Analysis of Recent Superfund Decision Documents for PRG, RSL, RAIS, and RESRAD Usage

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Study Protocol

This brief analysis reviewed decision documents for Department of Energy (DOE) sites on the Superfund Decision Documents webpage at: https://www.epa.gov/superfund/search-superfund-decision-documents to determine what model was used for risk assessment decisions. Decision documents on the website include Records of Decision (ROD), ROD Amendments, and Explanations of Significant Differences (ESD), along with other associated memos and files. The purpose of this study is to correct the misconception that the PRG calculator is not being used at US Department of Energy (DOE) Superfund sites.

According to the documentation listed on the Superfund Decision Documents webpage all sites belong to DOE except for one site that was in the Formerly Utilized Sites Remedial Action Program (FUSRAP), which has been transferred to the Army Corp of Engineers. I started with the most current entry and went backwards through the list approximately 10 years (until August 14, 2014), capturing any sites that were posting 5 Year Reviews on the decision documents webpage. I targeted these decisions because they will have been issued after the June 13, 2014, guidance "Radiation Risk Assessment At CERCLA Sites: Q & A", which may be found here: https://semspub.epa.gov/work/HQ/176329.pdf

I performed a key word search for PRG, RSL, RESRAD, and associated words in the decision documentation to see which of these models had been cited. This report includes screenshots of the best language in the decision document that summarizes the use of the model in facilitating making a remedial decision. The summary figure on the next page only includes models for soil, water, and air media. The SPRG was mentioned in one document as being used for the assessment of building slabs. Models for lead contamination were excluded from the figure.

Study Findings

The conclusion from this study is that over the past 10 years, DOE is using the PRG and RSL calculators to make risk-based determinations for radionuclides and chemicals. RESRAD is usually not mentioned. At one site, RESRAD is used for dose assessment for a DOE Order under the Atomic Energy Act (AEA), and at another site, it is used for dose assessment for an ARAR; neither were included in the figure since they are not CERCLA risk assessments. One site had RESRAD cited for a short-term risk assessment but used PRG for long-term risk assessments. Only one site cited RESRAD as the primary risk assessment tool with the PRG used to evaluate the RESRAD-based concentrations. Two site decisions had RAIS PRGs for radionuclides used for risk assessment, and one of those evaluated the concentrations with EPA PRGs and in conversations with EPA and the state the DOE site has agreed to use the PRG calculator for subsequent evaluations. Fifteen of the documents did not mention any of the five tools (PRG, RSL, RAIS PRG rad or chem, and RESRAD).

Models used for CERCLA Risk Assessment at DOE sites
(Focus on Remedial Decision Documents since August 2014)

Date, Site, CERCLA Remedial Decision Document	Model Used for CERCLA Risk Assessment Of Radionuclides and Chemicals in Soil, Water, or Air					
	EPA PRG	EPA RSL	EPA R9 RSL	RAIS PRG/ rad	RAIS PRG/ chem	DOE RESRAD
05/16/2024 Oak Ridge Reservation – Interim ROD						
05/09/2024 Oak Ridge Reservation - ROD	✓	✓				
09/26/2023 Savannah River Site - ESD						
09/22/2023 Savannah River Site - ESD	✓	✓				
09/01/2023 Mount Plant – ROD Amendment		✓				
12/21/2022 Pantex Plant – ESD						
12/02/2022 Paducah Gaseous Diffusion Plant – ESD						
09/30/2022 Oak Ridge Reservation – ROD	✓	✓				
05/04/2022 Monticello Rad. Contaminated Properties – 5YR	✓	✓				✓
05/2022 Rocky Flats – 5 YR	✓	✓				
03/17/2022 Idaho National Engineering Laboratory – 5YR	✓	✓		✓		
12/09/2021 Savannah River Site – ROD	✓	✓				
09/16/2021 Savannah River Site – ROD		✓				
01/07/2021 Idaho National Engineering Laboratory – 5YR		✓		✓	✓	
09/09/2020 Savannah River Site – ROD		✓				
06/23/2020 Oak Ridge Reservation – ROD Amendment						
03/26/2020 Oak Ridge Reservation – ROD Amendment						
05/22/2019 Savannah River Site – ROD	✓	✓				
08/23/2028 Oak Ridge -- ESD						
07/01/2018 Hanford 100-Area - ROD	✓	✓				✓
05/21/2018 Savannah River Site -- ROD	✓	✓				
08/02/2017 Rocky Flats Plant – 5YR	✓	✓				
03/16/2017 Idaho National Engineering Laboratory	✓	✓				
02/22/2017 Savannah River Site - ESD						
09/29/2016 LEHR -- ROD	✓	✓				
06/03/2016 Hanford – ESD						
05/24/2016 Oak Ridge – ROD Amendment						
04/12/2016 Hanford – ESD						
01/13/2016 Paducah – ESD			✓			
12/22/2015 Hanford – ROD Amendment						
12/17/2015 Idaho National Engineering Laboratory – 5YR	✓		✓			
09/25/2015 Hanford – ESD						
09/09/2015 Savannah River Site – Early Action ROD	✓	✓				
09/30/2014 Lawrence Livermore National Lab – ESD						
08/13/2014 Savannah River Site – ESD						
Number of DOE Decision Documents citing Each Model	**15**	**18**	**2**	**2**	**1**	**2**

Short summary and screenshots of model used for CERCLA risk assessment in each decision document.

05/16/2024 Oak Ridge Reservation (USDOE) – Interim ROD

https://semspub.epa.gov/work/04/11199782.pdf

No mention of PRG, RSL, or RESRAD. Mentions earlier risk assessments and risk-based levels (soil to groundwater and groundwater SSLs) and states the human health risk assessment will be part of additional RI/FS.

05/09/2024 Oak Ridge Reservation (USDOE) - ROD

https://semspub.epa.gov/work/04/11199768.pdf

Used PRG and RSL calculators. No mention of RESRAD.

