUREG-1748, it is specified that long-term impacts are to be considered in the impact assessment of an EIS (in addition to direct, indirect, cumulative, short-term, beneficial, and negative impacts). Furthermore, a prudent NEPA strategy is to estimate the maximum impacts under an alternative, and these impacts become an upper bound for likely impacts. To date, the Army has not specified a date by which DU penetrators, DU fragments, and DU-contaminated soil would be removed from the DU Impact Area; and in Section 1.3.2 on page 1-7 of the ER (U.S. Army, 2013a), the Army states, "…the Army is not planning to conduct any cleanup, retrieval, or any other remedial activities regarding the approximate 73,500 [kilograms] kg [162,040 pounds (lb)] of DU remaining in the DU Impact Area." Therefore, the NRC staff must assume for the EIS that the duration of the DU Impact Area site containing DU could exist over an undefined period of time that could be well beyond 1,000 years. Additionally, the uranium from the DU penetrators could travel through the soil column and eventually impact groundwater after 1,000 years. For these reasons, an estimate of the ultimate travel time and mass flux to groundwater is needed from the Army for the NRC staff to assess the ultimate environmental impacts even if they occur after 1,000 years.

Based on the Army's calculations of the corrosion and dissolution rates of the DU penetrators presented in the ER, nearly all of the uranium from the DU penetrators would be released to the soil within 100 to

120 years (Figure 4-1 of ER Appendix B). This uranium would represent an essentially fixed initial mass of uranium in the soil column that could potentially move downward for as long as water infiltrates into the soil, unless it is removed by surface erosion, although its movement through the soil column might be very slow if the K_ds presented in the ER are indeed representative of the site. However, review of Appendix D (Distribution Coefficient K_d Study Report) of the ER (U.S. Army, 2013a) indicates that there are numerous uncertainties and inconsistencies present in the results and analyses that lead to the final recommended K_d values for soils at JPG used in the Army's modeling. Thus, the K_d values used in the transport model described in Appendix B of the ER should reflect the range of uncertainty in the estimated K_d values and their natural variability in the soil. Additional analyses and justification would be required to exclude possible K_d values that are as much as an order of magnitude lower than the minimum values used in the transport model.

RESPONSE

During the 5 June 2015 conference call between NRC, the Army, and their contractors to discuss questions and clarifications on selected NRC RAIs, the Army noted additional time would be required to complete the additional uranium transport modeling using the soil column model extending the duration until the time of peak simulated concentrations at the base of the soil column. This modeling includes sensitivity analyses using the full range of soil K_d vales reported in Table 4-3 of ER (U.S. Army 2013), Appendix B and defining the source term for uranium concentrations used in the column model to be consistent with those estimated from geochemical modeling pursuant to RAI WR-7 (see below). The Army proposes to provide response to RAI WR-1 by October 1, 2015.

REFERENCES

U.S. Army. 2013. Environmental Report for License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

RAI WR–2

Provide information on (i) current impairments of Clean Water Act (CWA) Section 303(d) listed water bodies crossing the boundaries of the JPG site (both north and south of the firing line) plus water bodies within 16 km [10 miles (mi)] of the JPG boundary into which streams crossing the JPG site flow, and (ii) how the proposed action may affect the impairments either positively or detrimentally.

BASIS

In EPA Region 5's EIS scoping comments (EPA, 2014), on page 1 under the *Water Quality* section, the EPA stated, "The draft EIS should analyze how the proposed action may affect CWA Section 303(d) listed water bodies and their listing status as impaired. We recommend this section of the document discuss current impairments and how the proposed action may affect the impairment, either positively or detrimentally." Because transport of uranium leached from DU penetrators, DU fragments, and DU corrosion products via surface water represents a significant potential pathway for migration of uranium from the DU Impact Area (Section 4.3.1 of the ER [U.S. Army, 2013a]), the NRC staff needs the requested information to address EPA Region 5's concern about how the proposed action may affect current impairments of CWA Section 303(d) listed water bodies within and downgradient of the DU Impact Area. In addition, this information is needed to assess the potential environmental impacts in the EIS of uranium on surface water use within and downgradient of JPG (e.g., on livestock and wildlife watering and on recreational uses such as fishing).

RESPONSE

Due to potential impacts from responses to RAI WR-1, the Army proposes to provide response to RAI WR-2 by October 1, 2015.

RAI WR-3

Provide Microsoft Excel spreadsheets, or a database that can be converted into Microsoft Excel spreadsheets, containing the results of all surface water, groundwater, soil, sediment, and deer tissue data reported in the Data Presentation Tables in Appendix F of the ER (U.S. Army, 2013a). Specifically, provide the Microsoft Excel spreadsheets or database containing the data in the following Data Presentation Tables:

- Summary of Groundwater Quality Parameters (pages F-640 to F-647)
- Summary of Surface Water Qaulity Parmeters (pages F-648 to F-651)
- Summary of Soil Sampling Field Records (pages F-659 to F-669)
- Total and Isotopic Uranium Results for Soil and Sediment Samples (pages F-670 to F-697)
- Total and Isotopic Uranium Results of Surface Water and Groundwater Samples (pages F-698 to F-722)
- Deer Tissue (pages F-723 to F-733)
- Nonradiological Data for Soil Samples (pages F-734 to F-824)
- Nonradiological Data for Surface Water Samples (pages F-825 to F-844)
- Nonradiological Data for Soil Samples (page F-845)
- K_d Batch Testing Data for Leachant Samples (pages F-846 to F-883)
- Soil Characteristics for Modeling (pages F-884 to F-885)
- ERM Surface Soil Samples (pages F-886 to F-895)
- Nonradiological Groundwater Data (pages F-896 to F-925)

BASIS

The NRC staff needs to perform independent evaluation for the EIS of the statistical distribution of the various radiological and non-radiological constituents detected in environmental samples from JPG. In addition, the NRC staff needs to compare the analytical data in the Data Presentation Tables in Appendix F of the ER (U.S. Army, 2013a) with parameters such as primary and secondary drinking water standards, soil release limits, and NRC dose limits, to independently evaluate the impacts of the proposed action on human health and safety and the environment. The data in the tables of results of analyses of surface water, groundwater, soil, sediment and deer tissue provided in the portable data files of Appendix F of the ER are not amenable to being extracted in one of the forms requested, to support such statistical analyses and comparisons.

RESPONSE

The electronic files are provided on DVD within the folder "RAI WR-3."

RAI WR-4

Provide the results of surface water and sediment transport simulations that consider the effects of future climate conditions over the timeframes estimated in Section 6.4 of Appendix E (Surface Water Flow, Sediment, and Depleted Uranium Fate and Transport Model) of the ER (U.S. Army, 2013a) over which uranium would be released into the surface water from corrosion of DU penetrators. In Section 6.4 of ER Appendix E, it is estimated all uranium from corrosion of DU penetrators would be released in the Big Creek basins to surface water in approximately 1,000 years and would be released in the Middle Fork Creek basins to surface water in 10,000 years. The requested surface water and sediment transport simulations should consider the following climate change influences: (i) the frequency and intensity of precipitation events, (ii) the frequency and intensity of floods, (iii) the ambient air temperature, and (iv) the ecosystem. The surface water and sediment transport simulations should also include the in-growth of uranium decay products that could increase the concentration of radiological constituents in the source term for surface water, or the rationale for not including the in-growth of daughter products in the source term for surface water should be explained.

In addition, using the calibrated surface water model as described in Appendix E, Section 3, of the ER (U.S. Army, 2013a), for the current and future climate conditions and climate change influences over the timeframes as developed in response to the above request, provide calculations of the average annual mass of uranium transported as uranium adsorbed onto suspended sediment and uranium mass transported as uranium adsorbed onto bed load sediment at the downstream boundaries of (i) subbasins 15 and 16 on Middle Fork Creek, (ii) subbasin 122 on Big Creek, and (iii) subbasin 129 at the confluence of Big Creek and Middle Fork Creek. For each of the subbasin boundaries, provide the calculations of suspended and bed load sediment transport for the base case composite K_d value of 2,200 milliliters/gram (mL/g) (ER Appendix E, page 6-9) and for the desorption test composite K_d value of 429 mL/g and the sorption test composite K_d value of 7,004 mL/g (ER Appendix E, page 6-15). As above, the surface water and sediment transport simulations should also include the in-growth of uranium decay products which could increase the concentration of radiological constituents in the source term for surface water, or the rationale for not including the in-growth of daughter products in the source term for surface water should be explained.

The results should include a write-up explaining the development of the model simulations, annotated input and output files for all the simulations performed to respond to this RAI, tabular listings of the requested calculations, and appropriate graphics illustrating the results of the simulations.

BASIS

Surface water is the primary pathway by which uranium can be transported from the DU Impact Area to the environment outside JPG. Surface water and sediment transport simulations need to account for the effects of climate change to properly estimate the magnitude (i.e., concentrations or doses) of uranium released into the environment. On December 24, 2014, the CEQ released revised draft guidance describing how Federal agencies should consider the effects of climate change in their evaluation of all Federal actions in their NEPA reviews (CEQ, 2014). This guidance explains that Federal agencies should consider both the potential effects of a proposed action on climate change and the implications of climate change for the environmental effects of a proposed action.

The simulations of uranium transport by surface water and sediment under future climate conditions reported in Section 7.2 of Appendix E of the ER (U.S. Army, 2013a) only considered an increase in ambient air temperature over 100 years even though the modeling covered 500 years. The effect of increased temperature as reported in the ER was to increase evapotranspirative losses and reduce runoff. However, climate change can also change the frequency and intensity of precipitation events, the frequency and intensity of floods, and ecosystems (U.S. Global Change Research Program (GCRP), 2014). These climate change influences can affect surface water runoff, soil erosion, and sediment

transport which, in turn, can affect uranium transport by surface water and sediment**.** The NRC staff needs the results of surface water and sediment transport simulations that include the effects of future climate change to fully and independently evaluate potential uranium transport (in both the dissolved form and attached to sediment) and to evaluate potential uranium concentrations in onsite and offsite surface water and sediments. To account for the effects of climate change, the meteorological record used in the surface water and sediment transport simulations should be modified by the Army based on climate information from the GCRP. For example, "*Climate Change Impacts in the United States: The Third National Climate Assessment*" (GCRP, 2014) provides climate modeling information for the Midwest United States on the frequency and intensity of future precipitation, the frequency of future flood events, ambient air temperatures, and the ecosystem.

Furthermore, the calibrated surface water and sediment transport model described in Section 6.2, Appendix E, of the ER (U.S. Army, 2013a) was based on a uranium source term proportional to the time over which uranium was estimated to be released into the soil from corrosion of the DU penetrators (Figure 6-4, ER Appendix E). The description of the calibrated source term in Section 6.3 (Critical Parameters) of ER Appendix E states that the uranium source term or release rate for the Big Creek basins was one-ninth of the rate indicated in Figure 6-4. On that basis, it would take approximately 963 years (107 years times 9) to release all of the uranium in the Big Creek basins to surface water. The release rate for the Middle Fork Creek basins was reduced by a factor of 100, so it would take approximately 10,000 years to release the uranium to surface water. The NRC staff needs the surface water and sediment transport simulations to be conducted over the timeframe ranging from 1,000 to 10,000 years to capture the time of peak simulated uranium concentrations in surface water and sediments. In addition, the NRC staff needs the surface water and sediment transport simulations to include the in-growth of uranium decay products, which could potentially increase the concentration of radiological constituents released to surface water and sediment from corrosion of the DU penetrators. The results of surface water and sediment transport simulations conducted beyond 1,000 years, which include in-growth of uranium decay products, are needed to fully evaluate in the EIS the potential radiological constituent concentrations in onsite and offsite surface water and sediments and, in turn, the potential doses to onsite and offsite receptors.

Additionally, the NRC staff needs the calculation of uranium-bearing sediment mass loading that include the effects of future climate change and the in-growth of uranium daughters, over the timeframe ranging from 1,000 to 10,000 years, to fully and independently evaluate potential uranium transport and to evaluate potential uranium concentrations in onsite and offsite sediments in the EIS and to capture the time of peak simulated uranium concentrations in sediments. Uranium can be transported in the streams leaving JPG dissolved in surface water, adsorbed onto suspended sediment, and adsorbed onto bed load sediment that moves along the beds of the streams draining from the DU Impact Area. Assuming, as the Army did in performing the surface water modeling (Appendix E, Section 5.1, page 5-2, of the ER [U.S. Army, 2013a]), that no net accumulation of sediment occurs in the beds of Big Creek and Middle Fork Creek within the JPG boundary, sediment carrying absorbed uranium will leave JPG and enter the surface water system downstream from JPG. Ultimately, any uranium that does not remain in the DU Impact Area will be transported out of JPG via Big Creek and Middle Fork Creek, then into the main channel of Big Creek, and then to the Muscatatuck River and downstream water bodies where it will mix with sediment from the drainage basins of these water bodies. The calculation of the uranium-bearing sediment mass loading from the DU Impact Area is necessary for the NRC staff to assess the potential offsite impacts (i.e., downgradient of the JPG boundary) of the proposed action and its alternatives in the EIS. The information on the surface water model simulations reported in Sections 6.4 and 6.5 of ER Appendix E does not include the suspended and bed load sediment transport rates needed for the NRC staff to assess uranium mass loadings to surface water downstream from the DU Impact Area and downstream of JPG. Simulations for a range of K_d values are needed because partitioning between dissolved and adsorbed uranium is strongly related to the K_d value.

RESPONSE

During the 5 June 2015 conference call between NRC, the Army, and their contractors to discuss questions and clarifications on selected NRC RAIs, the Army noted additional time would be required to address the effects of climate change on fate and transport, as determined through additional evaluation of surface water and sediment transport modeling simulations that consider the effects of future climate change conditions. The Army proposes to provide response to RAI WR-4 by October 1, 2015.

RAI WR-5

Provide an annotated list of the files used as input to the Hydrologic Simulation Program – Fortran (HSPF) code to perform the surface water flow and sediment transport modeling described in Appendix E (Surface Water Flow, Sediment, and Depleted Uranium Fate and Transport Model) of the ER (U.S. Army, 2013a). The annotations should identify the input parameters contained in the file. If a file does not contain data used as direct input to the HSPF code, explain its relationship to the HSPF modeling process. In addition, identify any files that contain output from the HSPF simulations and what output they contain.

BASIS

In support of its independent verification of information provided in the Army's ER (U.S. Army, 2013a), the NRC staff needs to perform QA checks on the simulations of surface water flow and sediment transport reported in Appendix E of the ER, and may perform independent simulations of surface water flow and transport. The Army previously informally provided the NRC staff with digital files contained in a folder titled, "Surface Water Modeling Files." This folder and its subfolders contain a multitude of files that the NRC staff understands may contain input used by the Army's contractor to perform the surface water and sediment transport simulations; however, the content of these files is not transparent. In order for the NRC staff to perform its independent evaluation of the simulation results and, if necessary, to perform its own simulations, the staff needs to clearly understand the content of each of the files provided by the Army and how these files relate to the simulations reported in ER Appendix E.

RESPONSE

The listing of input/output files and the electronic files for the HSPF surface water modeling are provided in the response to RAI GEN-1.

RAI WR-6

Provide the results of simulated water balances and simulated groundwater elevation contours produced by the calibrated groundwater flow model (MODFLOW-SURFACT) described in Section 5 (Groundwater Flow Model) in Appendix B (Groundwater Modeling) of the ER (U.S. Army, 2013a). In addition, provide annotated input files for the calibrated MODFLOW- SURFACT model. The simulated water balance results should include: (i) the simulated flow between the overburden layer (layer 1) and shallow bedrock layer (layer 2) for the entire model domain; (ii) flow to stream segments assigned the river boundary condition within JPG; (iii) flow to stream segments assigned the drain boundary condition within JPG; and (iv) simulated discharge between the overburden layer and the shallow bedrock layer within the footprint of the DU Impact Area. The simulated groundwater elevation contours should include original contour maps of the simulated groundwater elevations in layers 1 and 2 of the model, or electronic files of the simulated groundwater elevations in these layers in the form of geographical coordinates (latitude-longitude, UTM coordinates, or model coordinates).

BASIS

The groundwater flow simulations reported in Section 5 of Appendix B of the ER (U.S. Army 2013a) indicate that groundwater flowing through the overburden (model layer 1) in and near the DU Impact Area discharges to streams within the local drainage basins; and this may also be the case for groundwater flowing through the shallow bedrock (model layer 2). However, these conclusions cannot be confirmed with the information provided in ER Appendix B. The simulated water balances and simulated groundwater elevation contours will allow the NRC staff to fully understand the characteristics of groundwater flow within the DU Impact Area, including the volume of groundwater flowing between the overburden and the shallow bedrock layer and the volume of groundwater discharging to streams from the overburden and shallow bedrock layer. The NRC staff needs the results of the simulated water balances and simulated groundwater elevation contours to independently evaluate impacts to groundwater in the DU Impact Area and impacts to surface water from uranium and other radiological constituents leached from the DU penetrators and corrosion products for the EIS.

RESPONSE

Results of the simulated water balances from the calibrated groundwater flow model are summarized in Table WR-6-1.

Table WR-6-1. Simulated Water Balances for the Calibrated Groundwater Flow Model

Model Simulation		Model Wide			DU Impact Area		
		Q (cfs)	Q (cfd)	Q (mgd)	Q (cfs)	Q (cfd)	Q (mgd)
Discharge from Overburden to Shallow Bedrock		2.00	172751.6	1.292	0.3	22836.2	0.171
Discharge to River	Overburden	1.11	95740.8	0.716	0.19	16412.9	0.123
	Shallow Bedrock	1.67	143870.0	1.076	0.18	15128.3	0.113
	Both Layers	2.77	239610.8	1.792	0.37	31541.3	0.236
Discharge to Drain	Overburden	2.18	188228.4	1.408	0.21	18455.5	0.138
	Shallow Bedrock	0.31	26952.8	0.202	0.02	1480.3	0.011
	Both Layers	2.49	215181.1	1.610	0.23	19935.8	0.149

Annotated input files for the calibrated groundwater flow model are summarized in Table WR-6-2. Output files from the calibrated model are also included in Table WR-6-2. Electronic files are provided on the attached DVD ROM in the folder labeled “RAI WR-6.”