Screenshot from page 2-22 (44 of the pdf)

Chemical constituents in groundwater, and more specifically the maximum detected concentrations (MDCs), were compared to their corresponding regional screening levels for tap water (EPA 2021a). Likewise, MDCs for radionuclides were compared to the corresponding preliminary remediation goal for tap water (ORNL 2021). Volatile chemicals (i.e., volatile organic compounds and mercury) were also evaluated against EPA's vapor intrusion screening levels to determine COPCs associated with vapor intrusion pathways (EPA 2021b). Finally, groundwater MDCs were evaluated against contaminant-specific MCLs. While MCLs are not risk-based values, they are identified as ARARs required for implementation

Screenshot from page 2-49 (71 of the pdf)

EPA 2021a. *Regional Screening Levels for Chemical Contaminants at Superfund Sites (November 2021)*, Accessed May 1, 2022. URL: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Screenshot from page 2-50 (72 of the pdf)

ORNL 2021. *Preliminary Radiation Goals for Radionuclides Calculator (June 2021)*, Accessed April 16, 2022. URL: https://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search.

09/26/2023 SAVANNAH RIVER SITE (USDOE) - ESD

https://semspub.epa.gov/work/04/11189771.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

09/22/2023 SAVANNAH RIVER SITE (USDOE) – ROD

https://semspub.epa.gov/work/04/11189751.pdf

Used PRG and RSL calculators. No mention of RESRAD.

Screenshot from page 39

The *USEPA Regional Screening Levels* website (USEPA 2020a) was the source of RSLs used in this assessment. The generic table located on the USEPA website was published in November 2020, and used all default parameters for both the residential and industrial worker scenarios. The RSL website was accessed in February 2021.

The *USEPA Superfund Radionuclide Preliminary Remediation Goals for Superfund* website (USEPA 2020b) was the source of the PRGs used in this assessment. The website was accessed in February 2021. The PRGs for a residential scenario were obtained by using the website calculator function to derive site-specific PRGs. These site-specific PRG values were calculated by using all default parameters as standard input assumptions with the exception of the fruit and vegetable consumption pathways (SRNS 2022a). The PRGs for an industrial worker scenario were obtained from the generic table which assumed all default parameters.

09/01/2023 MOUND PLANT (USDOE) – ROD Amendment

https://semspub.epa.gov/work/05/985494.pdf

Used RSL calculator. No mention of PRG or RESRAD.

Screenshot from page 40

Table 4. Remediation Goals for Groundwater in OU-1

COCs (µg/L)	Risk-Based Comparison Value[a]	Regulatory Limits	Maximum Concentration[b]	Remediation Goal	Lifetime Risk at Proposed PRG
PCE	11.3	5.0	5.82	5.0	4.4×10^{-7}
TCE	0.49	5.0	7.37	5.0	1.0×10^{-5}
cDCE	36.1	70.0	32.2	50.0	HI = 1.0
VC	0.019	2.0	14.2	1.0	5.3×10^{-5}
TOTAL					**6.3×10^{-5}**

Notes:

[a] Risk-based comparison values equate to 1×10^{-6} ELCR or an HI of 1.0 and were estimated using the EPA Regional Screening Level calculator.

[b] Maximum concentrations were obtained from 2019–2021 groundwater data.

12/21/2022 PANTEX PLANT (USDOE) – ESD

https://semspub.epa.gov/work/06/100028228.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

12/02/2022 PADUCAH GASEOUS DIFFUSION PLANT (USDOE) – ESD

https://semspub.epa.gov/work/04/11175003.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

09/30/2022 OAK RIDGE RESERVATION (USDOE) – ROD

https://semspub.epa.gov/work/04/11174407.pdf

PRG used for cleanup levels, RSL used for risk assessment, RESRAD used as dose assessment for DOE Order

Screenshot page 2-67

A recreational fisher in the recreational use scenario was identified as the appropriate exposure scenario. For the 21 radionuclides of interest, fish tissue and instream water column PRGs/cleanup levels have been developed to be protective of recreational use (human health), specifically fish ingestion.

PRGs/cleanup levels have been established for the 21 radionuclides of interest, inclusive of relevant progeny, using EPA's PRG Calculator tool, based on a target of 10^{-5} ELCR, as specified in Tennessee's water quality criteria for recreational use. Exposure factors used to develop the PRGs/cleanup levels

Screenshot pages 3-394 and 3-411

[iii] The 95% Upper Confidence Level of the sum of PCB-1254 and PCB-1260 in fish collected from Bear Creek for the 5-year interval of Calendar Year (CY) 2017 through CY2021 is 0.782 mg/kg. Using the EPA Regional Screening Level Calculator at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search with 17500 mg/day fish ingestion rate, 365 days per year, for 26 years consistent with assumptions in EMDF PRG Development, an existing excess lifetime cancer risk (ELCR) of 1.27E-04 from ingestion of fish collected from Bear Creek is calculated.

[iii] The 95% Upper Confidence Level of the sum of PCB-1254 and PCB-1260 in fish collected from Bear Creek for the 5-year interval of Calendar Year (CY) 2017 through CY2021 is 0.782 mg/kg. Using the EPA Regional Screening Level Calculator at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search with 17500 mg/day fish ingestion rate, 365 days per year, for 26 years consistent with assumptions in EMDF PRG Development, an existing excess lifetime cancer risk (ELCR) of 1.27E-04 from ingestion of fish collected from Bear Creek is calculated.

Screenshots 2-60 to 61

Supplemental Release Scenario

The dose assessments for the two EMDF PA scenarios have been used to develop analytic WAC, consistent with DOE requirements. Although the results of these dose assessments demonstrate protectiveness under the CERCLA risk range under the assumptions made for inputs to the RESRAD computer modeling program and at the point of compliance allowed by the DOE 435.1 Order and guidance, the FFA parties have agreed to further assess potential human health risks through evaluation of a supplemental scenario in which the results could be used in the design and to inform decisions in the final WAC Compliance Plan.

05/04/2022 MONTICELLO RADIOACTIVELY CONTAMINATED PROPERTIES – draft final 5 Year Review

https://semspub.epa.gov/work/08/100011869.pdf

RESRAD used to evaluate short-term protection from radionuclides, PRG calculator will be used to assess long-term protection of radionuclides, RSL was used for chemical risk of uranium.

Screenshot of page 1 of DOE letter to EPA and Utah

This report concludes the MVP remedy is short-term protective. In order for the remedy to be protective in the long-term, LM will need to (1) confirm the Five-Year Report (FYR) human health risk evaluation using the EPA preliminary remediation goal (PRG) calculator; (2) send an informational letter to current landowners regarding use restrictions applicable to their properties; and (3) complete a climate resilience assessment and discuss the findings with EPA and UDEQ.

Screenshot of page 16 from FYR report

assessments under CERCLA (EPA 2003). Nevertheless, as noted in the 2017 FYR, EPA recommends that a value of 0.0002 mg/kg/d be considered as the uranium RfD for risk evaluation, including in FYRs (EPA 2016b). This value was published as a maximum recommended level by the Agency for Toxic Substances and Disease Registry (ATSDR 2013) and results in a residential regional screening level (RSL) for uranium of 16 mg/kg.

Screenshot from page 15 from FYR report

To evaluate the protectiveness of the supplemental standard, the current version (7.2) of RESRAD-ONSITE (RESRAD) was used to estimate the dose associated with the 16 pCi/g cleanup level (ANL 2016). Although RESRAD was not used in support of the MS-00176-VL supplemental standards application, this model is now widely used and is recognized as an industry standard for dose and risk evaluation of exposure to radionuclides. RESRAD uses updated exposure calculations, toxicity values, dose modeling, and risk modeling not available at the time of the supplemental standards application.

The RESRAD evaluation used the same residential yard exposure pathways and input parameters used in the supplemental standards application for this property (DOE 1999f). The evaluation

Screenshot from page 18 from FYR report

Table 5. Issue and Recommendation Summary

Operable Unit	Issue Type	Issue	Recommendation	Affects Protectiveness?		Milestone Date
				Current	Future	
	RP	The RESRAD program was used in the FYR human health risk evaluation instead of the EPA PRG calculator.	DOE to confirm the FYR human health risk evaluation using EPA PRG calculator.	N	Y	07/31/22

05/2022 Rocky Flats (USDOE) – 5 Year Review

https://semspub.epa.gov/work/08/1985514.pdf

PRG used for radionuclides, RSL used for chemicals. RESRAD not mentioned.

Screenshots from pages 37-38

6.2.2.1 Chemical Constituents

The evaluation performed in the 2017 FYR was essentially a complete update of the screening process used in the CRA to account for any chemical-specific changes in toxicity values. In lieu of recalculating the soil preliminary remediation goals (PRGs), the then-current industrial regional screening levels (RSLs)[4] were used as a proxy for updated WRW PRGs (EPA 2016). As described in Appendix C, the default exposure assumptions for the industrial soil scenario used to develop the corresponding 2016 RSLs were comparable but more conservative (i.e., health protective) than those used for the WRW described in the CRA. The RSLs are conservative screening values that are used in this FYR to identify individual contaminants that may require further evaluation. The development of RSLs does not use site-specific analytical data because RSLs represent concentrations based on a target risk level rather than a calculated risk from measured concentrations.

[4] The EPA RSLs are updated regularly and presented in generic tables available on the EPA website. The values are based on conservative exposure assumptions and inputs and do not include site-specific considerations.

This FYR evaluation used the 2016 RSLs included in the last FYR evaluation as a baseline to evaluate changes in toxicity values over the past 5 years. The exposure assessment methods and default input values in the 2021 soil RSLs for an industrial worker have not changed since the last FYR evaluation (EPA 2021b). Any changes to toxicity values since the last FYR are included in the 2021 RSLs. Therefore, the 2021 RSLs are appropriate for use as a screening tool to represent updated WRW PRGs in this FYR evaluation.

Screenshot from page 40

Radiological Risk

This 2022 FYR risk evaluation for radiological constituents followed the same approach to evaluating radiological risk as the 2017 FYR evaluation. Both evaluations utilized the EPA online "Preliminary Remediation Goals for Radionuclides" calculator (PRG calculator) to calculate updated radiological PRGs (EPA 2021a) to determine if the risk from radionuclides to the WRW in the COU remains within the acceptable risk range. The acceptable risk range for CERCLA sites is an added cancer risk of less than 1 in 1,000,000 (1×10^{-6}) to a maximum of 1 in 10,000 (1×10^{-4}). The approach in this FYR evaluation is consistent with the methodology utilized in the 2017 FYR and is described in Appendix C.

The PRGs calculated by the PRG calculator are conservative screening values used in this FYR to identify individual contaminants that may require further evaluation. This methodology does not require input of site-specific analytical data because PRGs represent concentrations based on a target risk level rather than a calculated risk from measured concentrations. As such, no new analytical data were collected for this FYR risk evaluation. For completeness, this FYR radiological risk review considered $^{239/240}$Pu (the only radionuclide COC identified in the 2006 CRA), ^{241}Am, ^{234}U, ^{235}U, and ^{238}U. The Am and U isotopes represent the other primary radionuclides associated with RFP historical operations.

03/17/2022 IDAHO NATIONAL ENGINEERING LABORATORY (USDOE) – 5 Year Review

https://semspub.epa.gov/work/10/100389133.pdf

Used RSL for chemicals. Had been using RAIS PRG (ORNL tool similar to EPA PRGs), evaluated using current EPA PRG. No mention of RESRAD.