Simulated water level maps for model layers 1 and 2 are provided below in Figures 1 and 2 and in

electronic form (shapefiles). Figures 1 and 2 show 10-foot contoured water levels. The shapefiles include information for the water levels at contour intervals of 5 and 10 feet.

Table WR-6-2. Annotated Input and Output Files for the Calibrated Groundwater Flow Model

Input File Name	Explanation	Content
FILE.ID	Root name file	Contains the name for BAS file
F009f.nam	Name file	Contains names for all the input file and output file and their unit numbers
F009f.bas	Basic file	Model dimensions and boundaries
F009f.bcf	Block-centered flow file	Model properties: grid size, hydraulic conductivity, layer elevations,
F009f.drn	Drain file	Drain cell locations, drain elevations, and drain conductances
F009f.riv	River file	River cell locations, river stages, river bottom conductances, river bottom elevation
F009f.ghb	General-head boundary file	General head boundary locations, general head, conductance
F009f.rch	Recharge file	Recharge rate
F009f.oc	Output control file	Output format
F009f.pcg	Preconditioned conjugate gradient file	Solver parameters: iteration numbers, closure criteria
Output File Name	**Explanation**	**Content**
F009f.cbb	Cell to cell flow budget file	This is a binary file
F009f.crc	Cell to cell recharge budget file	This is a binary file
F009f.hds	Head file	This is a binary file
F009f.ddn	Drawdown file	This is a binary file

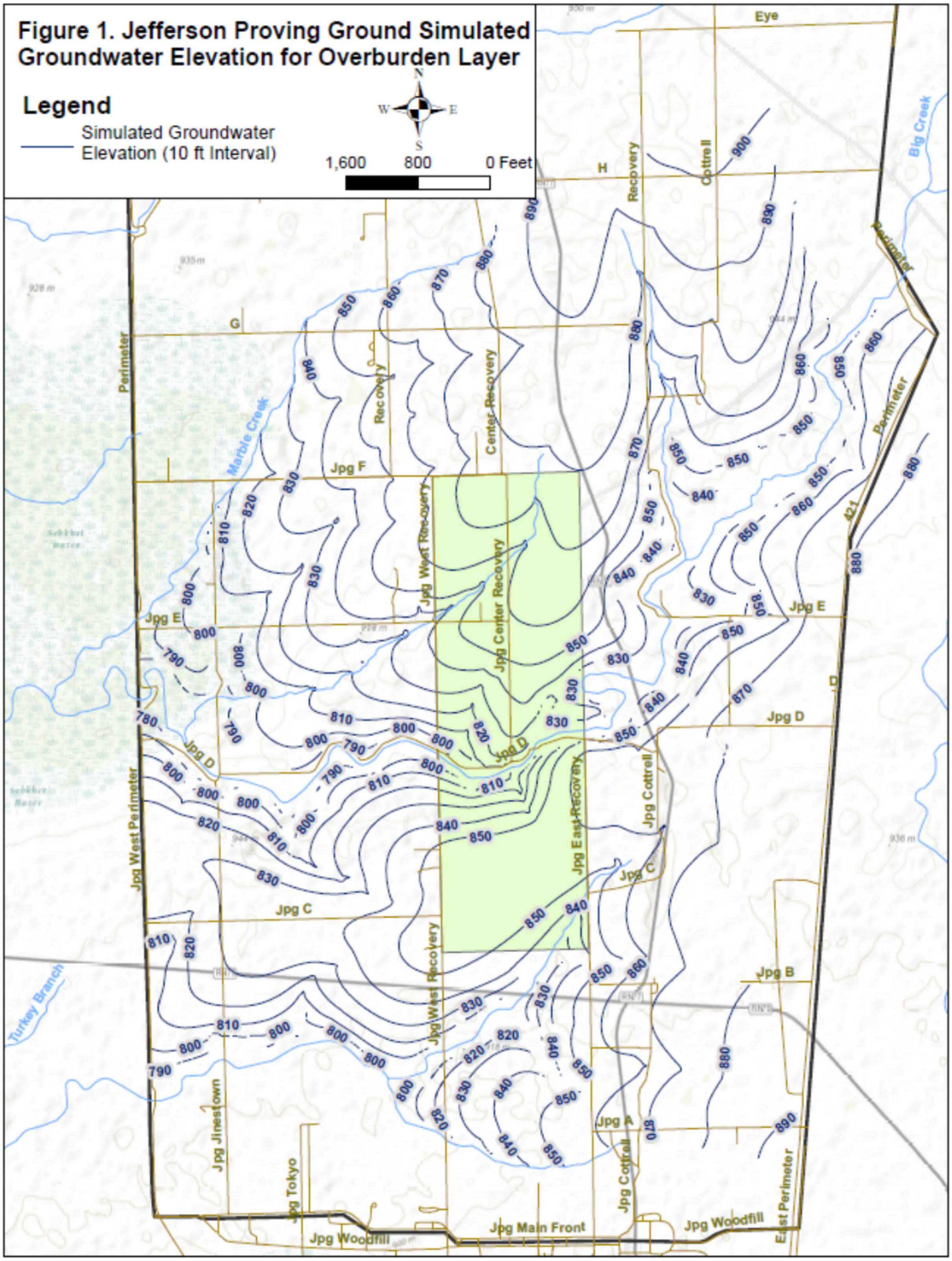

Figure 1. Jefferson Proving Ground Simulated Groundwater Elevation for Overburden Layer

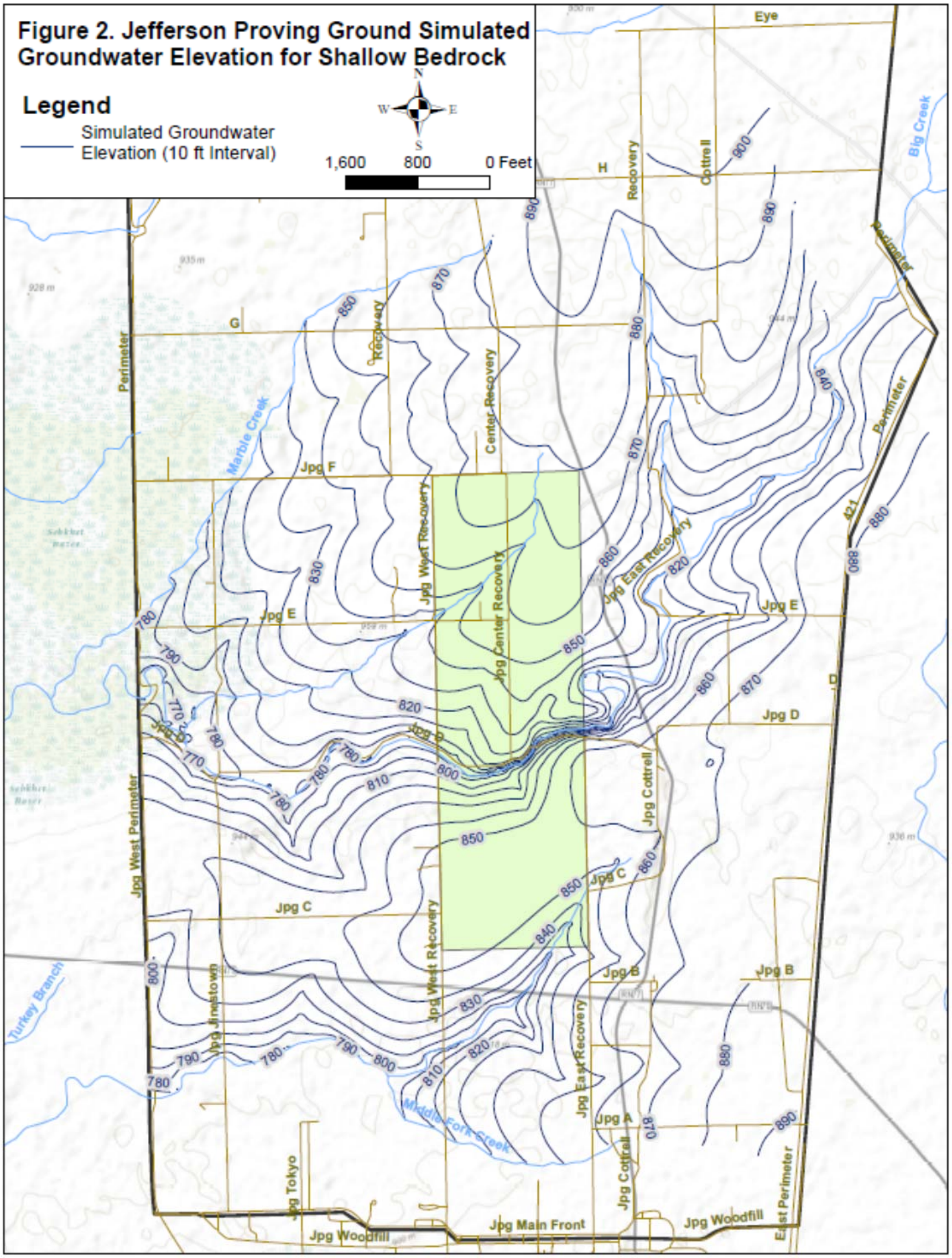

Figure 2. Jefferson Proving Ground Simulated Groundwater Elevation for Shallow Bedrock

RAI WR-7

Provide calculations of the range of possible concentrations of total dissolved uranium in soil pore waters that would result from an average uranium soil concentration in the Primary Contamination Zone (PCZ) and Secondary Contamination Zone (SCZ). These calculations should consider the mass of DU projectiles and corrosion products in each zone, the spatial area of each zone, and the range of possible uranium distribution coefficient (K_d) values in the surficial soil. For example, the mass of DU in the DU Impact Area could be assumed to completely partition between the soil and pore water in the upper six inches of the overburden to calculate an effective pore water concentration to use as a source in the Vadose Zone Column Model. Alternatively, calculations of the dissolved uranium concentration based on geochemical modeling, such as those reported in Table 6-7 of Appendix C of the ER (U.S. Army 2013a), could be used as a source in the Vadose Zone Soil Column Model. If the calculations reported in Table 6-7 of ER Appendix C are used, provide an explanation of the difference between the total dissolved uranium concentration based on Table 6-7 and the concentration of dissolved uranium based on the mass of schoepite added to the soil in the geochemical model calculations and the mass of water in the soil assumed in the calculations as stated in Section 6.1.3 of ER Appendix C, and reconcile that with the statement in Section 6.3.2 of ER Appendix C that, "In all of the [pH-Redox-Equilibrium] PHREEQC calculations, the schoepite dissolves completely and, as in the K_d tests, all of the uranium goes into solution." The explanation should clearly state the mass of uranium added to the soil to perform the calculations and which, if any, processes resulted in uranium being removed from the pore water solution.

In addition, provide calculations of the concentration of dissolved uranium that will reach the water table at the time of peak concentration (even if greater than 1,000 years), using the calculated range of potential concentrations of dissolved uranium in the soil pore water as a source and using the Vadose Zone Soil Column Model described in Section 4 of Appendix B (Groundwater Modeling) of the ER (U.S. Army, 2013a). Further, perform and provide the results of sensitivity analyses/tests to determine the effect of the K_d on the peak uranium concentration using the full range of K_ds based on rainwater sorption and desorption (R_d) values reported in Table 4-3 of Appendix B of the ER (U.S. Army, 2013a). Include in the sensitivity analyses simulations in which the upper 2.28 m (7.5 ft) of the soil column consists of Cincinnati/Rossmoyne soil. Perform all simulations under the assumption that essentially all of the uranium from the DU penetrators has been released to the soil during the approximately 100-year period shown in Figure 4-1 of ER Appendix B. Include in the sensitivity analyses the case where the annual recharge rate is as high as 0.3 m/yr ([12 in/yr] (see Appendix B, page 4-11, of the ER [U.S. Army, 2013a]).

Based on the results of the vadose zone soil column simulations, provide calculations of the potential concentration of dissolved uranium in groundwater beneath the PCZ and SCZ due to infiltration of dissolved uranium, based on the calculation of uranium infiltrating through the soil column. Such calculations could be done with relatively simple mixing cell models or with more sophisticated groundwater transport modeling. In addition, provide calculations of the areal extent of any resulting dissolved uranium plume in the groundwater with concentrations of dissolved uranium above background levels due to the calculated groundwater uranium concentrations beneath the DU Impact Area. The calculations for the extent of the plume should be performed for a time period long enough to delineate the full extent of the area containing dissolved uranium concentrations above background concentration. For example, the calculations of the extent of the uranium plume could be performed based on simulated groundwater flow paths from the DU Impact Area or with concentrations computed using a groundwater transport model.

Provide a written report detailing the parameters and boundary conditions used in the requested calculations, simulations, and sensitivity analyses, as well as graphs and/or tables showing the time histories of dissolved uranium concentrations in the effluent from the column models and uranium concentrations in the soil and maps showing the full extent of the groundwater uranium plume. Provide

annotated input and output files for any calculations involving the use of geochemical or flow and transport models.

BASIS

The Army provided simulations of uranium transport through the soil column in the DU Impact Area in Section 4.5 of Appendix B of the ER (U.S. Army, 2013a). These simulations were performed for a period of 1,000 years assuming a constant source of uranium in the surficial soil. Based on the K_ds for uranium used in the simulations, the average travel time of uranium in the loess-derived soil comprising the upper 0.6 m (2 ft) of the column model would be greater than 1,000 years; thus, the Army concluded that the concentration of dissolved uranium reaching the water table during the 1,000-year simulation period would be *de minimis* except for the case where the depth to the water table was 0.6 m (2 ft). However, in the case of the DU Impact Area, the Army did not provide calculations of the concentrations of dissolved uranium that might develop in the zone of saturated groundwater beneath the DU Impact Area after the 1,000 year simulation period. Calculations of the uranium concentration in the source pore water that will move through the soil column are needed by the NRC staff to calculate potential groundwater concentrations and impacts in the EIS. In addition, calculations of the ultimate extent of any groundwater plume that might originate from the DU Impact Area are needed by the NRC staff to assess the significance of the impacts in the EIS.

With respect to the calculations of dissolved uranium presented in Table 6-7 of Appendix C of the ER (U.S. Army, 2013a), the molality of U(VI) of 9.94×10^{-6} in Table 6-7 equates to a total uranium concentration of 2.37×10^{3} micrograms/liter (µg/L). Section 6.3.2 states that in the soil speciation calculations, "…uranium is added as schoepite. In all of the PHREEQC calculations, the schoepite dissolves completely and, as in the K_d tests, all of the uranium goes into solution." Section 6.1.3 of ER Appendix C states, "The mass of schoepite assumed to be present in the soil was based on the uranium concentration measured in the soil below the DU penetrators at JPG (see Table 6-2 of Appendix D)." Table 6-2 of ER Appendix D lists an average soil uranium concentration of 16,842 milligrams/kilogram (mg/kg) (16,842 µg/g). Section 6.3.2 of ER Appendix C further states that the PHREEQC calculations were performed with a "mass ratio of soil to water" of 1,200 to 320. If the calculations of the uranium concentrations in the soil water were performed using the average soil uranium concentration from Table 6-2 of ER Appendix D and all of the uranium dissolved (as stated in Section 6.3.2), then the pore water concentration 1,200 g of soil times 16,842 µg uranium/g soil divided by 320 g water [0.32 L of water] gives 6.32×10^{7} µg/L. A full explanation of the assumptions and processes involved in the uranium speciation calculations reported in Section 6.3.2 of ER Appendix C or in any geochemical modeling of pore water concentrations performed pursuant to this RAI is needed for the NRC staff to understand and evaluate the results of the calculations for the EIS.

Based on the Army's calculations of the corrosion and dissolution rates of the DU penetrators presented in the ER (U.S. Army, 2013a), nearly all of the uranium from the DU penetrators would be released to the soil within 100 to 120 years (Figure 4-1 of ER Appendix B). This uranium would represent an essentially fixed initial mass of uranium in the soil column that could dissolve in the soil pore water and potentially move downward for as long as water infiltrates into the soil, unless it is removed by surface erosion (although its movement through the soil column might be very slow if the K_ds presented in the ER are indeed representative of the site). However, review of Appendix D (Distribution Coefficient K_d Study Report) of the ER (U.S. Army, 2013a) indicates that there are numerous uncertainties and inconsistencies present in the results and analyses that lead to the final recommended K_d values for soils at JPG used in the Army's modeling. Thus, the K_d values used in the transport model described in ER Appendix B should reflect the range of uncertainty in the estimated K_d values and their natural variability in the soil. Additional analyses and justification would be required to exclude possible K_d values that are as much as an order of magnitude lower than the minimum values used in the transport model.

Furthermore, the 1,000-year timeframe of the Army's simulations does not apply to the NRC staff's assessment of environmental impacts in the NRC's EIS, in accordance with the NRC's guidance for implementing the requirements of NEPA in NUREG-1748 (NRC, 2003). As discussed in Section 4.2.5.1 on page 4-12 of this guidance document, "The impacts should be assessed [in an EIS] over the expected lifetime of the action (e.g., expected duration of the site) and beyond." Also, in Section 4.2.5 on page 4-11, it is specified that long-term impacts are to be considered in the impact assessment of an EIS (in addition to direct, indirect, cumulative, short-term, beneficial, and negative impacts). Furthermore, a prudent NEPA strategy is to estimate the maximum impacts under an alternative, and these impacts become an upper bound for likely impacts. To date, the Army has not specified a date by which DU penetrators, DU fragments, and DU-contaminated soil would be removed from the DU Impact Area; and in Section 1.3.2 on page 1-7 of the ER (U.S. Army, 2013a), the Army states, "…the Army is not planning to conduct any cleanup, retrieval, or any other remedial activities regarding the approximate 162,040 lb (73,500 kg) of DU remaining in the DU Impact Area." Therefore, the NRC staff must assume for the EIS that the duration of the DU Impact Area site containing DU could exist over an undefined period of time that could be well beyond 1,000 years. Furthermore, the uranium from the DU penetrators could travel through the soil column and eventually impact groundwater after 1,000 years. For these reasons, an estimate of the ultimate travel time and mass flux to groundwater and resulting groundwater concentrations is needed from the Army for the NRC staff to assess the ultimate environmental impacts in the EIS, even if they occur after 1,000 years.

RESPONSE

During the 5 June 2015 conference call between NRC, the Army, and their contractors to discuss questions and clarifications on selected NRC RAIs, the Army noted additional time would be required to evaluate the range of possible total dissolved uranium concentrations in soil pore waters resulting from an average uranium soil concentration in the PCZ and SCZ using the source term uranium concentrations from the column modeling for RAI WR-1 consistent with the geochemical modeling results. The Army proposes to provide response to RAI WR-7 by October 1, 2015.

RAI WR-8

Provide the following maps, all to the same scale of no less than 1 inch to 200 meters: (i) a map showing the spatial distribution of crayfish burrows in the DU Impact Area; (ii) a map showing the thickness of overburden in the DU Impact Area; and (iii) a map showing the depth to the water table in the DU Impact Area. In addition, provide a review of technical information, including available reference documentation, on the burrowing habits of crayfish indigenous to JPG. Also, based on the depth of the crayfish burrows and position of the water table in the DU Impact Area, provide an evaluation of the potential for the crayfish burrows to act as fast pathways for uranium and UXO chemical constituents to reach the water table and impact groundwater quality.

BASIS

During the NRC site visits at JPG on December 2, 2014, and January 12, 2015, observations by the NRC and contractor staff and discussions with Army, Leidos, and USFWS staff indicated the presence of areas within the DU Impact Area and other parts of JPG with abundant crayfish burrows. Thoma and Armitage (2008) reported data on burrow depths of crayfish in Indiana that burrows may extend to the water table at depths of up to 2 m (6.5 ft) (see Figure C-12 in Thoma and Armitage, 2008). These burrows could represent fast pathways for uranium from DU and for UXO chemical constituents to migrate from the surficial soils to groundwater. That is, surface water running off from the portions of the DU Impact Area contaminated with uranium and munitions constituents could carry dissolved uranium and munitions constituents and uranium and munitions constituents adsorbed onto soil/sediment into the burrows where they could move directly into the overburden and potentially reach the water table without their movement being substantially retarded by adsorption onto the overburden soils. The NRC staff needs the requested maps and technical information to fully assess the potential for and estimated magnitude of contaminant transport in the DU Impact Area to groundwater in the EIS. Further, all three requested maps need to be provided on the same scale so that the maps can be effectively used by the staff to evaluate the potential for crayfish burrows to act as fast pathways for contaminant transport through the surficial soils to the water table.

RESPONSE

During the 5 June 2015 conference call, the Army noted additional time would be required to construct a conceptual model of transport processes through crayfish burrows. The Army proposes to provide response to RAI WR-8 by October 1, 2015.

RAI WR-9

Provide an explanation of the uranium concentrations reported in Table 6-5 in Section 6.1.2.2 on page 6-12 of the ER (U.S. Army, 2013a), as to whether these concentrations represent dissolved uranium concentrations in surface water or if these concentrations include uranium in suspended sediment. Also explain whether the uranium concentrations in ER Table 6-5 were determined from samples that were filtered before acid digestion or if acid digestion was performed prior to filtration. In addition, provide clarification of the units reported on pages F-716 through F-722 of Appendix F of the ER (U.S. Army, 2013a) for total uranium concentration (picocuries/liter [pCi/L] or µg/L) for surface water samples that were analyzed by Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS).

BASIS

For the EIS, the NRC staff needs clarification of the results of analyses of surface water summarized in Table 6-5 in Section 6.1.2.2 on page 6-12 of the ER (U.S. Army, 2013a). Tabular data on surface water uranium analyses on ER Appendix F pages F-716 through F-722(U.S. Army, 2013a), on which the summary in Table 6-5 is presumed to be based, indicate that surface water samples from sampling locations SW-DU-001 through SW-DU-008 were not filtered. The ERM Program Plan for License Sub-1435 Jefferson Proving Ground, Addendum (U.S. Army, 2003a) states that the uranium analyses were to be performed using Method SW 6020A. Method 6020A states, "When dissolved constituents are required, samples must be filtered and acid-preserved prior to analysis. No digestion is required prior to analysis for dissolved elements in water samples. Acid digestion prior to filtration and analysis is required for groundwater, aqueous samples, industrial wastes, soils, sludges, sediments, and other solid wastes for which total (acid-soluble) elements are required" (EPA, 2007a). If the surface water samples from sampling locations SW-DU-001 through SW-DU-008 were filtered, either in the field or in the laboratory prior to acid digestion, then the analytical results for total uranium would be interpreted as representing total dissolved uranium. If the samples were acid digested prior to filtering, then the analytical results would be interpreted as representing both dissolved uranium and uranium adsorbed onto suspended sediment.

The NRC staff needs to understand for the EIS how the surface water samples from sampling locations SW-DU-001 through SW-DU-008 were treated, in terms of the sequence of filtering and acidification, in order to be able to correctly interpret and evaluate the surface water transport pathway for uranium and to evaluate the results of surface water transport modeling in ER Appendix E which are presented in terms of simulated dissolved uranium and uranium adsorbed onto suspended silt (ER Appendix E Figures 6-4 and 6-4 of [U.S. Army, 2013a]).

With respect to the uranium concentration units reported for surface water samples analyzed by ICP-MS, the units reported in the tables in ER Appendix F are pCi/g whereas one would expect units of mass per volume, such as µg/L. Therefore, clarification of the units is also needed.

RESPONSE

Consultation with the radioanalytical laboratory confirms that the samples were filtered and preserved at the laboratory prior to analysis. For samples submitted to the laboratory for uranium analysis in April 2004, the fluorometric method that had previously been completed by the Army's laboratory was not available commercially, so a method that used an ICP-MS instrument was used to analyze samples from that ERM sampling event. The primary analytical method subsequent to that sampling event was alpha spectrometry. The ICP-MS results shown on pages F-716 through F-722 of Appendix F of the ER represent the confirmatory reanalysis of samples that exhibited U-238/U-234 ratios exceeding 3.0 inclusive of the total propagated uncertainty, which the Army has performed since 2010.

AIR QUALITY (AQ)

RAI AQ-1

Clarify the timeframe associated with the wind speed and gust data documented in Table 3-9 in Section 3.6 on page 3-33 of the ER (U.S. Army, 2013a).

BASIS

Text on page 3-31 in Section 3.6 of the ER (U.S. Army, 2013a) states that wind speed and gust data in Table 3-9 are for 2002 to 2013, whereas text within Table 3-9 states the time period for these data is 2007 to 2013. These data, including the timeframe for the data, will likely be documented and referenced in the EIS. Therefore, the correct timeframe associated with these data is needed so an accurate description can be included in the EIS.

RESPONSE

In response to Comment RAI AQ-1, the timeframe associated with the wind speed and gust data documented in Table 3-9 in Section 3.6 on page 3-33 of the ER was reviewed. The actual time period for these data has been confirmed to be from 2007 to 2013 as indicated in Table 3-9.

RAI AQ-2

Describe activities and emissions sources and provide annual emission estimates for air emissions associated with the environmental monitoring, onsite inspections, and institutional controls. Consideration should be given to combustion emissions and fugitive dust emissions from vehicles and equipment conducting and supporting these activities. This information should be included for the JPG security fence replacement activity as described in Section 7.2 of the ER (U.S. Army, 2013a) and for the other institutional control activities as identified in Appendix F of the DP (U.S. Army, 2013b). The annual emission inventory estimates should include carbon monoxide, nitrogen oxides, particulate matter $PM_{2.5}$, particulate matter PM_{10}, sulfur dioxide, hydrocarbons, and carbon dioxide. The information provided should include all of the details and calculations used to generate the annual emissions estimates, including any mitigation incorporated into the estimates. Consideration should also be given to air emissions associated with any activities the Army would need to perform to implement institutional controls at JPG should the Army-USFWS-USAF MOA (Appendix B of the DP [U.S. Army, 2013b]) be terminated (see RAI CB-5 below).

BASIS

The air quality impact analysis in Section 4.6 of the ER (U.S. Army, 2013a) was limited to activities specifically associated with the DU Impact Area, and no air emission estimates were provided. Environmental monitoring and onsite inspections will be part of the no action alternative and possibly of other reasonable alternatives evaluated in detail by the NRC staff in the EIS. Institutional controls will be a part of all of the alternatives evaluated in detail by the NRC staff in the EIS, including the proposed action. As described in Section 1.3.2 of the ER (U.S. Army, 2013a), institutional controls include the perimeter chain-link fence and warning signs surrounding the JPG property north of the firing line as well as barriers and warning signs to restrict access to the DU Impact Area. The institutional controls described in Section 7.2 of the ER (U.S. Army, 2013a) and Appendix F of the DP (U.S. Army, 2013b) appear to be limited to the JPG site perimeter. It is unclear which, if any, activities the Army would need to perform to implement institutional controls and control access to and within the JPG site if the MOA is terminated. The institutional controls described in the MOA include physical mechanisms (e.g., gates and signage) and associated infrastructure maintenance. Air emission estimates from institutional control activities need to be described and evaluated by the NRC staff in the EIS for a complete discussion of potential air quality impacts, and because of the proximity of these activities to Madison Township which is nonattainment for particulate matter $PM_{2.5}$ (Annual NAAQS) (40 CFR 81.315).

RESPONSE

In response to RAI AQ-2, the following presents the activities and the estimated emissions associated with the activities that would occur at JPG. The activities that are expected to result in air emissions that were considered in this analysis included the following:

- Maintenance activities, including concrete pavement repairs, perimeter mowing, perimeter fence inspection, perimeter fence repair, and fence sign monitor and repair.
- Visitor vehicle travel to and from JPG.
- Air National Guard aircraft operations.

Factors needed to derive source emission factors for non-aircraft activities at JPG were obtained from the USEPA Nonroad Engine Emissions Model (NONROAD2008a) for maintenance equipment (USEPA 2009) and the USEPA MOtor Vehicle Emissions Simulator (MOVES2014) model for on-road vehicles (USEPA 2014). The analysis developed emission factors for year 2015 for these activities and based emissions estimates on annual periods of activity. Factors needed to derive CO_2 source emission rates for aircraft were obtained from the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2014). Tables AQ-2-1 through AQ-2-9 include data and assumptions used to calculate emissions from these activities.

To estimate visitor vehicle emissions, the analysis conservatively assessed the emissions based on the maximum annual visitor trips as presented in the JPG ER, Table 3-1. Taking into consideration the locations of population centers in proximity to JPG and expected origins of visitors at Building 125, the analysis estimated average round trips distances for each type of visitor trip. The analysis assumed that the visitor vehicle fleet would consist of 50/50 percent autos/light duty trucks and that each trip would travel at 50/50 percent of the time at 25/55 mph.

Aircraft emissions for the net increase in aircraft operations proposed for the JPG A Military Operating Area (MOA), JPG B MOA, and the JPG Range (R-3403) were obtained from ANG Actions in Ohio and Indiana Environmental Assessment (EA), Table 4.5-1 (ANG 2001). These data only represent emissions for aircraft operations that would occur below 3,000 feet above ground level, as emissions released above this level are considered to have minimal ground-level impacts. Since these data do not include estimates of CO_2 emissions from proposed aircraft activities, the analysis determined these by factoring proposed SO_2 emissions by the ratio of CO_2/SO_2 emission factors identified in *Air Emissions Guide for Air Force Mobile Sources*, Table 2-8 (AFCEC 2014).

Table AQ-2-1 presents an estimate of the annual operational emissions for proposed activities at the JPG for year 2015. The emissions are mainly due to aircraft operations that occur over a large area and well above ground level. According to the Final EA (ANG 2001), air emissions were not expected to result in an exceedance of the ambient air quality standards or significant impacts (ANG 2001).

REFERENCES

Air Force Civil Engineer Center (AFCEC). October 2014. Air Emissions Guide for Air Force Mobile Sources – Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations. Compliance Technical Support Branch.

ANG (Air National Guard). 2001. Final Environmental Assessment, Proposed Air National Guard Actions in Ohio and Indiana, Ohio Air National Guard and Indiana Air National Guard. Air National Guard, Environmental Division, 3500 Fetchet Avenue, Andrews Air Force Base, Maryland, 20762-5157. March.

USEPA. 2009. NONROAD2008a Model. Available at http://www.epa.gov/otaq/nonrdmdl.htm.

USEPA. 2014. MOVES (Motor Vehicle Emission Simulator) Model. Available at http://www.epa.gov/otaq/models/moves.

Table AQ-2-1. Annual Operational Emissions for Activities at the JPG – Year 2015

Activity/Source	Air Pollutant Emissions (Tons per Year)*						
	VOC	CO	NO_x	SO_2	PM^{10}	$PM^{2.5}$	CO_2 (mt)
Maintenance Activities							
Concrete Pavement Repairs	0.00	0.00	0.01	0.00	0.00	0.00	2
Perimeter Mowing	0.05	0.97	0.08	0.00	0.00	0.00	8
Perimeter Fence Inspection	0.03	0.54	0.05	0.00	0.00	0.00	4
Perimeter Fence Repair	0.00	0.06	0.01	0.00	0.00	0.00	0
Fence Sign Monitor and Repair	0.01	0.08	0.01	0.00	0.00	0.00	1
Visitor Vehicles							
Vehicle Travel	0.30	6.28	1.00	0.01	0.07	0.02	464
Aircraft Operations							
JPG MOA A	2.30	3.30	20.10	0.70	0.20	0.20	1,954
JPG MOA B	1.30	2.00	11.90	0.50	0.10	0.10	1,396
R-3403 (JPG Range) – Net Increase	1.10	1.50	9.00	0.30	0.10	0.10	838
Total Annual Emissions	5.09	14.74	42.14	1.51	0.48	0.42	4,667

Notes:
CO = carbon monoxide
CO_2 = carbon dioxide
mt = metric tons
NO_x = nitrogen oxides
PM^{10} = particulate matter less than or equal to 10 microns in diameter
$PM^{2.5}$ = particulate matter less than or equal to 2.5 in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound.
* All annual emissions are in tons per year except for CO_2 emissions, which are in metric tons per year.

Table AQ-2-2. Off-road Equipment Maintenance Activity Data for JPG – Year 2015

Activity/Equipment Type	Hp Rating	Ave. Daily Load Factor	Number Active	Hourly Hp-Hrs	Hours/ Day	Daily Hp-Hrs	Work Days	Total Hp-Hrs
Road Maintenance								
Concrete Paver	25	0.42	1	11	4	42	3	126
Concrete Pump Truck, 110' Boom	285	0.42	1	120	3	359	3	1,077
Concrete Vibrator	8	0.42	1	3	4	13	3	40
Loader	215	0.36	1	77	3	232	3	697
Water Truck - 5000 Gallons	175	0.38	1	67	2	133	3	399
Fugitive Dust (1)	NA	NA	0.1	NA	8	NA	3	0.3
Perimeter Mowing								
Mower	40	0.33	1	13	7	92	108	9,979
Perimeter Fence Inspection								
Specialty Cart (Gator)	50	0.58	2	29	7	203	26	5,278
Fence Repair								
Specialty Cart (Gator)	50	0.58	1	29	7	203	3	609
Fence Sign Monitor/Replace								
Specialty Cart (Gator)	50	0.58	1	29	7	203	4	812

Notes:
(1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.

Table AQ-2-3. On-road Equipment Maintenance Activity Data for JPG – Year 2015

Activity/Equipment Type	Miles/ Round Trip	Daily Trips	Daily Miles	Work Days	Total Miles
Road Maintenance					
Concrete Trucks	15	3	49	3.0	147
Supply Trucks	20	1	20	3.0	60

Table AQ-2-4. Visitor Activity Data for JPG – Year 2015

Activity	Max 1-Time Capacity	Max Events/Yr	Average Distance (Mi)	Max Distance per Year (Mi)
Deer Hunting	500	15	24	180,000
Spring Turkey Hunting	220	15	24	79,200
Fall Turkey Hunting	500	14	24	168,000
Squirrel Hunting	72	35	24	60,480
Fishing	200	70	37	518,000
Collecting (Mushrooms, etc.)	2	80	24	3,840
Wildlife Observation	80	80	18	115,200
Guided Tours	50	10	18	8,750
Total Distance for Autos (1)				566,735
Total Distance for Light Duty Trucks (1)				566,735

Notes:

(1) Assumes that the visitor vehicle fleet would consist of 50/50 percent autos/light duty trucks

This assumes no ridesharing - 1 person/vehicle

Table AQ-2-5. Air Emission Factors for JPG Maintenance Activities and Visitor Trips - Year 2015

Project Year/Source Type	Fuel Type	Emission Factors (Grams/Horsepower-Hour)							References
		VOC	CO	NO_x	SO_2	PM^{10}	$PM^{2.5}$	CO_2	
Year 2015									
Concrete Paver (16 < hp <=25)	D	0.05	2.40	4.46	0.00	0.35	0.34	595	(1)
Off-highway Trucks (175 < hp <= 300)	D	0.02	0.27	1.13	0.00	0.10	0.10	536	(1)
Surfacing Equipment (6 < hp <=11)	D	0.06	4.73	4.35	0.00	0.39	0.38	594	(1)
Other Construction Equipment (175 < hp <= 300)	D	0.22	0.86	2.63	0.00	0.16	0.16	536	(1)
Front Mowers (25 < hp 40)	G	4.48	87.82	7.39	0.01	0.07	0.06	775	(1)
Specialty Vehicles/ Carts (40 < hp < 50)	G	5.88	92.64	7.77	0.01	0.07	0.06	780	(1)
Passenger Cars - 25 mph	G	0.16	2.88	0.36	0.01	0.07	0.01	377	(2)
Passenger Cars - 25 mph	G	0.10	2.63	0.37	0.01	0.02	0.01	300	(2)
Composite - Passenger Cars	G	0.13	2.75	0.36	0.01	0.05	0.01	338	(3)
Passenger Trucks - 25 mph	G	0.46	7.83	1.21	0.01	0.10	0.02	525	(2)
Passenger Trucks - 25 mph	G	0.23	6.79	1.25	0.01	0.04	0.02	433	(2)
Composite - Passenger Trucks	G	0.34	7.31	1.23	0.01	0.07	0.02	479	(3)
Short Haul Truck >33k Lb. - 10 mph	D	1.43	3.65	9.42	0.02	1.25	0.67	2,233	(2)
Short Haul Truck >33k Lb. - 25 mph	D	0.68	2.07	5.31	0.01	0.55	0.34	1,331	(2)
Short Haul Truck >33k Lb. - 55 mph	D	0.39	1.34	3.25	0.01	0.25	0.19	851	(2)
Composite - Short Haul Truck >33k Lb.	D	0.66	2.01	5.10	0.01	0.53	0.33	1,277	(4)
All Years									
Disturbed Ground - Fugitive Dust						27.50	2.75		(5)