Screenshot from page 111

6.5 Risk Information Review

The Preliminary Remediation Goals (PRGs) and Regional Screening Levels (RSLs) and the methodology used to develop them are presented at the following websites: http://rais.ornl.gov/ (ORNL, 2020) and https://www.epa.gov/risk/regional-screening-levels-rsls, respectively. The INL recently performed a risk assessment review as part of their 2020 FYR (DOE-ID, 2021). This review included a comparison of toxicity values and PRGs published in previous decision documents (i.e., the OU 10-08 ROD (DOE-ID, 2009)) with the latest values available from published sources (e.g., Integrated Risk Information System, the Health Effects Assessment Summary Table, and other sources). NRF reviewed this risk evaluation and used conclusions made as an aid in performing an evaluation of the NRF CERCLA sites. NRF also reviewed the latest published PRGs and RSLs (May 2021) listed in the EPA websites to verify that no significant changes in PRGs or RSLs have occurred since the INL FYR.

12/09/2021 SAVANNAH RIVER SITE (USDOE) – ROD

https://semspub.epa.gov/work/04/11166860.pdf

PRG and RSL were used, RESRAD not mentioned.

Screen shot page 18.

Media Assessment Results

The characterization data was used to perform a human health risk assessment (HHRA), an ecological risk assessment (ERA), and a PTSM evaluation (SRNS 2017). Sediment/soil media was compared to USEPA regional screening levels (RSLs) for non-radionuclides and USEPA preliminary remediation goals (PRGs) for radionuclides, while surface water was compared to USEPA maximum contaminant levels (MCLs), SCDHEC ambient water quality criteria, RSLs, or PRGs as appropriate. For the HHRA, an IOU onsite worker (wetland researcher) is selected as the most likely receptor scenario for the Upper LTR IOU. A recreational fisherman scenario is also considered for EAs that can sustain populations of consumable fish. Table 2 summarizes the results of these evaluations and identifies refined constituents of concern (RCOCs) for each EA. RCOCs are those

Screenshot page 29-30.

The *USEPA Regional Screening Levels* website (USEPA 2016) was the source of RSLs used in this assessment. The website was accessed in October 2016. The generic table published in May 2016 used all default parameters for both the residential and industrial worker scenarios. The RSLs for the onsite worker and recreational fisherman scenarios were obtained by using the website calculator function to derive site-specific RSLs.

The *USEPA Superfund Radionuclide Preliminary Remediation Goals for Superfund* website (USEPA 2014) was the source of the PRGs used in this assessment. The website was accessed in October 2016. The PRGs for a residential scenario were obtained by using

the website calculator function to derive site-specific PRGs. These site-specific PRG values were calculated by eliminating the fruit and vegetable consumption pathways as standard input assumptions and using all other default parameters (SRNS 2012b). The PRGs for an industrial worker scenario were obtained from the website using the calculator function and assuming all default parameters. The PRGs for the IOU onsite worker and recreational fisherman scenarios were obtained by using the website calculator function to derive site-specific PRGs.

09/16/2021 SAVANNAH RIVER SITE (USDOE) – ROD

https://semspub.epa.gov/work/04/11175260.pdf

RSL was used, PRG and RESRAD not mentioned.

Screenshot from page 11.

estimates. In June 2017 the USEPA regional screening levels (RSLs) for the PAHs were updated based on a new toxicological profile. The RSLs increased by an order of magnitude for both the residential and industrial worker scenarios. No constituents had a risk greater than 1E-06 for either the residential or industrial worker scenario. The November 2019 RSLs were used to calculate risk. Based on the revised risk assessment, there are no human health RCOCs and there are no problems warranting action at Stormwater Outfall A-013 OU that require remedial action.

01/07/2021 IDAHO NATIONAL ENGINEERING LABORATORY (USDOE) – 5 Year Review

https://semspub.epa.gov/work/10/100536242.pdf

Used RSL and ORNL PRG for chemicals, and ORNL PRGs for radionuclides. PRG and RESRAD not mentioned.

Screenshot from page B39.

Table B-10. Comparison of U.S. Environmental Protection Agency soil regional screening levels[a] and Risk Assessment Information System preliminary remediation goals[b] for the resident scenario (mg/kg). Regional screening levels and preliminary remediation goals are based on 10^{-4} carcinogenic risk and a hazard index of 1 for noncarcinogens.

COC	Case Number	RSL	Basis[c]	PRG c[c]	PRG n[c]	Minimum PRG	Ratio[d]	Comments
Acrylonitrile	107-13-1	25	c	25.5	15.9	15.9	0.64	The RSL is based on carcinogen. The RAIS PRG is based on resident child noncarcinogen.
Aroclor 1242	53469-21-9	23	c	23	NA	23.0	1.00	—

Screenshot from page B42.

Table B-11. Comparison of U.S. Environmental Protection Agency soil regional screening levels[a] and Risk Assessment Information System preliminary remediation goals[b] for the industrial scenario (mg/kg). Regional screening levels and preliminary remediation goals are based on 10^{-4} carcinogenic risk and a hazard index of 1 for noncarcinogens.

COC	Case Number	RSL	Basis[c]	PRG c[c]	PRG n[c]	Ratio	Comments
Acrylonitrile	107-13-1	110	c	113	67.2	0.61	The RSL is based on carcinogen. The RAIS PRG is based on noncarcinogen.
Aroclor 1242	53469-21-9	95	c	95	NA	1.00	—

Screenshot from pages B70-B71

Table B-19. Comparison of 2014 preliminary remediation goal values reported in Table B-3 of DOE-ID (2015) and those calculated in 2020 for the current 5-year review. Preliminary remediation goal values are based on a risk of 1.0×10^{-4}.