Notes:
(1) Emissions factors estimated with the use of the EPA NONROAD2008a model via MOVES interface for Indiana.
(2) Estimated with the use of the EPA MOVES2014 model and based upon annual default parameters for Ripley County. Units are in grams per mile. Particulate emission factors include emissions from break and tire wear.
(3) Equal to 50/50% 25/55 mph factors.
(4) Equal to 10/60/30% 10/25/55 mph factors.
(5) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulate implementation of best management practices (BMPs) for fugitive dust control

Table AQ-2-6. Emissions Resulting from Maintenance Activity at JPG – Year 2015

Construction Activity/Equipment Type	Tons per Year						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Road Maintenance (Off-road Equipment)							
Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.08
Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	0.64
Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.41
Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.24
Fugitive Dust					0.00	0.00	
Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.21
Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.08
Total - Road Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	1.68
Perimeter Mowing							
Mower	0.05	0.97	0.08	0.00	0.00	0.00	8.52
Total - Perimeter Mowing	0.05	0.97	0.08	0.00	0.00	0.00	8.52
Perimeter Fence Inspection							
Specialty Cart (Gator)	0.03	0.54	0.05	0.00	0.00	0.00	4.54
Total - Perimeter Fence Inspection	0.03	0.54	0.05	0.00	0.00	0.00	4.54
Fence Repair							
Specialty Cart (Gator)	0.00	0.06	0.01	0.00	0.00	0.00	0.52
Total - Fence Repair	0.00	0.06	0.01	0.00	0.00	0.00	0.52
Fence Sign Monitor/Replace							
Specialty Cart (Gator)	0.01	0.08	0.01	0.00	0.00	0.00	0.70
Total - Fence Sign Monitor/Replace	0.01	0.08	0.01	0.00	0.00	0.00	0.70

Notes:
Off-road Equipment Emission Formula: Annual Emission (tpy) = Usage (hp-hr/yr) * EF (g/hp-hr) / 453.6 (g/lb) / 2,000 (lb/ton)
On road Equipment Emission Formula: Annual Emission (tpy) = Usage (mi/yr) * EF (g/mi) / 453.6 (g/lb) / 2,000 (lb/ton)

Table AQ-2-7. Visitor Activity Data for JPG – Year 2015

Vehicle Type	Tons per Year						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Visitor Trips							
Automobile	0.08	1.72	0.23	0.00	0.03	0.01	211.43
Light Duty Truck	0.21	4.57	0.77	0.01	0.04	0.01	299.51
Total - Visitor Trips	0.30	6.28	1.00	0.01	0.07	0.02	510.95

Notes:
On road Vehicle Emission Formula: Annual Emission (tpy) = Usage (mi/yr) * EF (g/mi) / 453.6 (g/lb) / 2,000 (lb/ton)

Table AQ-2-8. Annual Emission from Proposed Air National Guard Actions in JPG – Year 2015

Airspace/Scenario	Tons per Year						
	VOC	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e} (mt)
JPG MOA A							
Proposed	2.30	3.30	20.10	0.70	0.20	0.20	1,954
JPG MOA B							
Proposed	1.30	2.00	11.90	0.50	0.10	0.10	1,396
R-3403 (JPG Range)							
Proposed	6.10	8.80	53.30	1.90	0.60	0.60	5,305
Baseline	5.00	7.30	44.30	1.60	0.50	0.50	4,467
Net Change	1.10	1.50	9.00	0.30	0.10	0.10	838
Total Net Increase - All Airspaces	4.70	6.80	41.00	1.50	0.40	0.40	4,188

Notes:
All data from ANG Actions in Ohio and Indiana EA Table 4.5-1, except CO_2 emissions estimated from SO_2 emissions.

Table AQ-2-9. Annual Operational Emissions from Activities at JPG – Year 2015

Activity/Equipment Type	Tons per Year							CO_2 (mt)
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2	
Road Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	1.7	1.5
Perimeter Mowing	0.05	0.97	0.08	0.00	0.00	0.00	8.5	7.7
Perimeter Fence Inspection	0.03	0.54	0.05	0.00	0.00	0.00	4.5	4.1
Fence Repair	0.00	0.06	0.01	0.00	0.00	0.00	0.5	0.5
Fence Sign Monitor/Replace	0.01	0.08	0.01	0.00	0.00	0.00	0.7	0.6
Visitor Trips	0.30	6.28	1.00	0.01	0.07	0.02	510.9	464.5
Aircraft Operations	4.70	6.80	41.00	1.50	0.40	0.40	4,607	4,188
Total 2015 Emissions	5.09	14.74	42.14	1.51	0.48	0.42	5,134	4,667

CLIMATE CHANGE (CC)

RAI CC-1

Utilize climate modeling to estimate and provide information on the frequency and intensity of potential future flood events at JPG; and provide an analysis to determine the physical or chemical impact (if any) of the predicted future flooding events on the UXO and DU at JPG and the resulting potential radiological and non-radiological impacts (if any) on human health and the environment.

BASIS

In EPA Region 5's EIS scoping comments to the NRC (EPA, 2014), on page 2 in the *Climate Change and Stormwater Management* section, the EPA stated, "Over the past 50 years, the amount of rain falling during the most intense 1% of storms increased by almost 20% (EPA, 2013), resulting in more flooding. The draft EIS should utilize climate modeling to estimate the frequency and intensity of potential flood events in the future, and analyze that data to determine if future flooding events are likely to have any physical or chemical impacts on the UXO or DU." Thus, the NRC staff needs the requested information to address EPA Region 5's concern about future climate change and its potential impacts on release and transport of radiological and chemical constituents from UXO and DU.

The Army's hydrologic modeling documented in Appendices B (Groundwater Modeling) and E (Surface Water Flow, Sediment, and Depleted Uranium Fate and Transport Modeling) of the ER (U.S. Army, 2013a) does not address the influence of climate change in terms of the intensity and frequency of precipitation events and flooding, on the release and transport of radiological and chemical constituents from UXO and DU. Based on EPA Region 5's comments, that information now needs to be provided by the Army for the NRC staff's independent evaluation and inclusion in the NRC's EIS. The GCRP should serve as source for the climate change information. For example, "*Climate Change Impacts in the United States: The Third National Climate Assessment*" (GCRP, 2014) provides climate modeling information for the Midwest United States on the frequency and intensity of future precipitation and flood events.

RESPONSE

The Army notes that additional time is required to complete climate modeling in RAI CC-1. The Army proposes to provide response to RAI CC-1 by October 1, 2015.

PUBLIC AND OCCUPATIONAL HEALTH (POH)

RAI POH-1

Clarify the basis for converting the cited EPA maximum contaminant level (MCL) for uranium of 30 µg/L to 9 pCi/L in the ER (U.S. Army, 2013a) and DP (U.S. Army, 2013b). This conversion was used in describing site characterization results in ER Section 6.1.3.2, Section 2.27 of ER Appendix E, DP Section 3.8.5, and Section 2.1.2 of DP Appendix C, (U.S. Army, 2013a; U.S. Army, 2013b).

BASIS

Site characterization results presented in ER Section 6.1.3.2, Section 2.27 of ER Appendix E , DP Section 3.8.5, and Section 2.1.2 of DP Appendix C, (U.S. Army, 2013a; U.S. Army, 2013b) compare surface water monitoring results to the EPA MCL of 30 µg/L for total uranium. Because the surface water monitoring measured uranium activity rather than mass per unit volume, the Army converted the EPA MCL to an activity concentration of 9 pCi/L, by applying a conversion factor of 0.3 pCi/µg. The EPA *Federal Register* notice for the National Primary Drinking Water Regulations; Radionuclides; Final Rule (66 FR 76708), which established the 30-µg/L MCL, described that the conversion of total uranium mass to activity varies depending on the abundance of the uranium isotopes in the mixture. For example, the EPA reported conversion factors that ranged from 0.67 to 1.5 pCi/µg based on variations in natural uranium isotopic abundances in water samples. The specific activity for U-238 is 0.336 pCi/µg (e.g., the value of 3.36×10^{7} Ci/g provided in Section 3.4.2 of Appendix C of the DP (U.S. Army, 2013b) expressed in different units) and is the lowest for the naturally occurring isotopes of uranium. The DP and ER sections referenced above that use the 0.3-pCi/µg conversion are unclear as to why the total uranium mass was converted to activity based on a conversion factor that is lower than the smallest specific activity of the available uranium isotopes. This information is needed so the NRC staff can ensure that the description and interpretation of site characterization results in the EIS is clear, accurate, and based on acceptable methods.

RESPONSE

Converting the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 30 micrograms of uranium per liter of water (µg/L) based on the specific activity of DU (i.e., 3.6×10^{-7} curies per gram [Ci/g]) cited in 10 Code of Federal Regulations (CFR) Section 20, Appendix B equates to an activity concentration of 10.8 picocuries per Liter (pCi/L) whereas use of a specific activity of 3.0×10^{-7} Ci/g equates to 9 pCi/L.

REFERENCES

EPA (U.S. Environmental Protection Agency). 2002. Implementation Guidance for Radionuclides. EPA 816-F-00-002. Office of Ground Water and Drinking Water (4606M). March.

RAI POH-2

Verify the completeness and accuracy of the RESRAD dose modeling input and output files that were previously provided informally to the NRC staff by the Army/Leidos following our January 12, 2015, meeting at JPG. The previously provided files include the subdirectories and files listed below. Verify that the contents of each file match the receptor and scenario indicated by the filename and provide any missing or inaccurate input and output files, annotated in the manner of the previously provided files. If the guidance requires input files to be converted to a different format than is used by the RESRAD-OFFSITE code then provide an additional separate set of the input files in the original code format for NRC staff use. Additionally, if the guidance requires output files to be converted to a format that alters the readability of the formatted output tables (e.g., word wrapping) then an additional separate set of the output files should be provided in the original format (or the same Word format that was used for the informally submitted files) for NRC staff use.

Farmer\DU Trace Contaminants\
Farmer_Onsite_PCZ_Trace_Contaminants_SUMMA
RY.docx JPG-FARMER PCZ TC-PU.ROF

Farmer\Offsite\PCZ\ Farmer_Offsite_PCZ_lhs.rep.docx
Farmer_Offsite_PCZ_MCSUMMAR.docx
Farmer_Offsite_PCZ_SUMMARY.docx

JPG-FARMER OFFSITE PCZ PROB R2.ROF

Farmer\Offsite\SCZ\ Farmer_Offsite_SCZ_lhs.rep.docx
Farmer_Offsite_SCZ_MCSUMMAR.docx
Farmer_Offsite_SCZ_SUMMARY.docx

JPG-FARMER OFFSITE SCZ PROB R2.ROF

Farmer\Onsite\1 Foot Deterministic - External Gamma\
Farmer_Onsite_PCZ_1_Foot_Determ_SUMMARY.docx JPG-
FARMER PCZ 1 FOOT.ROF

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Farmer_Onsite_PCZ_MCSUMMAR.docx
Farmer_Onsite_PCZ_SUMMARY.docx JPG-
FARMER PCZ PROB R2.ROF

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FARMER SCZ LEFT PROB2.ROF

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FARMER SCZ RIGHT PROB R2.ROF

Sensitivity\

JPG-FARMER PCZ SENSITIVITY.ROF

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FWS_Worker_Onsite_PCZ_SUMMARY.docx JPG-FWS
PCZ PROB R2.ROF

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FWS_Worker_Onsite_SCZ_Left_MCSUMMAR.docx
FWS_Worker_Onsite_SCZ_Left_SUMMARY.docx JPG-FWS
SCZ LEFT PROB R2.ROF

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FWS_Worker_Onsite_SCZ_Right_MCSUMMAR.docx
FWS_Worker_Onsite_SCZ_Right_SUMMARY.docx JPG-
FWS SCZ RIGHT PROB R2.ROF

Sportsman\Onsite\PCZ\
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Sportsman_Onsite_PCZ_MCSUMMAR.docx
Sportsman_Onsite_PCZ_SUMMARY.docx JPG-
SPORTSMAN PCZ PROB R2.ROF

Sportsman\Onsite\SCZ Left\
Sportsman_Onsite_SCZ_Left_lhs.rep.docx
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SPORTSMAN SCZ RIGHT PROB R2.ROF

BASIS

Input and output files for the RESRAD-OFFSITE dose modeling software that was used by the Army for the dose calculations in Section 4.12.2 of the ER (U.S. Army, 2013a) and Section 4.1 of the DP (U.S. Army, 2013b) were previously provided informally by the Army/Leidos to the NRC staff to support the NRC's environmental review. An initial NRC staff review of these files has found the output file for the onsite farmer, PCZ (filename: Farmer_Onsite_PCZ_SUMMARY) contains initial soil concentrations (i.e., source term input) applicable to the SCZ. Therefore, there may have been a problem with the code run, or in saving the output files, or in the labeling of files; and the correct output files for at least that receptor and exposure scenario have not been provided. This identified problem causes the NRC staff to be concerned

that there may be other problems with the RESRAD-OFFSITE I/O files. Therefore, the NRC staff is requesting that the Army check all of the previously provided RESRAD-OFFSITE dose modeling I/O files and verify that the submitted information submitted is complete and accurate, and that any missing or inaccurate files be provided to the NRC in response to this RAI. These files are needed so the NRC staff can complete its detailed review of the RESRAD calculations to determine if they are suitable for supporting the analysis of public and occupational health impacts in the EIS.

RESPONSE

It appears that the submitted files were named improperly, which would have prevented the input files supplied by the Army from running in RESRAD-Offsite. Since the possibility exists for the outcome of other RAIs to alter the RESRAD-Offsite input parameters, all files will need to be recompleted and resubmitted. The Army will provide revised input files for RESRAD-Offsite related to RAI POH-2 by October 1, 2015.

RAI POH-3

Provide corrections as necessary to the descriptions of RESRAD-OFFSITE input parameter selections for the "Fraction of Water from SW (all uses including irrigation)" (SW means Surface Water) and the "Fraction of Drinking Water from Well Water (all uses including irrigation)" in Table 3-5 in Appendix C of the DP (U.S. Army, 2013b). The information presented in the table documenting these input parameter selections is not internally consistent (as described below under BASIS). Additionally, these table entries are not consistent with the DP description of the conceptual model (Figure 3-2 in Appendix C of the DP shows the water sources for each receptor). These table entries are also not consistent with the comparable input parameter selections that are tabulated in an applicable RESRAD-OFFSITE output file. The response to this RAI can either describe any corrections or clarifications needed to clearly present the parameter selections for these groups of inputs or provide revised tables.

BASIS

The entries for "Fraction of Water from SW (all uses including irrigation)"and "Fraction of Drinking Water from Well Water (all uses including irrigation)" in Table 3-5 in Appendix C of the DP (U.S. Army 2013b) are internally inconsistent because the "Fraction of Water from SW (all uses including irrigation)" (for all receptors except the offsite farmer) is set to 1.0; however the description states that all water is from a groundwater well. Also, the "Fraction of Drinking Water from Well Water (all uses including irrigation)" for the offsite farmer has a value of 1.0; however the description notes that the drinking water pathway from surface water resulted in a higher dose than well water (implying that the more conservative surface water selection should be used rather than well water). Additionally, the parenthetical for "all uses" associated with the "Fraction of Drinking Water from Well Water (all uses including irrigation)" table entry is confusing because drinking water is a single water use; therefore, the parameter selection as described could not apply to other uses. The conceptual model information in Figure 3-2 of Appendix C of the DP (U.S. Army 2013b) shows the onsite receptors obtaining water from a groundwater source while the offsite receptors obtain water from a surface water source (the opposite of the table entries). A RESRAD-OFFSITE output file for the offsite farmer receptor (PCZ) was checked and the selections for these receptor water use fractions were consistent with the information in Figure 3-2 of Appendix C of the DP (all water use for the offsite farmer is from surface water and none is from well water), suggesting that the entries in Table 3-5 of Appendix C of the DP contains inconsistent information. The corrections are needed to ensure that the DP clearly and consistently describes the exposure pathways that were evaluated in the RESRAD-OFFSITE dose calculations, which are incorporated by reference into Section 4.12.2 of the ER (U.S. Army, 2013a), so that the NRC staff can evaluate and accurately describe these calculations in the public and occupational health impact analysis in the EIS.

RESPONSE

After further review, it appears that the descriptions in Table 3-5 for fraction of surface water and fraction of well water were transposed. However, the correct values were used for the RESRAD-Offsite simulations for the specific scenarios. Revised wording for Table 3-5 is shown in Figure POH-3-1.

REFERENCES

U.S. Army. 2013b. Decommissioning Plan for Materials License SUB-1435, Depleted Uranium Impact Area, Jefferson Proving Ground, Madison, Indiana. August.