Radionuclide	Fromm (1996) Resident (pCi/g)[a]	ORNL (2014) Resident PRG (pCi/g)[a]	ORNL (2020a) Resident PRG (pCi/g)[b]	Fromm (1996) Industrial (pCi/g)[a]	ORNL (2014) Composite Worker PRG (pCi/g)[a]	ORNL (2020a) Composite Soil Worker PRG (pCi/g)[b]
Ag-108m	6.80E-01	1.60E+00	1.65E+00	3.50E+00	2.50E+00	2.50E+00
Am-241	2.50E+02	4.90E+00	6.56E+01	1.00E+03	4.70E+02	4.67E+02

Table B-19. (continued).

Radionuclide	Fromm (1996) Resident (pCi/g)[a]	ORNL (2014) Resident PRG (pCi/g)[a]	ORNL (2020a) Resident PRG (pCi/g)[b]	Fromm (1996) Industrial (pCi/g)[a]	ORNL (2014) Composite Worker PRG (pCi/g)[a]	ORNL (2020a) Composite Soil Worker PRG (pCi/g)[b]
U-235+D	1.30E+01	4.90E+00	1.58E+01	6.80E+01	3.00E+01	3.01E+01
U-238+D	6.70E+01	5.00E+00	3.69E+01	3.40E+02	1.40E+02	1.39E+02

a. From Table B-3 in Appendix B of DOE-ID (2015); original source consisted of the following spreadsheets: "Resident_rad_prg_17DEC2014_prg17937-part1.xlsx" and "Resident_rad_prg_17DEC2014_prg17937-part2.xlsx."
b. From the RAIS PRG calculator ORNL (2020a)
c. These radionuclides were not reported in DOE-ID (2015).

PRG preliminary remediation goal
RAIS Risk Assessment Information System

09/09/2020 SAVANNAH RIVER SITE (USDOE) – ROD

https://semspub.epa.gov/work/04/11154815.pdf

RSL was used, PRG and RESRAD not mentioned.

Screenshot from page 21.

polychlorinated biphenyls. Only the metal constituents were detected in the surface water samples. The concentrations of beryllium (0.010 mg/L) and cadmium (0.0129 mg/L) exceed the MCL in Inlet Basin #1. Cobalt (0.337 mg/L) and manganese (7.08 mg/L) also exceed the tapwater regional screening level (RSL) in this basin. There are no MCL/RSL exceedances from Inlet Basin #2 or for either of the surface water samples from the 488-1D Ash Basin. This information is provided in the RSER/EE/CA for the 488-1D Ash Basin (SRNS 2016a).

Screenshot from page 24.

confirmation sample dataset. Each of these samples were analyzed for 24 metals and six radionuclides. The residual concentrations of all analytes, except hexavalent chromium, met the pre-established cleanup levels documented in the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River Site* for unrestricted land use (SRNS 2014a). The concentration of hexavalent chromium (maximum = 1.94 mg/kg) does not exceed the threshold level for an industrial use scenario (RSL = 6.3 mg/kg). The residential threshold for hexavalent chromium is 0.29 mg/kg.

06/23/2020 OAK RIDGE RESERVATION (USDOE) – ROD Amendment

https://semspub.epa.gov/work/04/11150461.pdf

No mention of PRG, RSL, or RESRAD. Mentions risk-based cleanup levels are discussed in original RODs.

03/26/2020 OAK RIDGE RESERVATION (USDOE) – ROD Amendment

https://semspub.epa.gov/work/04/11154672.pdf

No mention of PRG, RSL, or RESRAD. Mentions risk-based cleanup levels are discussed in original RODs.

05/22/2019 SAVANNAH RIVER SITE (USDOE) – ROD

https://semspub.epa.gov/work/04/11131673.pdf

Used PRG and RSL, RESRAD not mentioned.

Screenshot on page 18.

The *USEPA Regional Screening Levels* website (USEPA 2016) was the source of RSLs used in this assessment. The generic table located on the USEPA website was published in May 2016 and used all default parameters for both the residential and industrial worker scenarios. The website was accessed on May 7, 2017.

The *USEPA Superfund Radionuclide Preliminary Remediation Goals for Superfund* website (USEPA 2017) was the source of the PRGs used in this assessment. The website was accessed on May 8, 2017. The PRGs for a residential scenario were obtained by using the website calculator function to derive site-specific PRGs. These site-specific PRG values were calculated by using all default parameters as standard input assumptions with the exception of the fruit and vegetable consumption pathways (SRNS 2012). The PRGs for an industrial worker scenario were obtained from the generic table which assumed all default parameters.

Screenshot on page 19.

For surface water, maximum detected concentrations of each constituent were conservatively compared to drinking water MCLs. In the absence of a MCL, the lowest value for the tap water RSL/PRG or promulgated ambient water quality criteria (AWQC) (Federal/State) was used as a screening threshold. Constituents that exceed the MCL (PRG/RSL or AWQC) thresholds were further evaluated in the refinement of COCs step. No RCOCs were identified for surface water.

08/23/2018 Oak Ridge (USDOE) – ESD

https://semspub.epa.gov/work/04/11126359.pdf

No human health risk assessment models cited since this is an ESD based on ecological risk.

07/01/2018 HANFORD 100-AREA (USDOE) - ROD

https://semspub.epa.gov/work/10/100105579.pdf

Used RSL for chemical and RESRAD for radionuclide to set risk-based levels. Further evaluated radiation levels using PRG.

Screenshot from pages 29

Human health risk from exposure to groundwater was evaluated through risk calculations and comparison to federal and state drinking water or cleanup standards. For assessing human health risks from radionuclides and chemicals in groundwater, the methodology identified in EPA's tap water scenario was used (residential drinking water source in EPA's "Regional Screening Levels for Chemical Contaminants at Superfund Sites"). The approach used assumes that the groundwater is used as a tap water source for a 30 year period. Potential routes of exposure include ingestion, dermal contact and inhalation of volatiles during household activities. Groundwater concentrations were also compared to existing federal and state drinking water or cleanup standards.