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Water Use Parameters				
Drinking water intake (L/y)	FMR	---	5.10E+02	Mean adult value per USEPA (1997); more than NUREG/CR-6697 recommended mean (probabilistic) rate of 409.5 L/y
	FWS	---	0	Current water supply is public water; FWS employee drinks public water supply or bottled water while in the CZ
	SPT	---	4.97E+00	Assumes incidental ingestion of 1 oz. (0.02957 L) SW per hour in CZ
Household use of water (L/day)	FMR only	---	2.50E+02	Rounded mean per capita value of lognormal distribution per NUREG/CR-6937 calculated as exp^5.51 (see Figure 5.1-1); consistent with values listed in Tables 5.1-1 and 5.1-2
Livestock water intake for meat (L/day)	FMR/SPT	---	5.00E+01	Midpoint of default uniform distribution spanning value
Livestock water intake for milk (L/day)	FMR only	---	1.60E+02	Midpoint of uniform distribution centered at value
Irrigation rate in agricultural Areas 1-4 (m/y)	FMR only	---	2.00E-01	Midpoint of default uniform distribution spanning value
Irrigation rate in offsite dwelling site (m/y)	FMR only	---	2.00E-01	Midpoint of default uniform distribution spanning value
Fraction of drinking water from well water (all uses including irrigation)~~Fraction of water from SW (all uses including irrigation)~~	All except FMR Offsite	---	1.00E+00	All water from groundwater well; drinking water pathway from well water resulted in higher dose than from surface water body
~~Fraction of drinking water from well water (all uses including irrigation)~~Fraction of water from SW (all uses including irrigation)	FMR Offsite	---	1.00E+00	Drinking water pathway from surface water body resulted in higher dose than from well water
Well pumping rate (m^3/y)	FMR only	---	5.121E+03	RESRAD-OFFSITE calculated value to support specified use
Surface Water Body Parameters				
Sediment delivery ratio (PCZ)	All	---	1.00E+00	Estimate based on % of area where runoff goes to Big Creek
Sediment delivery ratio (SCZ)	All	---	1.00E+00	Estimate based on % of area where runoff goes to Big Creek
Volume of SWB (m^3)	All	---	7.5E+04	Estimated volume; assumes 3-m depth * area
Mean residence time of water in SWB (y)	All except FMR Offsite	---	3.1E-03	NUREG/CR-6697, App A, Section 4.2.1; value obtained by dividing the volume of the surface water body by the quantity of water that flows into it each year; annual flow = upgradient watershed area (14,100 ac or 5.7E+07 m^2) * annual rainfall (1.19 m) * runoff coefficient (0.36)
Mean residence time of water in SWB (y)	FMR Offsite	---	2.2E-03	NUREG/CR-6697, App A, Section 4.2.1; value obtained by dividing the volume of the surface water body by the quantity of water that flows into it each year; annual flow = upgradient watershed area (19,600 ac or 7.9E+07 m^2) * annual rainfall (1.19 m) * runoff coefficient (0.36)
Surface area of water in SWB (m^2)	All	---	2.5E+04	Estimated area if Big Creek were dammed; 50-m width by 500-m length

Figure POH-3-1. Revisions for Table 3-5 in Appendix C of DP (U.S. Army 2013)

RAI POH-4

Provide a descriptive analysis of the effect of projected future climate change on the input parameters selected for the RESRAD-OFFSITE dose calculations that are documented in Section 4.12.2 of the ER (U.S. Army 2013a) and Chapter 4 and Appendix C of the DP (U.S. Army 2013b). This analysis should consider the results of surface water and sediment transport simulations requested in RAI WR-4 which address the following climate change influences: (i) the frequency and intensity of precipitation events, (ii) the frequency and intensity of floods, (iii) the ambient air temperature, and (iv) the ecosystem. The GCRP should serve as source for the climate change information. For example, the *Climate Change Impacts in the United States: The Third National Climate Assessment* (GCRP, 2014) provides climate information for the Midwest United States on the changes to precipitation, air temperature, storm events, and ecology.

The requested analysis should identify all RESRAD-OFFSITE input parameters that could potentially be impacted by the projected climate changes. For each parameter or group of like parameters in the subset of inputs that could be affected by climate changes, describe the direction of expected change (i.e., increase or decrease) and whether, based on the use of the input parameter in the RESRAD-OFFSITE model, the expected change would increase or decrease the calculated receptor dose. For each input parameter for which climate change is expected to increase the calculated dose, provide an estimate of the magnitude of the input parameter change and the resulting expected change in dose. If the change in dose cannot be clearly estimated, the code should be run to estimate the magnitude of the change. If the results of the analysis indicate climate change could significantly increase the calculated doses to any receptor (i.e., increase the total dose by more than a factor of 2), then a separate set of RESRAD-OFFSITE dose calculations that incorporates the climate change input parameter changes should be run for all affected receptor scenarios. The results of this analysis and any new code runs should be documented in the RAI response or separate written report and provided with all applicable annotated code I/O files.

BASIS

As discussed in the BASIS disucssion for RAI POH-4 above, the CEQ's revised draft guidance on how Federal agencies should consider the effects of climate change in NEPA reviews (CEQ, 2014) explains that agencies should consider both the potential effects of a proposed action on climate change and the implications of climate change for the environmental effects of a proposed action. Therefore, the effects of climate change on the dose calculations should be evaluated to ensure the calculated doses are not being underestimated by not accounting for the projected future changes in the environment.

Additionally, EPA Region 5's EIS scoping comments (EPA, 2014) included recommendations to consider the effect of climate change on specific projected environmental impacts. Because climate change has the potential to change the environment in ways that could alter conditions potentially affecting the DU source term release, as well as the DU fate and transport and exposure to projected releases, the NRC staff believes it is important to evaluate whether projected climate change could affect the calculated doses that support the evaluation of potential public and occupational health impacts in the EIS. The NRC staff also believes that EPA Region 5 will be expecting discussion of the effects of climate change on potential environmental impacts to be included in the NRC's Draft EIS.

RESPONSE

As noted above, the response for this RAI (POH-4) is dependent upon the response to RAI WR-4, which the Army will provide by October 1, 2015. Since preliminary results for RAI WR-4 will not be available until later this summer, the Army will need additional time to provide response to RAI POH-4. The Army plans to provide response to RAI POH-4 by October 1, 2015.

RAI POH-5

Provide additional RESRAD-OFFSITE dose calculations for the PCZ onsite and offsite farming scenarios that extend beyond 1,000 years to the time of peak groundwater uranium concentration and dose (hereafter referred to as time-extended base case runs). This analysis should consider the results of additional uranium transport modeling using the Vadose Zone Soil Column Model requested in RAI WR-1 above, which extend until the time of peak simulated uranium concentrations at the base of the soil column. The analysis should also consider the response to RAI WR-8 requesting an evaluation of the effect of crayfish burrows on vadose zone transport. If the responses to RAI WR-1 or RAI WR-8 result in permanent changes to any input parameters in the groundwater modeling used to make impact determinations in the ER and these parameters are comparable to RESRAD-OFFSITE input parameters (e.g., distribution coefficients, hydraulic conductivities), then equivalent input parameter value changes should also be incorporated into the RESRAD-OFFSITE time-extended base case runs requested in this RAI. If the comparable groundwater modeling inputs are only being changed temporarily to evaluate sensitivities in response to the water resource RAIs but are not being permanently changed in the modeling used to make impact determinations, then similar sensitivity test cases should be run using RESRAD-OFFSITE and these runs should be separate from the requested time-extended base case runs. The time period for the analysis should be selected so that the groundwater concentration peaks and then shows a decline. Report the peak or peak of the mean groundwater concentration and dose results and the time of the peak. Additionally, update the sensitivity analysis in Section 3.8.3 of Appendix C of the DP (U.S. Army, 2013b) to evaluate the sensitive parameters for the time-extended base case.

In addition, repeat the time-extended base case calculations with an adjusted "Computed Erosion Rate of the Contaminated Zone" input parameter to test the effect of erosion on the groundwater pathway. For this test, use a "Computed Erosion Rate of the Contaminated Zone" that is either the default value for RESRAD-OFFSITE or compute the lowest erosion rate based on site conditions and the same calculation approach used for the dose modeling runs reported in Section 4.12.2 of the ER (U.S. Army, 2013a) and Chapter 4 and Appendix C of the DP (U.S. Army, 2013b).

For all sets of calculations requested above, provide RESRAD-OFFSITE groundwater concentration vs. time plots for each scenario that show the peak or peak of the mean concentration. Also provide all annotated code I/O files for the additional modeling, and describe the analysis and results in the response to this RAI or in a separate written report.

BASIS

Review of the RESRAD-OFFSITE output file Farmer_Onsite_SCZ_Left_SUMMARY.docx shows the drinking water dose at a low level but increasing until the simulation ends at 970 years. Based on the distribution coefficient K_ds for uranium used in the simulations of uranium transport through the soil column in the DU Impact Area in Appendix B of the ER (U.S. Army, 2013a), the average travel time of uranium in the loess-derived soil comprising the upper 0.6 m (2 ft) of the column model would be greater than 1,000 years. To date, the Army has not specified a date by which DU penetrators, DU fragments, and DU-contaminated soil would be removed from the DU Impact Area; and in Section 1.3.2 on page 1-7 of the ER (U.S. Army, 2013a), the Army states, "…the Army is not planning to conduct any cleanup, retrieval, or any other remedial activities regarding the approximate 73,500 kg [162,040 lb] of DU remaining in the DU Impact Area." Therefore, the NRC staff must assume for the EIS that the duration of the DU Impact Area site containing DU could exist over an undefined period of time that could be well beyond 1,000 years, and that uranium from the DU penetrators could travel through the soil column and eventually impact groundwater after 1,000 years. Providing the simulation results for the groundwater dose when it peaks would provide necessary information for the NRC's EIS about the full range of dose impacts from the proposed action.

The RESRAD-OFFSITE sensitivity analysis needs to be updated to evaluate the sensitivity of groundwater transport input parameters over the extended simulation time. This is needed because the

lack of sensitivity detected for these input parameters in the sensitivity analysis in DP Appendix C, Section 3.8.3 (U.S. Army, 2013b) may have been the result of limited groundwater transport during the 1,000-year simulation time.

The contaminated zone erosion rate test is necessary because review of the RESRAD- OUTPUT file *Farmer_Offsite_PCZ_SUMMARY.docx* by the NRC staff indicates that the computed erosion rate of the contaminated zone (the layer of soil defined in the model as containing the uniformly mixed inventory of DU) would erode the entire 1-m (3-ft) depth of the contaminated zone in 810 years. This relatively fast erosion of the contaminated zone, which is fairly level ground and mostly covered with vegetation, may be conservative for the surface water pathway because the eroded material is an input to the modeled surface water body; however, it may not be conservative for the groundwater pathway (due to source depletion) and, therefore, the test results will provide additional information for the EIS about the effect of the erosion rate selection on the groundwater pathway concentration and dose results from the RESRAD-OFFSITE simulations.

RESPONSE

As noted above, the response for this RAI (POH-5) is dependent upon the response to RAI WR-1, which the Army will provide by October 1, 2015. Since preliminary results for RAI WR-1 will not be available until later this summer, the Army will need additional time to provide response to RAI POH-5. The Army plans to provide response to RAI POH-5 by October 1, 2015.

CUMULATIVE IMPACTS (CI)

RAI CI–1

Provide the following information to support the NRC staff's evaluation of the potential cumulative impacts on the environment from the proposed action and the past, present, and ongoing presence of UXO at the JPG DU Impact Area and elsewhere at JPG north of the firing line:

- Status and Conclusions of JPG Environmental Restoration Programs and Similar Programs: Clarify the status and any findings and conclusions from any past and present JPG site environmental restoration programs and from similar evaluations or analyses (e.g., from other, similar sites) that are directly related to the current status of JPG with regard to any characterization of the potential past, present, and long-term hazards of UXO constituents at JPG and possible response actions or determinations. The expected UXO constituents include, but may not be limited to RDX (Royal Demolition Explosive), HMX (Her Majesty's Explosive), TNT (trinitrotoluene), DEGDN (diethylene glycol dinitrate), lead azide, lead styphnate, perchlorate, and mercury fulminate (ASI, 1993). The Army has provided the NRC with historical documentation of past site environmental restoration programs and related studies; however, within the context of these programs or any more recent programs, the ER (U.S. Army, 2013a) and the DP (U.S. Army, 2013b) do not provide any discussion of the present status of addressing potential UXO constituent hazards from the UXO that remains in place in the areas north of the firing line. Describe whether these potential UXO hazards currently fall under any existing Army site restoration programs that have been developed to investigate and evaluate possible response actions to areas of JPG (or similar sites) where potentially harmful substances such as explosive compounds have been released to the environment or could potentially be released to the environment in the future. If no applicable programs exist, then explain why. If the current JPG status with respect to UXO is based on decisions from past environmental restoration programs, then describe the applicable findings and documentation.
- Munitions Response Site Prioritization Protocol (MRSPP) Status: Provide information to clarify the MRSPP status of all JPG sites listed on DOD's Environment, Safety, and Occupational Health Network and Information Exchange (DENIX) website (DOD, 2013). The status of all JPG sites are presently listed on DENIX as "MRSPP evaluation no longer required," with no supporting discussion, documentation, or rationale. Provide any documented basis or bases for these conclusions and describe whether these conclusions have any bearing on the potential future long-term hazards from munitions constituents in the UXO at JPG that could overlap with potential impacts from the DU in the DU Impact Area.
- Monitoring and Mitigation: Clarify if any applicable environmental response programs would detect or mitigate potential future UXO constituent impacts at JPG. If applicable programs are described, emphasize any program requirements or processes that would serve to detect and/or mitigate potential future impacts from releases of UXO constituents into the environment and to locations outside the JPG boundary. For example, describe any planned commitments to monitor UXO constituents in various environmental media. Summarize any program analyses, findings, and conclusions with regard to the nature and magnitude of any current and future risks from potential release and migration of UXO constituents. If no such programs or mitigations are planned, provide the rationale for this course of action.

BASIS

Information provided in the ER (U.S. Army, 2013a) and the DP (U.S. Army, 2013b) on the past and potential present and long-term hazards from munitions constituents from the UXO located within and surrounding the DU Impact Area at JPG is limited and insufficient for the NRC staff to evaluate the potential for cumulative impacts in the EIS. The Executive Summary on page v in the CEQ's "*Considering Cumulative Effects Under the National Environmental Policy Act* "(CEQ, 1997), CEQ

regulations in 40 CFR 1508.7, and NRC guidance in Section 4.2.5.2 on page 4-12 of NUREG-1748 (NRC, 2003) define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The presence of the UXO left in place by the Army and that will be remaining in place at JPG within and surrounding the DU Impact Area would be considered a past, a present, and a reasonably foreseeable future action in relation to the proposed action that must be addressed by the NRC staff in the cumulative impact analysis in the EIS.

In addition, NRC guidance in Section 6.2.3 on page 6-5 and Section 6.4 and subsections starting on page 6-18 of NUREG-1748 (NRC, 2003) further describes NRC expectations that cumulative impacts will be evaluated in licensees' and applicants' environmental reports. However, Section 2.3 (Cumulative Effects) of the Army's ER (U.S. Army, 2013a) does not include an analysis of cumulative effects, and it instead identified no other actions as occurring simultaneously with the proposed action.

Therefore, the NRC staff is requesting clarification of the current status of Army assessments and applicable environmental restoration programs and similar programs to inform the NRC staff's cumulative impact assessment in the EIS. Based on its initial review of the available information on the status of potential UXO constituent hazards in areas north of the firing line at JPG, the NRC staff found that potential hazards have been identified to some extent, but the readily available information is limited and may not be current. A brief summary of the NRC staff's present understanding of the status of the Army's environmental restoration program efforts for areas north of the firing line at JPG is as follows.

- The Army's past JPG environmental restoration program documentation in the ER and DP (U.S. Army 2013a,b) referenced a preliminary investigation that previously identified the entire firing range area north of the firing line as an area requiring further environmental evaluation (AREE) based, in part, on the potential for release of hazardous substances to soil, groundwater, and surface water from UXO that may leak constituents into the environment (such as when casings are compromised by cracking or corrosion) (U.S. Army, 1990).
- Subsequent monitoring for explosive compounds in the DU Impact Area and vicinity has not detected explosive compounds in groundwater as of 2003 (U.S. Army, 2003b). Some explosive compounds were found in soil and surface water but were reported as being below levels of concern (U.S. Army, 2003b). While the 2003 levels of munitions constituents were found to be low or undetected, intact UXO are capable of containing explosive materials for long time periods before the canisters are compromised and releases to the environment are possible. While no information has been identified that characterizes the number of UXO that are intact at JPG, information from another military range where UXO has been studied suggests it is possible that only a small fraction of UXO casings have been compromised (MMRCT, 2011). Therefore, the potential exists for a large portion of the UXO constituent inventory at JPG to be contained within intact UXO that are subject to degradation and subsequent releases of munitions constituents in the future.
- Constituents of the munitions tested at JPG have been documented (ASI, 1993) and include perchlorate, lead, mercury, and explosive compounds such as TNT, RDX, HMX, and DEGDN. Some of these munitions constituents are considered potentially harmful to human health (including renal and possible carcinogenic effects similar to those from DU) and the environment (DOD, 2002; EPA, 2005).
- Army analysis of historical records (including staff interviews) indicates historical test firing records are incomplete for most of the testing period at JPG and do not provide information on the types of munitions that would be located in specific areas of the site (MHSMCI, 1992; U.S. Army, 1990). The Army reported that physical surveys would be needed to obtain additional characterization information on UXO (MHSMCI, 1992; U.S. Army, 1997). The NRC staff

> understands that such surveys (e.g., Remedial Investigation/Feasibility Study) would have been conducted as a normal part of the Army environmental restoration program at JPG following the preliminary site investigations that were completed, as they have been done at other military sites; however, such detailed characterization studies appear to have been deferred at JPG based on UXO explosive hazards (U.S. Army, 1997). The Army has stated that the timeframe for an environmental investigation of areas north of the firing line is dependent on regulatory requirements, the level of safety that may be attained during an investigation, the UXO removal technology available to eliminate potential hazards, the identification of reuse options for the area, and the establishment of reuse-based cleanup levels (U.S. Army, 1997).

As indicated in the summary above, NRC review of the historical documentation of UXO at JPG suggests the information is limited and the status of future characterization and response actions is indeterminate.

Note also that in EPA Region 5's EIS scoping comments (EPA, 2014), on page 2 under the *Site Safety* section, the EPA expressed the concern that if environmental monitoring is not proposed, the NRC's EIS should provide rationale for the decision not to monitor, preferably using data from other, similar sites, and explain what plans are in place to ensure any future contaminant movement is remediated before migrating offsite. In addition, on page 2 under the *Remediation* section, the EPA expressed concerns about the weathering of UXO casings leaving hazardous contents susceptible to erosion, and requested descriptions in the NRC's EIS of existing or planned measures that will remediate or contain UXO and any other hazardous wastes. (EPA Region 5's comment went on to state that this may include implementing one or more non- hazardous passive waste treatment systems that are described in the EPA's "*Technology Reference Guide for Radioactively Contaminated Media"* [EPA, 2007b]). Thus, the NRC staff needs the information requested in the RAI to address EPA Region 5's concern.

RESPONSE

Cumulative impacts from UXO, MCs, and nonradiological impacts from DU are under further evaluation. The Army plans to provide response to RAIs CI-1 to CI-4 by October 1, 2015.