Screenshot from pages 104-105

Comment: Policy and Guidance: (Board requests future decision documents should fully explain use of non-EPA document such as RESRAD over requirement to use of our guidance).

> a. Response stated, when appropriate, the Region (i.e., Region X) may choose to use non-EPA guidance tools and that the rationale for using these types of tools is provided in the supporting technical documents. YN ERWM has previously noted concerns with RESRAD.

Response: When appropriate, non-EPA guidance tools may be used. The rationale for using such tools is provided in the supporting technical documents. The Tri Parties recognize that YN ERWM has previously noted concerns with RESRAD, but the Tri-Parties have determined that the use of RESRAD is appropriate.

As part of addressing comments from the National Remedy Review Board, the Tribes, and the public on the proposed plan, the selected remedy for soils was further evaluated using the EPA PRG Calculator, which confirmed that the residual contamination below 15 feet following excavation and placement of clean fill under the interim ROD, does not pose an unacceptable risk.

05/21/2018 Savannah River Site (USDOE) – ROD

https://semspub.epa.gov/work/04/11111436.pdf

Used the RSL for chemical and PRG for radionuclides to set risk- based levels. RESRAD not mentioned.

Screenshots from page 14-15

The *USEPA Regional Screening Levels* website (USEPA 2011) was the source of RSLs used in this assessment. The website was accessed on February 27, 2012. The generic table published in November 2011 used all default parameters for both the residential and industrial worker scenarios. The RSLs for the onsite worker and adolescent trespasser scenarios were obtained by using the website calculator function to derive site-specific RSLs.

The *USEPA Superfund Radionuclide Preliminary Remediation Goals for Superfund* website (USEPA 2010) was the source of the PRGs used in this assessment. The website was also accessed on February 27, 2012. The PRGs for a residential scenario were obtained by using the website calculator function to derive site-specific PRGs. These site-specific PRG values were calculated by eliminating the fruit and vegetable consumption pathways as standard input assumptions and using all other default parameters (SRNS 2012). The PRGs for an industrial worker scenario were obtained from the generic table that assumed all default parameters. The PRGs for the onsite worker and adolescent trespasser scenarios were obtained by using the website calculator function to derive site-specific PRGs.

08/02/2017 ROCKY FLATS PLANT (USDOE) – 5 Year Review

https://semspub.epa.gov/work/08/1885612.pdf

PRG and RSL used for radiation and chemical risk evaluation. RESRAD used for ARAR dose evaluation.

Screenshot from page 38

Radiological Risk

The 2017 EPA online PRG calculator was used in this FYR evaluation to determine if the risk from radionuclides to the wildlife refuge worker in the COU remains within the acceptable CERCLA risk range. The acceptable risk range for CERCLA sites is an added cancer risk of less

To perform this FYR radiological risk evaluation, the 2017 EPA online calculator was used to generate site-specific PRGs using the input parameters from the 2006 comprehensive risk assessment for the WRW at a 1×10^{-6} risk level. These values were then compared to the PRG WRW values in the 2006 CRA, which were also calculated at the 1×10^{-6} risk level. The PRGs

Screenshot from page 39

Radiological Dose

The CAD/ROD identified select Colorado radiation protection standards as ARARs for the COU. For radiological sites that do not allow unrestricted use, as is the case for the COU, Colorado regulations require that institutional controls be in place that reasonably assure that the total effective dose equivalent from residual radioactivity within the COU does not exceed 25 millirems per year (mrem/year) (6 CCR 1007-4.61.2). In 2006, a dose assessment was completed for the COU using the RESRAD computer model, to determine if the COU met the 25 mrem/year dose criteria upon closure (DOE 2006). For this FYR, changes to input parameters (e.g., slope factors, dose conversion factors) used in the dose assessment were evaluated to determine if this ARAR continues to be met. The methodology used to complete this FYR review of radiological dose is described in Appendix C.

To understand the relative impact to dose resulting from the numerous changes to input parameters and the computer model that have occurred since 2006, a range of exposure scenarios and associated analytical data evaluated in the 2006 RESRAD (version 6.3) dose assessment was entered into the current RESRAD model (version 7.2). No new sample data to support this fourth FYR dose evaluation were collected.

A comparison of the RESRAD version 6.3 dose results to the RESRAD version 7.2 dose results indicates little change in total dose. All of the 2006 scenarios evaluated in Appendix C yielded

Screenshot from page C6.

C2.3.1 Chemical Constituent Review Methodology

Because the first two steps of the COC screening process in the CRA relied on a comparison of residual soil concentrations with the WRW PRGs, any subsequent changes to exposure assumptions or toxicity values used to calculate the PRGs could change the outcome of the screening process. For this FYR risk evaluation, a methodology similar to that described above for the CRA was applied to determine the impact of changes to risk assessment parameters for surface soils. Figure C-3 presents the screening methodology. In lieu of recalculating over 200 site-specific PRGs for a WRW, this FYR risk evaluation utilized the EPA regional screening levels (RSLs) for industrial soil as a proxy for revised WRW PRGs (EPA 2016a). The RSLs incorporate current toxicity data and methodologies for the same exposure pathways of concern for the WRW. The default exposure assumptions for the industrial soil scenario are very similar to those used for the WRW for surface soils. Table C-3 compares the key assumptions used in RSL and site-specific PRG calculations. Where exposure factors are not the same, those used by EPA tend to be more conservative (i.e., assume a greater degree of exposure). Therefore, it was determined that the EPA industrial soil RSLs were an acceptable screening tool to represent updated surface soil WRW PRGs (referred to as "updated WRW RSLs" for the remainder of this appendix).

03/16/2017 Idaho National Engineering Laboratory (USDOE) – 5 Year Reviews

https://semspub.epa.gov/work/10/100536244.pdf

PRG used for radionuclides and RSL used for chemicals. No mention of RESRAD.

Screenshot from page 99.

6.5 Risk Information Review

Based on the EPA five-year review guidance (EPA, 2001), risk parameters (toxicity values) used in the risk assessment at the time of the remedy selection should be reviewed for changes to determine whether the selected remedy is still protective. Therefore, an evaluation of the toxicity data was conducted to see whether any changes had occurred and whether the changes were significant enough to affect the remedy selection. Toxicity values (slope factors and reference doses) and risk-based concentrations, (also known as preliminary remediation goals (PRGs) for radionuclides or regional screening levels (RSLs) for non-radiological constituents), used in the initial risk assessments performed for the CERCLA sites were reviewed for any updated values that may have been published since the time the remedy selection was implemented. Slope factors are used to calculate PRGs or RSLs for use in screening and developing cleanup goals.

The PRGs and RSLs and the methodology used to develop them are presented at the following websites: http://epa-prgs.ornl.gov/radionuclides/ and http://epa.gov/risk/regional-screening-levels-rsls, respectively. During the INL's 2015 FYR (DOE-ID, 2015a), the INL performed a risk assessment review that compared the toxicity values and PRGs published in previous decision documents (i.e., the OU 10-08 ROD (DOE-ID, 2009b)) with the latest values available from published sources (e.g., Integrated Risk Information System, the Health Effects Assessment Summary Table, and other sources). NRF reviewed this risk evaluation and also reviewed the latest published PRGs and RSLs listed in the EPA websites.

02/22/2017 Savannah River Site (USDOE) - ESD

https://semspub.epa.gov/work/04/11066122.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

09/29/2016 LEHR (USDOE) - ROD

https://semspub.epa.gov/work/09/1161784.pdf

Used the RSL for chemical, the PRG for radionuclides, the California guidance for lead. RESRAD not mentioned.

Screenshot from page 20

7.1.2 Exposure Assessment

The exposure pathways that were considered in assessing human health risks are illustrated on Figure 4.

Soil and Solid Waste

Risks were originally evaluated for six on-site receptor groups in the HHRA Part A and HHRA Part C: age-adjusted adults, resident children, indoor researchers, outdoor researchers, construction workers, and trespassers. Exposure pathways that were evaluated included soil ingestion, soil dermal exposure, ingestion of homegrown produce, external radiation, dust inhalation, and inhalation of vapors from soil and groundwater in indoor and outdoor air. As part of later revisions to the HHRA, the Soil FS Appendix C re-evaluated risk only for a residential exposure scenario because it is the most conservative, and used default exposure parameters built into the Regional Screening Levels (RSLs), preliminary remediation goals (PRGs), and lead California Human Health Screening Levels (CHHSLs).

Screenshot from page 111

ATTACHMENT B.
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Requirement	ARAR Determination	Description of Requirement	Applicability
CHEMICAL-SPECIFIC ARARs - FEDERAL			
U.S. EPA Industrial Regional Screening Levels ("Industrial RSLs;" May 2016)	To Be Considered (TBC)	Industrial RSLs are chemical-specific concentrations for individual contaminants in air, drinking water and soil used to determine whether further investigation or cleanup of a site used for industrial purposes is necessary or appropriate to protect human health.	Industrial RSLs to be used to determine the sufficiency of excavation of chemical contamination to protect human health in the VOC hot spots, and other areas slated for excavation.
U.S. EPA Preliminary Remediation Goals for Radionuclides ("Radionuclide PRGs;" May 2016)	TBC	Radionuclide PRGs are risk-based calculations that set concentration limits for radioactive contaminants used to determine whether further investigation or cleanup of a site used for industrial purposes is necessary or appropriate to protect human health.	Radionuclide PRGs to be used to determine the sufficiency of excavation of low-level radioactive waste contamination to protect human health in areas slated for excavation.
10 CFR 20, Subpart D, Radiation Dose Limits for Individual Members of the Public, Sections 20.1301(a) & (b), and 20.1302	Relevant and Appropriate	Establishes dose limits for individual members of the public from licensed operations and compliance monitoring requirements.	During soil disturbing activities, members of the public may be exposed to solid waste, soil, soil gas, and dust that may contain licensed radioactive materials that were disposed in Site land disposal units.
CHEMICAL-SPECIFIC ARARs - STATE/LOCAL			
DTSC Human Health Risk Assessment Note 3, DTSC-Modified Screening Levels, June 2016	TBC	DTSC's HERO recommended screening levels (derived using DTSC-modified exposure and toxicity factors) may be considered for constituents in soil and tap water.	DTSC Screening Levels to be used to determine the sufficiency of excavation of chemical contamination to protect human health in the VOC hot spots, and other areas slated for excavation.

07/21/2016 Savannah River Site (USDOE) – Interim ROD

https://semspub.epa.gov/work/04/11050352.pdf

No mention of PRG, RSL, or RESRAD. The document states there was no CERCLA risk assessment.

Screenshot page iv of declaration.

This IROD provides the following information:

- Because of ongoing operations, a CERCLA risk assessment has not been conducted and is not required to support the interim action. A performance assessment has been prepared and has determined that exposure to stabilized residual waste in the tanks is unlikely during the interim period.

- Since this is an interim action, quantitative remediation goals (i.e., site-specific concentrations used as cleanup criteria) are not specified.

06/03/2016 Hanford (USDOE) – ESD

https://semspub.epa.gov/work/10/100090300.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

05/24/2016 Oak Ridge (USDOE) – ROD Amendment

https://semspub.epa.gov/work/04/11049301.pdf

No mention of PRG, RSL, or RESRAD. Mentions risk based cleanup levels are discussed in original RODs.

04/12/2016 Hanford – ESD

https://semspub.epa.gov/work/10/100020166.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

01/13/2016 Paducah – ESD

https://semspub.epa.gov/work/04/11064156.pdf

The Region 9 RSL was used. No mention of PRG, RSL, or RESRAD.