RAI CI-2

Provide and describe any available data and information, from Army or other DOD field investigations at JPG or other, similar military sites, and/or from other Army or other DOD studies (e.g., laboratory, pilot-level, modeling, or theoretical studies), that could be used by the Army, in response to RAI CI-3 below, to conduct a quantitative analysis of the present and long- term environmental impacts of leaving the UXO in place at JPG and that could be used by the Army as a basis for evaluating the cumulative impacts of the proposed action when added to any similar and additive past, present, or reasonably foreseeable impacts on the environment from leaving UXO in place at JPG. If no quantitative data and information are available for any of the categories listed below, then instead provide and describe available qualitative information.

- Data and information to determine or estimate the inventory within the watershed of the DU Impact Area of UXO constituents including, but not limited to RDX, HMX, TNT, DEGDN, lead azide, lead styphnate, perchlorate, and mercury fulminate.
- Data and information on the persistence, degradation, and transformation of munitions constituents under the environmental conditions at JPG or at similar sites.
- Data and information on the failure rate and/or the corrosion rate of ordnance casings under the environmental conditions at JPG or similar sites.
- Data and information on the mobility of munitions constituents in the environment under the environmental conditions at JPG or similar sites.
- Data and information on the toxicity to humans and the potential human health effects from exposure to munitions constituents, with emphasis on effects such as carcinogenicity and renal effects that are similar to the known effects of exposure to DU.
- Data and information on the toxicity to animals and the potential ecological impacts from exposure to munitions constituents, with emphasis on any potential effects that are similar to any known ecological effects associated with exposure to DU.
- Models for evaluating the environmental fate, transport, exposure, and health effects from munitions constituents (e.g., U.S. Army Corps ARAMS code or similar).

BASIS

Information provided in the ER (U.S. Army, 2013a) and the DP (U.S. Army, 2013b) on the past and potential present and long-term hazards from munitions constituents in the UXO located within and in areas surrounding the DU Impact Area at JPG is limited and insufficient for the NRC staff to evaluate the potential for cumulative impacts in the EIS. Following review of the available information on the status of potential UXO constituent hazards in areas north of the firing line at JPG, the NRC staff found that potential hazards have been identified, but the information is limited and may not be current. Additional details supporting the need for cumulative impact analyses addressing the potential present and long-term impacts of UXO constituents are provided in the first two paragraphs and the last paragraph of the BASIS for RAI CI-1 and are not repeated here. The data, information and descriptions requested in this RAI will help the NRC staff to understand and describe in the EIS the level of impact analysis that is possible using available data and information.

RESPONSE

Cumulative impacts from UXO, MCs, and nonradiological impacts from DU are under further evaluation. The Army plans to provide response to RAIs CI-1 to CI-4 by October 1, 2015.

RAI CI-3

Provide a quantitative cumulative impact analysis that evaluates the impact on the environment that results from the incremental impact of the proposed action when added to any similar and additive past, present, or reasonably foreseeable impacts on the environment from leaving UXO in place at JPG, both within and outside the DU Impact Area. The CEQ provides information on conducting cumulative impact analyses in "*Considering Cumulative Effects Under the National Environmental Policy Act* "(CEQ, 1997). The requested analysis should consider the potential impacts to the environment from UXO constituents that have been or could be released from damaged or degraded UXO casings into the environment during past, present, and future timeframes (determined based on the data and information collected or developed by the Army in response to RAI CI-2). The geographic scope of the analysis should be based on the overlapping impact regions for the proposed action and the potential UXO constituent impacts. For example, the geographic scope of the analysis would include the watershed of the DU Impact Area, to evaluate significant potential additive impacts from releases of DU and UXO constituents to shared soils and water resources. However, potential cumulative impacts to all resources that could be affected by both the DU in the DU Impact Area and the UXO constituents in and around the DU Impact Area need to be evaluated. The temporal domain of the analysis should encompass the time period of peak cumulative impacts.

In defining and assessing the cumulative impacts, the Army would need to first consider the direct and indirect impacts of the proposed action (i.e., the impact analyses in Chapter 4 of the ER (U.S. Army, 2013a), as supplemented by the Army's responses to the NRC staff's RAIs as applicable) and would need to determine the direct and indirect impacts of potential releases of UXO constituents (as indicated above). The Army would then need to identify those impacts of the proposed action and of the potential releases of UXO constituents that could overlap spatially and temporally and accumulate, affecting the same resources, and then combine the applicable additive impacts to derive total (cumulative) impacts and evaluate the level of intensity of these impacts.

In evaluating the direct and indirect impacts of potential releases of UXO constituents, in conjunction with the data and information collected or developed by the Army in response to RAI CI-2, the Army may utilize existing NEPA or other analyses that have previously evaluated these types of impacts either generically (programmatically) or at sites that have conditions similar to those at JPG. Any existing analyses used for this purpose should be scientifically credible, should have explicitly evaluated the past, present, and/or long-term potential impacts from the release of munitions constituents from UXO to the environment, and should have made clear conclusions about the potential human health and environmental impacts.

Although the Army will need to evaluate the potential for cumulative impacts to all affected resource areas in the requested impact analysis (see NUREG-1748 [NRC, 2003] for a complete list of resource areas), the NRC staff expects the assessment of impacts of potential UXO constituent releases on human and ecological health would be one of the most significant parts of the cumulative impact analysis. In specifically assessing the impacts of potential UXO releases on human and ecological health, if no applicable prior analyses are available, then the Army may utilize a quantitative assessment of the human and ecological risks from UXO constituents, an example of which would be a screening risk assessment comparable to the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) "*Training Range Site Characterization and Risk Screening, Regional Range Study, Jefferson Proving Ground, Madison, Indiana*" (U.S. Army, 2003b), with the exception that the measured environmental media concentrations of munitions constituents used in that study would be supplemented by the Army with estimated long-term media concentrations of munitions constituents. These estimated media concentrations should be based on an analysis of potential past, present, and future releases of UXO constituents following loss of UXO canister containment.

The level of impact analysis that can be conducted to support a cumulative impact assessment depends on the available data and information to support such an analysis. Additionally, only those potential impacts that are known and/or reasonably foreseeable need to be included in the analysis. The results of

investigations and the data and information requested in RAIs CI-1 and CI-2 will inform the level of cumulative impact analysis that can be conducted and may provide insights about the impacts that are known and reasonably foreseeable. Regardless of the scope and level of detail of the analysis, any resulting impact conclusions must be based on credible scientific evidence and methods that are generally accepted within the scientific community. For the various impact analyses associated with past, present, and reasonably foreseeable UXO constituent releases supporting the cumulative impact assessment, if insufficient information is available for any particular resource area or areas to support quantitative impact analysis, the unavailability of sufficient quantitative data and information should be explained/documented by the Army, and a semi-quantitative or qualitative impact analysis approach should instead be conducted by the Army based on accepted scientific methods.

The results of the Army's cumulative impact analysis should be documented in a written report, including appropriate results tabulations, annotated modeling I/O files, graphics, etc., as necessary.

BASIS

Information provided in the ER (U.S. Army, 2013a) and the DP (U.S. Army, 2013b) on the potential past, present, and long-term impacts from munitions constituents from the UXO remaining within and in the areas surrounding the DU Impact Area at JPG is very limited and insufficient for the NRC staff to evaluate the potential for cumulative impacts of the proposed action and reasonable alternatives to the proposed action. Based on its review of the available information on the status of potential UXO constituent hazards in areas north of the firing line at JPG, the NRC staff has found that potential hazards have been identified but information is limited and may not be current, and no applicable analyses of impacts with impact conclusions have been identified.

The Army's past JPG environmental restoration program documentation in the ER and DP includes a preliminary investigation that previously identified the entire firing range area north of the firing line as an area requiring further environmental evaluation (AREE) based, in part, on the potential for release of hazardous substances to soil, groundwater, and surface water from UXO that may leak constituents into the environment (such as when casings are compromised by cracking or corrosion) (U.S. Army, 1990).

Additional details supporting the need for cumulative impact analyses addressing the potential impacts of UXO constituents are provided in the first two paragraphs and the last paragraph of the BASIS for RAI CI-1 and are not repeated here. The requested cumulative impact analysis is needed to support the NRC staff's evaluation of cumulative impacts in the EIS.

RESPONSE

Cumulative impacts from UXO, MCs, and nonradiological impacts from DU are under further evaluation. The Army plans to provide response to RAIs CI-1 to CI-4 by October 1, 2015.

RAI CI-4

Provide the basis for or clarify the statement in Section 3.11.4 on page 3-43 of the ER (U.S. Army, 2013a) that significant sources of chemical (non-radiological) exposure were confined to the cantonment area and are not applicable to the DU Impact Area.

BASIS

The Army's past JPG environmental restoration program documentation referenced in the ER (Montgomery Watson Harza [MWH], 2002 in Section 3.11.4 on page 3-43) referenced a preliminary investigation that previously identified the entire firing range area north of the firing line as an area requiring further environmental evaluation (AREE) based, in part, on the potential for release of hazardous substances to soil, groundwater, and surface water from UXO that may leak constituents into the environment (such as when casings are compromised by cracking or corrosion) (U.S. Army, 1990). The clarification is needed to ensure the descriptions of the potential sources of chemical exposures within the DU impact area are correctly described and evaluated in the EIS.

RESPONSE

Cumulative impacts from UXO, MCs, and nonradiological impacts from DU are under further evaluation. The Army plans to provide response to RAIs CI-1 to CI-4 by October 1, 2015.

RAI CI-5

Provide information about the potential for the USFWS controlled burns to accelerate the breakdown of DU penetrators and whether and specifically how these controlled burns could affect the magnitude of public health and safety impacts from DU as reported in Section 4.12 of the ER (U.S. Army, 2013a). This can include both qualitative and quantitative information. For example, describe (i) the frequency of the USFWS controlled burns and their expected temperature range and duration; (ii) whether the burn conditions are sufficient to affect the integrity of the DU penetrators including the formation and behavior of their corrosion products (e.g., due to changes in oxidation states and other chemical and physical mechanisms); (iii) whether changes to the rate of physical breakdown of penetrators or characteristics of DU corrosion products could significantly affect Army dose estimates including any possible effects on airborne releases of DU; and (iv) any resulting effects on airborne concentrations of DU and public and occupational health.

BASIS

The USFWS conducts periodic controlled burning of vegetation at JPG, including the DU Impact Area (see Section 4.6 of the ER [U.S. Army, 2013a]). Concerns have been expressed by stakeholders about uranium transport in the smoke (for example, see Hill, 2014); and these concerns need to be addressed in the NRC's EIS. Although not part of the Army's proposed action, the controlled burns would be considered past, present, and reasonably foreseeable future actions for purposes of the EIS, the impacts of which would need to be addressed in the cumulative impacts analysis. Therefore, an understanding of the potential thermal effects of the USFWS controlled burns on the DU penetrators and their corrosion products is needed for the NRC staff to conduct an adequate assessment in the EIS of the cumulative environmental impacts to public and occupational health associated with the USFWS controlled burns. Additional details supporting the need for cumulative impact analyses are provided in the first two paragraphs and the last paragraph of the BASIS for RAI CI-1 and are not repeated here.

RESPONSE

Since information from modeling simulations is needed to develop responses for RAIs WR-1 and WR-7, additional time is needed to complete analysis and potential modeling simulations for this RAI. Since preliminary results for RAIs WR-1 and WR-7 will not be available until later this summer, the Army plans to provide response to RAI CI-5 by October 1, 2015.

MITIGATION MEASURES (MM)

RAI MM-1

Provide information describing plans that are in place to ensure that future contaminant movement from DU and UXO is identified and remediated before migrating offsite (i.e., off the JPG property), or provide justification that such plans are not needed.

BASIS

In EPA Region 5's EIS scoping comments (EPA, 2014), on page 2 under the *Site Safety* section, the EPA stated, "If environmental monitoring is not proposed, …explain what plans are in place to ensure any future contaminant movement is remediated before migrating offsite." Because the Army's proposed action (as described in the ER [U.S. Army, 2013a] and DP [U.S. Army, 2013b]) includes discontinuation of environmental monitoring upon license termination, the NRC staff needs the requested information to address EPA Region 5's concern about remediation of potential future offsite contaminant migration from the DU and UXO remaining onsite.

RESPONSE

Information from the evaluation of cumulative impacts from UXO and MCs (CI-1, CI-2, CI-3, and CI-4) is needed to completely respond to this RAI. The Army plans to provide response to RAI MM-1 by October 1, 2015.

RAI MM-2

Provide information to describe existing or planned measures that will remediate or contain the DU, UXO, and any other hazardous wastes at the JPG site, or provide justification that such measures would not be needed.

BASIS

In EPA Region 5's EIS scoping comments (EPA, 2014), on page 2 under the *Remediation* section, the EPA stated, "NRC's draft EIS should describe existing and planned measures that will remediate or contain the UXO [and DU] and any other hazardous wastes at JPG. This may include implementing one or more non-hazardous passive waste treatment systems that are described in *Technology Reference Guide for Radioactively Contaminated Media* (EPA, 2007b). Regarding the addition of DU to the EPA's comment, the NRC staff learned from a subsequent discussion with EPA Region 5 staff that the comment was also meant to include DU. The NRC staff needs the requested information to address EPA Region 5's request that the Draft EIS describe existing or planned measures that will remediate or contain the DU, UXO, and any other hazardous wastes at JPG.

RESPONSE

Information from the evaluation of cumulative impacts from UXO and MCs (CI-1, CI-2, CI-3, and CI-4) is needed to completely respond to this RAI. The Army plans to provide response to RAI MM-2 by October 1, 2015.

COST-BENEFIT (CB)

RAI CB-1

Clarify the frequency for conducting JPG perimeter fence inspections and provide the associated cost of conducting these inspections.

BASIS

NRC regulations in 10 CFR 51.71(d) state that EISs will include a consideration of the benefits and costs of the proposed action and alternatives. Institutional controls will be a part of the proposed action and all other alternatives evaluated in detail in the EIS. The highest estimated cost for an aspect of the Army's proposed institutional controls in Appendix F of the DP (U.S. Army, 2013b) is for the perimeter fence inspection. The perimeter fence inspection cost in DP Appendix F is based on biweekly (i.e., once every two weeks) inspections. However, the descriptions of institutional controls in Section 3.11.7.1 of the ER (U.S. Army, 2013a) and in the MOA between the Army, USFWS, and USAF (Appendix B in the DP [U.S. Army, 2013b]) state that perimeter fence inspection occurs weekly. Cost is a function of inspection frequency, and the correct information is needed so that an accurate description of the JPG perimeter fence inspection frequency and associated costs can be included in the cost-benefit analysis in the NRC's EIS.

RESPONSE

In accordance with the MOA (U.S. Army 2000) between the Army, the U.S. Fish and Wildlife Service (FWS), and the U.S. Air Force (USAF), Indiana Air National Guard (INANG) operates the Jefferson Range Operations Center for USAF and is responsible for the inspection and maintenance of the boundary/perimeter fence along with other maintenance activities. The boundary/perimeter fence surrounding the installation will continue to be inspected and maintained on a weekly basis by INANG for USAF under the requirements of the MOA following the termination of the license. The costs directly incurred by the Army for the weekly fence inspection are minimal and further discussed in the response prepared for RAI CB-3.

The costs presented in ER Section 7.2 and Appendix F of the Decommissioning Plan were developed in the event that both the INANG and FWS decide to terminate their respective agreements in the MOA. The Army, as responsible party, would continue to implement measures consistent with its authority and responsibilities outlined in the ROD (U.S. Army 1995) to regularly inspect and maintain the boundary/perimeter fence. Based on a conversation with MSgt John Deaton, the INANG Jefferson Range Scheduler, fence repairs are found to be necessary every 2 to 4 weeks during most of the year. However MSgt Deaton noted that during hunting season, fence repairs may be necessary weekly. Based on this review of the ongoing maintenance program, the Army believes biweekly fence inspections would adequately meet the requirements outlined in the ROD.

REFERENCES

U.S. Army. 1995. Final Environmental Impact Statement for Disposal and Reuse of the Jefferson Proving Ground. U.S. Army Materiel Command (AMCSO). Alexandria, Virginia. September.

U.S. Army. 2000. Memorandum of Agreement between the U.S. Army, U.S. Air Force, and U.S. Fish and Wildlife Service.

RAI CB-2

Provide a breakdown of the annual costs for conducting the current semi-annual ERM Program (two sampling events and one report per year), as described in Section 2.1.1 of the ER (U.S. Army, 2013a). Also provide a breakdown of the annual cost for conducting a single ERM sampling event and associated report per year.

BASIS

NRC regulations in 10 CFR 51.71(d) state that EISs will include a consideration of the benefits and costs of the proposed action and alternatives. Also, in accordance with CEQ regulations in 40 CFR 1502.14(d), EISs will analyze the no-action alternative, which in the case of the JPG project would be license continuation. In addition, the NRC's EIS for the proposed JPG DU Impact Area license termination may analyze a "license termination with continued monitoring" alternative as a reasonable alternative to the Army's proposed action. The monitoring frequency for this alternative may vary from that under the current ERM program. Knowledge of the breakdown of costs for the current semi-annual ERM program and for conducting a single sampling event and associated reporting provides information needed for the NRC staff to distinguish between the costs of the various alternatives to be analyzed in detail in the NRC's EIS and to conduct the required cost-benefit analysis.

RESPONSE

The ERMP SOP, which was reviewed and approved by the NRC prior to being utilized, specifies the U.S. Army Institute for Public Health's (formerly CHPPM's) protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in and near the DU Impact Area semiannually as part of the ERM program. Table CB-2-1 presents a summary of the annual costs for conducting the semiannual ERM program in accordance with the ERMP SOP (U.S. Army 2000) and the Remedial Action Cost Engineering and Requirements (RACER) software cost breakdown (AECOM 2015) is presented in Figure CB-2-1.