Screenshot from page A-6

A.3.1 TCE ALLOWABLE OFF-SITE CONCENTRATIONS

The maximum allowable air concentration for TCE was estimated using the EPA Region 9 Regional Screening Levels (RSLs), formerly referred to as Preliminary Remediation Goals, which are available from the EPA's Web site at: http://www.epa.gov/region9/superfund//prg/index.html. The TCE value is based on the carcinogenic risk posed by lifetime[5] exposure to TCE. The health effects of exposure to TCE are measured by a target risk of one in one million (1×10^{-6}). The residential RSL was used to develop an allowable off-site concentration limit.

The ambient air allowable off-site concentration for TCE is 0.43 $\mu g/m^3$. The allowable off-site concentration for TCE was selected from the EPA publication of RSLs. (Note: The air dispersion analysis was performed in 2013.)

A.3.2 1,1-DCE ALLOWABLE OFF-SITE CONCENTRATIONS

The maximum allowable air concentration for 1,1-DCE also was estimated using the EPA RSL. The 1,1-DCE value is based on the noncancer risks posed by long-term exposure to 1,1-DCE. The health effects of exposure to 1,1-DCE are measured by a hazardous index, with a hazard index of 1 being an indication of the nearest off-site receptor having detrimental health effects from exposure to 1,1-DCE. The residential RSL was used to develop an allowable off-site concentration limit.

The ambient air allowable off-site concentration for 1,1-DCE is 210 $\mu g/m^3$. The allowable off-site concentration for 1,1-DCE was selected from the EPA publication of RSLs. (Note: The air dispersion analysis was performed in 2013.)

12/22/2015 Hanford (USDOE) – ROD Amendment

https://semspub.epa.gov/work/10/100003686.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

12/17/2015 Idaho National Engineering Laboratory – 5 Year Review

https://semspub.epa.gov/work/10/100536239.pdf

PRGs were used for radionuclides and Region 9 RSLs were used for chemicals. RESRAD was not mentioned.

Screenshot from page B-8

B-1.1 Scope

This appendix compares current human health slope factors, reference doses (RfDs), inhalation reference concentrations (RfCs), and risk-based soil concentrations (RBCs) (also called PRGs for radionuclides and RSLs for nonradionuclides by the EPA) with values used in previous INL Site risk assessments to determine if a measureable effect on risk and hazard calculations is evident. To perform this evaluation, updated values were taken from the following sources:

- Integrated Risk Information System (IRIS) (EPA 2015b)
- Health Effects Assessment Summary Tables (HEAST) (EPA 2001b)
- Changes to default exposure factors used in human health risk assessments and outlined in EPA (2014b)
- EPA PRGs for radionuclides (EPA 2014a)
- EPA RSLs for nonradionuclides (EPA 2015a).

Screenshot on page B-46

EPA, 2007, *Preliminary Remediation Goals for Radionuclides, Download Area*, http://epa-prgs.ornl.gov/radionuclides/download.shtml, U.S. Environmental Protection Agency, website updated November 2007, website visited February 4, 2010.

EPA, 2010, *Regional Screening Levels (formerly PRGs)*, http://www.epa.gov/region09/superfund/prg/rsl-table.html, U.S. Environmental Protection Agency, website last updated June 7, 2010, website last visited August 10, 2010. (Note: This historical EPA website is no longer available; information was obtained at the time the website was visited.)

EPA, 2011, *Exposure Factors Handbook: 2011 Edition*, EPA/600/R-090/052F, U.S. Environmental Protection Agency, September 2011.

EPA, 2014a, *Preliminary Remediation Goals for Radionuclides*, http://epa-prgs.ornl.gov/radionuclides/download.html, U.S. Environmental Protection Agency, Web page updated November 2014, Web page visited November 25, 2015.

EPA, 2014b, *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors*, Memorandum, OSWER Directive 9200.1-120, U.S. Environmental Protection Agency, February 2014.

EPA, 2015a, *Regional Screening Levels*, http://www.epa.gov/region9/superfund/prg/, U.S. Environmental Protection Agency, Web page updated January 12, 2015, Web page visited March 12, 2015. (Note: This historical EPA website is no longer available; information was obtained at the time the website was visited.)

09/25/2015 Hanford (USDOE) – ESD

https://semspub.epa.gov/work/10/100090301.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

09/09/2015 Savannah River Site (USDOE) – Early Action ROD

https://semspub.epa.gov/work/04/11016135.pdf

RSL and PRG were used. Also used was the SPRG. RESRAD was not mentioned.

Screenshot page 32

The *USEPA Regional Screening Levels (RSLs)* website (USEPA 2012) was the source of RSLs used in the assessment. The generic table published in November 2012 uses all default parameters for both the residential and industrial worker scenarios. The website was accessed on March 20, 2013.

Screenshot page 33

The *USEPA Preliminary Remediation Goals (PRGs) for Radionuclides* website (USEPA 2010) was the source of the PRGs used in the assessment. The website was also accessed on March 20, 2013. The PRGs for a residential scenario were obtained by using the website calculator function to derive site-specific PRGs. These site-specific PRG values were calculated by eliminating the fruit and vegetable consumption pathways as standard input assumptions and using all other default parameters (SRNS 2012b). The PRGs for an industrial worker scenario were obtained from the generic table that assumes all default parameters.

The *USEPA Surface Preliminary Remediation Goals (SPRGs) for Radionuclides* website (USEPA 2011) was the source of the SPRGs used in the assessment for the evaluation of concrete media. The website was also accessed on March 20, 2013. The SPRGs for a composite worker scenario were obtained from the generic table that assumes all default parameters for two-dimensional direct external exposure.

09/30/2014 Lawrence Livermore National Lab – ESD

https://semspub.epa.gov/work/09/100000401.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.

08/13/2014 Savannah River Site – ESD

https://semspub.epa.gov/work/04/10989951.pdf

No mention of PRG, RSL, or RESRAD. There appears to be no discussion of risk assessment or risk-based cleanup levels.