Table CB-2-1. Estimated Costs for Semiannual ERM Program

Task/Activity/Component	Costs
Fall – Purging of the Monitoring Wells	$16,295
Fall – Sampling of Groundwater, Surface Water, Sediment, and Soil	$36,906
Fall ERM Program Event Subtotal	*$53,201*
Spring – Purging of the Monitoring Wells	$16,295
Spring – Sampling of Groundwater, Surface Water, Sediment, and Soil	$36,906
Spring ERM Program Event Subtotal	*$53,201*
Annual ERM Report – Draft Version	$35,354
Annual ERM Report – Final Version	$20,569
Annual ERM Program Report Subtotal	*$55,923*
Total	$162,326

Present value analysis is a method to evaluate the potential costs, either capital or operations and maintenance related, which occur over different time periods through the duration of a project. The analysis allows for cost comparisons of different alternatives or scenarios on the basis of a single cost figure. This single number, referred to as the present value or worth, is the amount needed to be set aside at the initial point in time (base year) to assure that the funds will be available in the future as they are needed, assuming certain economic conditions. The total estimated present worth costs for the Army to complete the semiannual ERM Program between 1 and 100 years with an annual discount rate of 7 percent is $2,477,125. Use of longer time periods does not increase the present worth costs substantially. The total estimated present worth costs for the Army to complete the semiannual ERM Program over 1,000 years, discounted at 3 percent for years 100 to 1,000, is $2,604,541. The discount rates were selected based on guidance in Appendix N of NUREG 1757 (NRC 2006). It should be noted that based on a

discount rate of 1.4 percent (OMB 2015), the total estimated present worth costs for the Army to complete the semiannual ERM Program through a 1,000 year period are approximately $11,000,000.

Table CB-2-2 presents a summary of the annual costs to limit the ERM Program to one monitoring event, but the locations and procedures outlined in ERMP SOP (U.S. Army 2000) would remain the same. The RACER cost breakdown (AECOM 2015) has been provided as Figure CB-2-2.

Table CB-2-2. Estimated Costs for Annual ERM Program

Task/Activity/Component	Costs
Purging of the Monitoring Wells	$16,295
Sampling of Groundwater, Surface Water, Sediment, and Soil	$36,906
ERM Program Event Subtotal	*$53,201*
Annual ERM Report – Draft Version	$29,381
Annual ERM Report – Final Version	$15,896
Annual ERM Program Report Subtotal	*$45,277*
Total	$98,479

The total estimated present worth costs for the Army to complete the annual ERM Program between 1 and 100 years with an annual discount rate of 7 percent is $1,503,587. Use of longer time periods does not increase the present worth costs substantially. The total estimated present worth costs for the Army to complete the annual ERM Program over 1,000 years, discounted at 3 percent for years 100 to 1,000, is $1,580,984. The discount rates were selected based on guidance in Appendix N of NUREG 1757 (NRC 2006). It should be noted that based on a discount rate of 1.4 percent (OMB 2015), the total estimated present worth costs for the Army to complete the annual ERM Program through a 1,000 year period are approximately $7,000,000.

REFERENCES

AECOM. 2015. Remedial Action Cost Engineering and Requirements System (RACER), version 11.1.

OMB (Executive Office of the President Office of Management and Budget). 2015. 2015 Discount Rates for OMB Circular Number A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. Online: http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c/

NRC. 2006. NUREG-1757, "Consolidated Decommissioning Guidance, Decommissioning Process for Material Licenses, Final Report." Vol. 1, Rev. 2. ADAMS Accession No. ML063000243; Vol. 2, Rev. 1, ADAMS Accession No. ML063000252; Vol. 3, Rev. 1, ADAMS Accession No. ML12048A683. Washington, DC: U.S. Nuclear Regulatory Commission. 2006.

U.S. Army. 2000. "Standard Operating Procedure (SOP). Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program, JPG, Indiana." SOP No. OHP 40-2. March 10.

Phase Technology Cost Detail Report
(with Markups)

System:

RACER Version: RACER™ Version 11.1.12.0
Database Location: C:\Documents and Settings\johnsonjr6\My Documents\RACER 11.1\RACER.mdb

Folder:

Folder Name: Jefferson Proving Ground

Project:

ID: JPG
Name: Jefferson Proving Ground
Category: None

Location
State / Country: INDIANA
City: INDIANA STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.920	0.920	

Options
Database: System Costs
Cost Database Date: 2013
Report Option: Fiscal

Description Costs developed in order to provide further clarification in response to

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program

RAIs.

Site:

ID: JPG DU Impact Area
Name: ERM Program
Type: None

Media/Waste Type

Primary: Groundwater
Secondary: Soil

Contaminant

Primary: Radioactive (Low Level)
Secondary: None

Phase Names

Pre-Study ☐
Study ☐
Design ☐
Removal/Interim Action ☐
Remedial Action ☐
Operations & Maintenance ☐
Long Term Monitoring ☑
Site Closeout ☐

Documentation

Description: Costs developed in order to provide further clarification in response to RAIs received from NRC. The following assumes continuation of the Environmental Radiation Monitoring (ERM) program for surface soil, sediment, groundwater, and surface water.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Phase Documentation:

Phase Type: Long Term Monitoring

Phase Name: Semiannual ERM Program

Description: The ERMP SOP (CHPPM 2000) specifies the U.S. Army Institute for Public Health's (formerly CHPPM's) protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in and near the DU Impact Area semiannually as part of the ERM program. Present analytical costs for all the samples to be analyzed under Method ASTM D4972-90M is included as User Defined Analysis 1. If the isotopic ratio indicates the potential presence of DU, the samples are re-analyzed. It is assumed that 4 groundwater, 3 surface water, 3 sediment, and 2 soil samples will be re-analyzed using Method SW 6010A and this included as User Defined Analysis 2.

Approach: Ex Situ

Start Date: October, 2017

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Fall ERM Program - Purge of Wells	True	100	0
Fall ERM Program - Sampling	True	100	0
Spring ERM Program - Purge of Wells	True	100	0
Spring ERM Program - Sampling	True	100	0
Annual ERM Program Report - Draft	True	100	0
Annual ERM Program Report - Final	True	100	0

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Total Marked-up Cost: $162,326.38

Technologies:

Technology: Fall ERM Program - Purge of Wells

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010102	Sample collection, vehicles, van or pickup rental	2	DAY	0.00	0.00	0.00	79.23	$158.46	False
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	8	DAY	0.00	0.00	0.00	143.00	$1,144.00	True
33020401	Disposable Materials per Sample	11	EA	13.57	0.00	0.00	0.00	$149.26	False
33020402	Decontamination Materials per Sample	11	EA	17.83	0.00	0.00	0.00	$196.16	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False
33029901	Magnetometer	2	DAY	0.00	0.00	0.00	95.59	$191.18	False
33040935	UXO Technician III (UXO Supervisor)	24	HR	0.00	65.70	0.00	0.00	$1,576.83	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	12	HR	0.00	177.54	0.00	0.00	$2,130.45	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Technology: Fall ERM Program - Purge of Wells

33222002	Site Safety & Health Officer	24	HR	0.00	158.83	0.00	0.00	$3,811.82	False
33230506	2" Submersible Pump Rental, Day	2	DAY	0.00	0.00	0.00	102.02	$204.04	False

Total Element Cost: $16,295.24

Total 1st Year Tech Cost: $16,295.24

Technology: Fall ERM Program - Sampling

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010102	Sample collection, vehicles, van or pickup rental	8	DAY	0.00	0.00	0.00	79.23	$633.86	False
33010104	Sample collection, vehicle mileage charge, car or van	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	16	DAY	0.00	0.00	0.00	143.00	$2,288.00	True
33020401	Disposable Materials per Sample	35	EA	13.57	0.00	0.00	0.00	$474.93	False
33020402	Decontamination Materials per Sample	35	EA	17.83	0.00	0.00	0.00	$624.14	False
33020520	Hip Waders	1	EA	158.54	0.00	0.00	0.00	$158.54	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Technology: Fall ERM Program - Sampling

33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	330.87	$330.87	False
33022043	Overnight delivery service, 51 to 70 lb packages	450	LB	0.00	0.00	0.00	1.50	$674.97	False
33029501	User Defined Analysis 1	35	LS	0.00	0.00	0.00	136.66	$4,783.21	True
33029502	User Defined Analysis 2	12	LS	0.00	0.00	0.00	107.89	$1,294.70	True
33029901	Magnetometer	4	DAY	0.00	0.00	0.00	95.59	$382.35	False
33040935	UXO Technician III (UXO Supervisor)	96	HR	0.00	65.70	0.00	0.00	$6,307.31	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	16	HR	0.00	177.54	0.00	0.00	$2,840.60	False
33220110	QA/QC Officer	8	HR	0.00	196.40	0.00	0.00	$1,571.21	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False
33222002	Site Safety & Health Officer	48	HR	0.00	158.83	0.00	0.00	$7,623.64	False
33232407	PVC bailers, disposable polyethylene, 1.50" OD x 36"	12	EA	5.91	0.00	0.00	0.00	$70.97	False

Total Element Cost: $36,906.35

Total 1st Year Tech Cost: $36,906.35

Technology: Spring ERM Program - Purge of Wells

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Technology: Spring ERM Program - Purge of Wells

33010102	Sample collection, vehicles, van or pickup rental	2	DAY	0.00	0.00	0.00	79.23	$158.46	False
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	8	DAY	0.00	0.00	0.00	143.00	$1,144.00	True
33020401	Disposable Materials per Sample	11	EA	13.57	0.00	0.00	0.00	$149.26	False
33020402	Decontamination Materials per Sample	11	EA	17.83	0.00	0.00	0.00	$196.16	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False
33029901	Magnetometer	2	DAY	0.00	0.00	0.00	95.59	$191.18	False
33040935	UXO Technician III (UXO Supervisor)	24	HR	0.00	65.70	0.00	0.00	$1,576.83	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	12	HR	0.00	177.54	0.00	0.00	$2,130.45	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False
33222002	Site Safety & Health Officer	24	HR	0.00	158.83	0.00	0.00	$3,811.82	False
33230506	2" Submersible Pump Rental, Day	2	DAY	0.00	0.00	0.00	102.02	$204.04	False

Total Element Cost:	$16,295.24
Total 1st Year Tech Cost:	$16,295.24

Technology: Spring ERM Program - Sampling

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Technology: Spring ERM Program - Sampling

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010102	Sample collection, vehicles, van or pickup rental	8	DAY	0.00	0.00	0.00	79.23	$633.86	False
33010104	Sample collection, vehicle mileage charge, car or van	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	16	DAY	0.00	0.00	0.00	143.00	$2,288.00	True
33020401	Disposable Materials per Sample	35	EA	13.57	0.00	0.00	0.00	$474.93	False
33020402	Decontamination Materials per Sample	35	EA	17.83	0.00	0.00	0.00	$624.14	False
33020520	Hip Waders	1	EA	158.54	0.00	0.00	0.00	$158.54	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False
33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	330.87	$330.87	False
33022043	Overnight delivery service, 51 to 70 lb packages	450	LB	0.00	0.00	0.00	1.50	$674.97	False
33029501	User Defined Analysis 1	35	LS	0.00	0.00	0.00	136.66	$4,783.21	True
33029502	User Defined Analysis 2	12	LS	0.00	0.00	0.00	107.89	$1,294.70	True
33029901	Magnetometer	4	DAY	0.00	0.00	0.00	95.59	$382.35	False
33040935	UXO Technician III (UXO Supervisor)	96	HR	0.00	65.70	0.00	0.00	$6,307.31	False

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Figure CB-2-1. RACER Output – Estimated Costs for Semiannual ERM Program (continued)

Technology: Spring ERM Program - Sampling

33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	16	HR	0.00	177.54	0.00	0.00	$2,840.60	False
33220110	QA/QC Officer	8	HR	0.00	196.40	0.00	0.00	$1,571.21	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False
33222002	Site Safety & Health Officer	48	HR	0.00	158.83	0.00	0.00	$7,623.64	False
33232407	PVC bailers, disposable polyethylene, 1.50" OD x 36"	12	EA	5.91	0.00	0.00	0.00	$70.97	False

Total Element Cost: $36,906.35

Total 1st Year Tech Cost: $36,906.35

Technology: Annual ERM Program Report - Draft

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager		HR	0.00	275.15	0.00	0.00	$0.00	False
33220102	Project Manager	10	HR	0.00	212.58	0.00	0.00	$2,125.81	False
33220105	Project Engineer	24	HR	0.00	177.54	0.00	0.00	$4,260.90	False
33220107	Senior Scientist	20	HR	0.00	264.98	0.00	0.00	$5,299.69	False
33220108	Project Scientist	60	HR	0.00	196.40	0.00	0.00	$11,784.04	False
33220110	QA/QC Officer	24	HR	0.00	196.40	0.00	0.00	$4,713.62	False
33220112	Field Technician	20	HR	0.00	97.94	0.00	0.00	$1,958.84	False
33220114	Word Processing/Clerical	16	HR	0.00	106.01	0.00	0.00	$1,696.24	False
33220115	Draftsman/CADD	16	HR	0.00	113.68	0.00	0.00	$1,818.95	False

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program

Technology: Annual ERM Program Report - Draft

33220120	Computer Data Entry	16	HR	0.00	106.01	0.00	0.00	$1,696.24	False

Total Element Cost: $35,354.32

Total 1st Year Tech Cost: $35,354.32

Technology: Annual ERM Program Report - Final

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	10	HR	0.00	212.58	0.00	0.00	$2,125.81	False
33220105	Project Engineer	24	HR	0.00	177.54	0.00	0.00	$4,260.90	False
33220107	Senior Scientist	16	HR	0.00	264.98	0.00	0.00	$4,239.75	False
33220108	Project Scientist	30	HR	0.00	196.40	0.00	0.00	$5,892.02	False
33220110	QA/QC Officer	10	HR	0.00	196.40	0.00	0.00	$1,964.01	False
33220112	Field Technician	8	HR	0.00	97.94	0.00	0.00	$783.54	False
33220114	Word Processing/Clerical	8	HR	0.00	106.01	0.00	0.00	$848.12	False
33220115	Draftsman/CADD	4	HR	0.00	113.68	0.00	0.00	$454.74	False
33240101	Other Direct Costs		LS	224.78	0.00	0.00	0.00	$0.00	True

Total Element Cost: $20,568.88

Total 1st Year Tech Cost: $20,568.88

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Total Phase Element Cost	$162,326.38

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Phase Technology Cost Detail Report
(with Markups)

System:

RACER Version: RACER™ Version 11.1.12.0
Database Location: C:\Documents and Settings\johnsonjr6\My Documents\RACER 11.1\RACER.mdb

Folder:

Folder Name: Jefferson Proving Ground

Project:

ID: JPG
Name: Jefferson Proving Ground
Category: None

Location
State / Country: INDIANA
City: INDIANA STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.920	0.920	

Options
Database: System Costs
Cost Database Date: 2013
Report Option: Fiscal

Description Costs developed in order to provide further clarification in response to

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

RAIs.

Site:

ID: JPG DU Impact Area
Name: ERM Program
Type: None

Media/Waste Type

Primary: Groundwater
Secondary: Soil

Contaminant

Primary: Radioactive (Low Level)
Secondary: None

Phase Names

Pre-Study ☐
Study ☐
Design ☐
Removal/Interim Action ☐
Remedial Action ☐
Operations & Maintenance ☐
Long Term Monitoring ☑
Site Closeout ☐

Documentation

Description: Costs developed in order to provide further clarification in response to RAIs received from NRC. The following assumes continuation of the Environmental Radiation Monitoring (ERM) program for surface soil, sediment, groundwater, and surface water.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Phase Documentation:

Phase Type: Long Term Monitoring
Phase Name: Annual ERM Program
Description: The ERMP SOP (CHPPM 2000) specifies the U.S. Army Institute for Public Health's (formerly CHPPM's) protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in and near the DU Impact Area annually as part of the ERM program. Present analytical costs for all the samples to be analyzed under Method ASTM D4972-90M is included as User Defined Analysis 1. If the isotopic ratio indicates the potential presence of DU, the samples are re-analyzed. It is assumed that 4 groundwater, 3 surface water, 3 sediment, and 2 soil samples will be re-analyzed using Method SW 6010A and this included as User Defined Analysis 2.

Approach: Ex Situ
Start Date: October, 2017
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Annual ERM Program - Purge of Wells	True	100	0
Annual ERM Program - Sampling	True	100	0
Annual ERM Program Report - Draft	True	100	0
Annual ERM Program Report - Final	True	100	0

Total Marked-up Cost: $98,479.36

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Technologies:

Technology: Annual ERM Program - Purge of Wells

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010102	Sample collection, vehicles, van or pickup rental	2	DAY	0.00	0.00	0.00	79.23	$158.46	False
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	8	DAY	0.00	0.00	0.00	143.00	$1,144.00	True
33020401	Disposable Materials per Sample	11	EA	13.57	0.00	0.00	0.00	$149.26	False
33020402	Decontamination Materials per Sample	11	EA	17.83	0.00	0.00	0.00	$196.16	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False
33029901	Magnetometer	2	DAY	0.00	0.00	0.00	95.59	$191.18	False
33040935	UXO Technician III (UXO Supervisor)	24	HR	0.00	65.70	0.00	0.00	$1,576.83	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	12	HR	0.00	177.54	0.00	0.00	$2,130.45	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False
33222002	Site Safety & Health Officer	24	HR	0.00	158.83	0.00	0.00	$3,811.82	False
33230506	2" Submersible Pump Rental, Day	2	DAY	0.00	0.00	0.00	102.02	$204.04	False

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Technology: Annual ERM Program - Purge of Wells

Total Element Cost:	$16,295.24
Total 1st Year Tech Cost:	$16,295.24

Technology: Annual ERM Program - Sampling

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010102	Sample collection, vehicles, van or pickup rental	8	DAY	0.00	0.00	0.00	79.23	$633.86	False
33010104	Sample collection, vehicle mileage charge, car or van	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010105	Sample collection, vehicle mileage charge, pickup truck	200	MI	0.00	0.00	0.00	0.57	$114.00	True
33010202	Per Diem (per person)	16	DAY	0.00	0.00	0.00	143.00	$2,288.00	True
33020401	Disposable Materials per Sample	35	EA	13.57	0.00	0.00	0.00	$474.93	False
33020402	Decontamination Materials per Sample	35	EA	17.83	0.00	0.00	0.00	$624.14	False
33020520	Hip Waders	1	EA	158.54	0.00	0.00	0.00	$158.54	False
33021229	Radiation Monitor, Digital, Hand-Held, w/data storage and logging capabilities, Monthly Rental	1	MO	217.19	0.00	0.00	0.00	$217.19	False
33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	330.87	$330.87	False
33022043	Overnight delivery service, 51 to	450	LB	0.00	0.00	0.00	1.50	$674.97	False

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Technology: Annual ERM Program - Sampling

	70 lb packages								
33029501	User Defined Analysis 1	35	LS	0.00	0.00	0.00	136.66	$4,783.21	True
33029502	User Defined Analysis 2	12	LS	0.00	0.00	0.00	107.89	$1,294.70	True
33029901	Magnetometer	4	DAY	0.00	0.00	0.00	95.59	$382.35	False
33040935	UXO Technician III (UXO Supervisor)	96	HR	0.00	65.70	0.00	0.00	$6,307.31	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	16	HR	0.00	177.54	0.00	0.00	$2,840.60	False
33220110	QA/QC Officer	8	HR	0.00	196.40	0.00	0.00	$1,571.21	False
33220112	Field Technician	48	HR	0.00	97.94	0.00	0.00	$4,701.22	False
33222002	Site Safety & Health Officer	48	HR	0.00	158.83	0.00	0.00	$7,623.64	False
33232407	PVC bailers, disposable polyethylene, 1.50" OD x 36"	12	EA	5.91	0.00	0.00	0.00	$70.97	False

Total Element Cost: $36,906.35

Total 1st Year Tech Cost: $36,906.35

Technology: Annual ERM Program Report - Draft

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager		HR	0.00	275.15	0.00	0.00	$0.00	False
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	24	HR	0.00	177.54	0.00	0.00	$4,260.90	False

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Technology: Annual ERM Program Report - Draft

33220107	Senior Scientist	18	HR	0.00	264.98	0.00	0.00	$4,769.72	False
33220108	Project Scientist	46	HR	0.00	196.40	0.00	0.00	$9,034.43	False
33220110	QA/QC Officer	20	HR	0.00	196.40	0.00	0.00	$3,928.01	False
33220112	Field Technician	16	HR	0.00	97.94	0.00	0.00	$1,567.07	False
33220114	Word Processing/Clerical	14	HR	0.00	106.01	0.00	0.00	$1,484.21	False
33220115	Draftsman/CADD	12	HR	0.00	113.68	0.00	0.00	$1,364.21	False
33220120	Computer Data Entry	12	HR	0.00	106.01	0.00	0.00	$1,272.18	False

Total Element Cost: $29,381.38

Total 1st Year Tech Cost: $29,381.38

Technology: Annual ERM Program Report - Final

Element:

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	8	HR	0.00	212.58	0.00	0.00	$1,700.65	False
33220105	Project Engineer	16	HR	0.00	177.54	0.00	0.00	$2,840.60	False
33220107	Senior Scientist	12	HR	0.00	264.98	0.00	0.00	$3,179.81	False
33220108	Project Scientist	24	HR	0.00	196.40	0.00	0.00	$4,713.62	False
33220110	QA/QC Officer	8	HR	0.00	196.40	0.00	0.00	$1,571.21	False
33220112	Field Technician	6	HR	0.00	97.94	0.00	0.00	$587.65	False
33220114	Word Processing/Clerical	8	HR	0.00	106.01	0.00	0.00	$848.12	False
33220115	Draftsman/CADD	4	HR	0.00	113.68	0.00	0.00	$454.74	False

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

Technology: Annual ERM Program Report - Final

33240101	Other Direct Costs	LS	224.78	0.00	0.00	0.00	$0.00	True

Total Element Cost:	$15,896.39
Total 1st Year Tech Cost:	$15,896.39
Total Phase Element Cost	**$98,479.36**

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Figure CB-2-2. RACER Output – Estimated Costs for Annual ERM Program (continued)

RAI CB-3

Provide a breakdown of all costs associated with the no-action alternative (i.e., license continuation) excluding the costs for conducting the ERM program (the costs of which are the topic of RAI CB-2). The requested cost breakdown would include, but may not be not limited to the costs for implementing the institutional controls and the Radiation Safety Program, the costs for conducting annual reviews and audits of radiation related JPG site activities and policies, and any fees paid to the NRC such as licensee fees and inspection fees.

BASIS

NRC regulations in 10 CFR 51.71(d) state that EISs will include a consideration of the benefits and costs of the proposed action and alternatives. Also, in accordance with CEQ regulations in 40 CFR 1502.14(d), the EIS will analyze the no-action alternative (i.e., license continuation in the case of the JPG DU Impact Area). The Army currently incurs costs from activities supporting the Army's compliance with and NRC oversight of Materials License SUB-1435, which would be equivalent to the costs associated with the no-action alternative. The Army's quantitative description of the costs for the no-action alternative in Section 7.1 of the ER (U.S. Army, 2013a) is limited to a reference to the proposed action's costs for specified institutional controls in Section 7.2 of the ER (U.S. Army, 2013a). However, text in ER Section 7.1 indicates that the institutional controls for the no-action alternative may differ from those for the proposed action. The requested costs, which are associated with the no-action alternative, are needed so that an accurate description and presentation of these costs can be included by the NRC staff in the cost-benefit analysis in the EIS.

RESPONSE

The estimated costs for the no-action alternative (i.e., license continuation) excluding the costs for conducting the ERM program are approximately $78,252 when the license is required to be renewed and approximately $50,052 in years not requiring license renewal. License renewal occurs every five years. The cost breakdown is presented in Figure CB-3-1.

The total estimated present worth costs for the no-action alternative between 1 and 100 years with an annual discount rate of 7 percent is $838,691. Use of longer time periods does not increase the present worth costs substantially. The total estimated present worth costs for no-action alternative over 1,000 years, discounted at 3 percent for years 100 to 1,000, is $887,447. The discount rates were selected based on guidance in Appendix N of NUREG 1757 (NRC 2006). It should be noted that based on a discount rate of 1.4 percent (OMB 2015), the total estimated present worth costs for the no-action alternative through a 1,000 year period are approximately $4,000,000.

REFERENCES

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Table CB-3-1. Cost Breakdown for No Action Alternative (License Continuation)

Item No.	Task/Activity/Component	Quantity	Units	Labor	Materials	Equipment	Total Unit Price	Base Year	Escalation	2015 Unit Costs	Total 2015 Costs
Radiation Safety Program[1]											
1	Rock Island Garrison Commander	24	hours	$165	–	–	–	2015	–	$165	$3,960
2	Radiation Safety Officer	120	hours	$130	–	–	–	2015	–	$130	$15,600
3	Army Legal Staff	24	hours	$150	–	–	–	2015	–	$150	$3,600
4	Staff Support	16	hours	$70	–	–	–	2105	–	$70	$1,120
5	Per Diem for Travel to JPG	8	days	–	$123	–	–	2015	–	$123	$984
6	Sedan, Automobile Rental	8	days	–	$60	–	–	2015	–	$60	$480
7	Airline Expense for Travel to JPG	2	days	–	$600	–	–	2015	–	$600	$1,200
								Radiation Safety Program Subtotal			*$26,944*
Institutional Control Oversight[2]											
8	USACE District Louisville - Technical Project Manager	72	hours	$120	–	–	–	2015	–	$120	$8,640
9	Mileage for Quarterly Trips to JPG	640	mile	–	$0.575	–	–	2015	–	$0.575	$368
								Institutional Control Oversight Subtotal			*$9,008*
NRC License Fees[3]											
10	Annual Inspection & Annual Report Review	1	LS	–	–	–	$10,000	2005	1.41	$14,100	$14,100
11	Five Year License Renewal, Expanded Inspection, & Report[4]	1	LS	–	–	–	$20,000	2005	1.41	$28,200	$28,200
								Total with Five Year License Renewal			$78,252
								Total without the License Renewal			$50,052
									Present Worth Costs[5]		$887,447

Footnotes:
1 Assumes quarterly meetings amongst Army personnel, annual review, auditing, and updating of JPG's training program and policies. Assumes two annual visits to be completed by the Radiation Safety Officer.
2 Assumes quarterly meetings amongst Army personnel and institutional control oversight. Assumes quarterly visits from to ensure the institutional controls are being maintained.
3 NRC License Fees were taken from NUREG 1757, Vol 1, Rev 2, Appendix M, Section M.3.10.
4 License renewal occurs every five years.
5 Total estimated present worth costs were discounted annually by 7% for years 1-100 and 3% for years 100-1,000.

RAI CB-4

Provide a breakdown of the costs incurred by the Army for the 5-year reviews to ensure the institutional controls are in place and continue to function in accordance with NUREG-1757, Volume 1, Revision 2, Appendix M, Section M.1.1 and Table M.1 (NRC, 2006).

BASIS

NRC regulations in 10 CFR 51.71(d) state that EISs will include a consideration of the benefits and costs of the proposed action and alternatives. The NRC staff acknowledges that for the proposed action, the Army is requesting not to conduct the five-year reviews identified above in the RAI (see Section 2.1.2 of the ER [U.S. Army, 2013a]). However, it is yet to be determined whether this request would be granted by the NRC. In addition, the EIS may analyze a "license termination with continued monitoring" alternative that may also include the five-year reviews. Therefore, costs for the five-year review activity are needed so that an accurate description and costs can be included in the cost-benefit analysis in the NRC's EIS.

RESPONSE

The estimated costs to conduct one five-year review are approximately $59,079. This includes labor, materials, and equipment costs for document review, interviews with applicable stakeholders, site inspection, reporting, and travel expenses in accordance with the U.S. Environmental Protection Agency's (USEPA) Five-Year Review guidance. The RACER cost breakdown (AECOM 2015) is presented in Figure CB-4-1.

The total estimated present worth costs for the Army to complete the five-year reviews every five years between 1 and 100 years with an annual discount rate of 7 percent is $156,854. Use of longer time periods does not increase the present worth costs substantially. The total estimated present worth costs for the Army to conduct the five-year reviews over 1,000 years, discounted at 3 percent for years 100 to 1,000, is $176,727. The discount rates were selected based on guidance in Appendix N of NUREG 1757 (NRC 2006). It should be noted that based on a discount rate of 1.4 percent (OMB 2015), the total estimated present worth costs for the Army to complete the five-year reviews through a 1,000 year period are approximately $830,000.

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Phase Technology Cost Detail Report (with Markups)

System:

RACER Version: RACER™ Version 11.1.12.0
Database Location: C:\Documents and Settings\johnsonjr6\My Documents\RACER 11.1\RACER.mdb

Folder:

Folder Name: Jefferson Proving Ground

Project:

ID: JPG
Name: Jefferson Proving Ground
Category: None

Location
State / Country: INDIANA
City: INDIANA STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.920	0.920	

Options
Database: System Costs
Cost Database Date: 2013
Report Option: Fiscal

Description Costs developed in order to provide further clarification in response to

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Figure CB-4-1. RACER Output – Estimated Costs for Five Year Reviews

RAIs.

Site:

ID: JPG DU Impact Area
Name: Five Year Reviews
Type: None

Media/Waste Type
Primary: Soil
Secondary: Groundwater

Contaminant
Primary: Radioactive (Low Level)
Secondary: Ordnance (residual)

Phase Names

- **Pre-Study** ☐
- **Study** ☐
- **Design** ☐
- **Removal/Interim Action** ☐
- **Remedial Action** ☐
- **Operations & Maintenance** ☑
- **Long Term Monitoring** ☑
- **Site Closeout** ☐

Documentation
Description: Costs developed in order to provide further clarification in response to RAIs received from NRC. The following estimate assumes one Five Year Review.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information
Estimator Name: Jamie Johnson

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Page: 2 of 6

Figure CB-4-1. RACER Output – Estimated Costs for Five Year Reviews (continued)

Phase Documentation:

Phase Type:	Operations & Maintenance
Phase Name:	Five Year Review
Description:	The esimated costs assumes one Five Year Review.
Approach:	Ex Situ
Start Date:	October, 2016
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Phase Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	True	100	0

Total Marked-up Cost: $59,078.93

Technologies:

Technology: Five-Year Review

Element: Document Review

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	4	HR	0.00	212.58	0.00	0.00	$850.32	False
33220105	Project Engineer	24	HR	0.00	177.54	0.00	0.00	$4,260.90	False

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Figure CB-4-1. RACER Output – Estimated Costs for Five Year Reviews (continued)

Technology: Five-Year Review

33220108	Project Scientist	14	HR	0.00	196.40	0.00	0.00	$2,749.61	False
33220109	Staff Scientist	30	HR	0.00	113.68	0.00	0.00	$3,410.53	False

Total Element Cost: $11,271.36

Element: Interviews

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	24	HR	0.00	212.58	0.00	0.00	$5,101.94	False

Total Element Cost: $5,101.94

Element: Site Inspection

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6	HR	0.00	212.58	0.00	0.00	$1,275.49	False
33220105	Project Engineer	24	HR	0.00	177.54	0.00	0.00	$4,260.90	False
33220108	Project Scientist	10	HR	0.00	196.40	0.00	0.00	$1,964.01	False
33220109	Staff Scientist	24	HR	0.00	113.68	0.00	0.00	$2,728.43	False

Total Element Cost: $10,228.82

Element: Report

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

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Figure CB-4-1. RACER Output – Estimated Costs for Five Year Reviews (continued)

Technology: Five-Year Review

33220102	Project Manager	20	HR	0.00	212.58	0.00	0.00	$4,251.62	False
33220105	Project Engineer	50	HR	0.00	177.54	0.00	0.00	$8,876.87	False
33220108	Project Scientist	46	HR	0.00	196.40	0.00	0.00	$9,034.43	False
33220109	Staff Scientist	80	HR	0.00	113.68	0.00	0.00	$9,094.76	False

Total Element Cost: $31,257.68

Element: Travel

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	4	DAY	0.00	0.00	0.00	58.78	$235.14	False
33010202	Per Diem (per person)	8	DAY	0.00	0.00	0.00	123.00	$984.00	True
33041101	Airfare	2	LS	0.00	0.00	0.00	0.00	$0.00	True

Total Element Cost: $1,219.14

Total 1st Year Tech Cost: $59,078.93

Total Phase Element Cost **$59,078.93**

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Figure CB-4-1. RACER Output – Estimated Costs for Five Year Reviews (continued)

RAI CB-5

Clarify whether the institutional controls specified in the cost estimates in Section 7.2 of the ER (U.S. Army, 2013a) and Appendix F of the DP (U.S. Army, 2013b) address all of the institutional controls specific to the Army's proposed action (i.e., license termination under restricted conditions) in a case in which the MOA between the U.S. Army, USFWS, and USAF (Appendix B of the ER [U.S. Army, 2013a]) is terminated. Specifically, if the MOA is terminated, what activities would the Army then need to perform to implement, support, and maintain institutional controls and access control within the JPG site. Describe the activities and provide a breakdown of the costs for any of these activities not already addressed in Section 7.2 of the ER and Appendix F of the DP.

BASIS

NRC regulations in 10 CFR 51.71(d) state that EISs will include a consideration of the benefits and costs of the proposed action and alternatives. Institutional controls will be a part of the proposed action and of other alternatives analyzed in detail by the NRC staff in the EIS. The institutional controls described in Section 7.2 of the ER (U.S. Army, 2013a) and Appendix F of the DP (U.S. Army, 2013b) appear to be limited to the JPG site perimeter. However, the institutional controls associated with the proposed license termination under restricted conditions described in Section 1.3.2 of the ER (U.S. Army, 2013a) also include institutional controls within the JPG site to restrict access to the DU Impact Area as specified in the MOA (Appendix B of the ER [U.S. Army, 2013a]). The MOA identifies many responsibilities (e.g., activities, programs, functions) that the USAF and USFWS are required to conduct. The MOA also specifies that the USAF and USFWS are responsible for the cost of these responsibilities unless otherwise arranged. It is unclear which, if any, responsibilities the Army would need to perform to implement institutional controls and control access within the JPG site if the MOA is terminated. The institutional controls described in the MOA include administrative mechanisms (e.g., oversight responsibilities for controlling access), physical mechanisms (e.g., gates and signage), and associated infrastructure maintenance. Identification of institutional controls within the JPG site and a breakdown of their associated costs are needed so that an accurate description can be included in cost-benefit analysis the NRC's EIS.

RESPONSE

In the event that both the USAF and FWS decide to terminate their respective agreements in the MOA (U.S. Army 2000), the Army, as responsible party, will continue to maintain institutional controls of the area north of the firing line based on Army ownership of the land and the existence of the substantial explosive safety hazards from the UXO and the DU remaining within the JPG DU Impact Area. Access would be restricted except to authorized Army personnel with the appropriate UXO and radiation training. The institutional controls outlined in ER Section 2.1.2 that currently are implemented would remain if the MOA was terminated in the future and these would include physical access restrictions (i.e., pad locked swing gates, warning signs, perimeter chain-link fence with pad locked chain-link fence gates) to prevent unauthorized entry into the DU Impact Area. Institutional controls also include legal (i.e., Army retains property ownership of JPG north of the firing line) and administrative (e.g., hunting prohibitions) controls over the DU Impact Area. No costs beyond the costs summarized in Section 7.2 of the ER and Appendix F of the DP would be incurred by the Army as a result of the termination of the MOA as all unauthorized access would be prohibited.

REFERENCES

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ADDITIONAL INFORMATION NEED – ER AND DP FIGURES FOR THE EIS

Revised figures (maps, drawings, graphs, charts, photographs, etc.) from the ER (U.S. Army 2013a) and DP (U.S. Army, 2013b) are not required to complete the NRC staff's analysis for the environmental review. However, certain ER and DP figures provided in a different format would significantly aid in the NRC staff's development of the EIS, because: (i) most, if not all figures from the ER and DP used in the published Draft and Final EIS will first need to be modified, and (ii) per NRC publication guidelines, all figures in the published Draft and Final EIS must be clear, legible, and understandable when printed in black and white. Therefore, provide all of the figures in the ER main text (not including appendices except as otherwise specified), ER Appendix D Figure 2-1, ER Appendix E Figure 2-5, and DP Figure ES-5, DP Figure ES-6, and DP Figure 2-1 in their original digital form for the NRC staff's use in developing the EIS. For photographs, provide original copies in a .jpg format. Figures that are not needed for this request are ER Figures 6-9, ER Figures 6-14 through 6-17, ER Figures 6-21 through 6-25, and ER Figures 6-27 through 6-37. For figures developed by the Army/Leidos with drafting software, it is requested that those figures are provided in a non-flattened or non-compressed format in a high-quality grey scale and resolution. It is further requested that the figures provided do not contain figure numbers or titles. In addition, font sizes used in the figures should be adjusted if needed so that the text in each figure will be legible in the EIS.

RESPONSE

The electronic files are provided on DVD within the folder entitled "FIGURES." Note that two of the figures are not available in native format, so they have been provided in alternate formats.

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