RELATIVE RISK SITE EVALUATION

Nashville Air National Guard Base, Tennessee

Introduction

The Department of Defense (DoD) has identified certain per- and polyfluoroalkyl substances (PFAS) as emerging contaminants of concern which affected installations across the Air Force, which for these fact sheets includes the Air National Guard. These PFAS are perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS) are components of Aqueous Film Forming Foam (AFFF) that the Air Force began using in the 1970s as a firefighting agent to extinguish petroleum fires. The U.S. Environmental Protection Agency (EPA) has issued health based site specific Regional Screening Levels (RSLs) for surface soil and groundwater (drinking water) for PFOS, PFOA, PFBS, PFNA, PFHxS and hexafluoropropylene oxide dimer acid (HFPO-DA, or Gen-X).

Site Inspections (SIs) were initiated to collect soil and groundwater samples and analyze those media for 16 different PFAS at the potential AFFF release areas that were identified in the PA. The intent of the SI is to determine if a release has occurred and determine if there are impacts to soil and/or groundwater. The next step in the process is the Relative Risk Site Evaluation (RRSE). The RRSE is a DoD-wide methodology to evaluate the relative risks posed by PFAS present at an installation in relation to other installations. The RRSE is a tool used to sequence funding for which installations have the highest priority to begin a Remedial Investigation (RI). The DoD premise in installation sequencing is "worst first," meaning the DoD Component shall address installations that pose a relatively greater potential risk to public safety, human health, or the environment before installations posing a lesser risk.

The results of Nashville Air National Guard Base PA and SI can be found at AFCEC Administrative Record (AR): ar.afcec-cloud.af.mil. Scroll to the bottom of the page and click on "Continue to site," then select the "Air National Guard" radio button, scroll down the Installation List and click on Nashville Metropolitan APT,TN, then in the "AR #" field enter either 474991 for the PA or 576459 for the SI, then click "Search" at the bottom of the page.

More information on the Air Force response to PFAS can be found at:
https://www.afcec.af.mil/WhatWeDo/Environment/Perfluorinated-Compounds/

Acronyms

AR - Administrative Record

AFFF - Aqueous Film Forming Foam

AST - Aboveground Storage Tank

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CHF - Contaminant Hazard Factor

DoD - Department of Defense

EPA - US Environmental Protection Agency

FTA - Fire Training Area

HA - Health Advisory

HFPO-DA - hexafluoropropylene oxide dimer acid (HFPO-DA, or Gen-X)

MPF - Migration Pathway Factor

PA - Preliminary Assessment

PFAS - Per- and poly-fluoroalkyl substances

PFBS - Perfluorobutane sulfonate

PFHxS - perfluorohexane sulfonate (PFHxS)

PFNA - perfluorononanoic acid (PFNA)

PFOS - Perfluorooctane sulfonate

PFOA - Perfluorooctanoic acid

RCRA - Resource Conservation and Recovery Act

RF - Reception Factor

RI - Remedial Investigation

RRSE - Relative Risk Site Evaluation

RSL - Regional Screening Level

SI - Site Inspection

SWMU - Solid Waste Management Unit

RELATIVE RISK SITE EVALUATION

Nashville Air National Guard Base, Tennessee

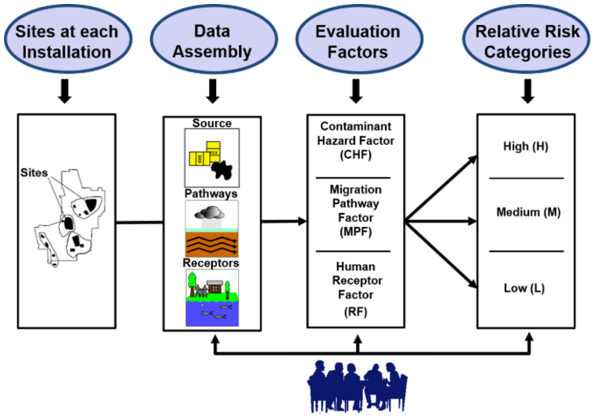
Q. What is the Relative Risk Site Evaluation (RRSE)?

A. RRSE is a methodology used by the Department of Defense (DoD) to sequence environmental restoration work . The DoD fundamental premise is "worst first," meaning the DoD Component shall address installations that pose a relatively greater potential risk to public safety, human health, or the environment before installations posing a lesser potential risk. Relative risk is not the sole factor in determining the sequence of environmental restoration work, but it is an important consideration in the sequencing process. The methodology is described in the DoD, Relative Risk Site Evaluation Primer, Summer 1997 Revised Edition denix.osd.mil/references/dod/policy-guidance/relative-risk-site-evaluation-primer/RRSE_Primer_Summer1997.pdf.

Q. What is the RRSE framework?

A. The RRSE framework provides a DoD-wide approach for evaluating the relative risks to human health and the environment posed by contamination present at component installations. The **Relative Risk Site Evaluation Concept Summary** (shown in the figure) illustrates the selection of sites, evaluation of the site data using three evaluation factors, and placement into high, medium, and low categories. The relative risk site evaluation framework is based on information fundamental to risk assessments: sources, pathways, and receptors, to sequence restoration work. However, the RRSE is not a baseline risk assessment or in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Regulators and public stakeholders are provided the opportunity to participate in the process in accordance with the DoD Defense Environmental Restoration Program.

Relative Risk Site Evaluation Concept Summary

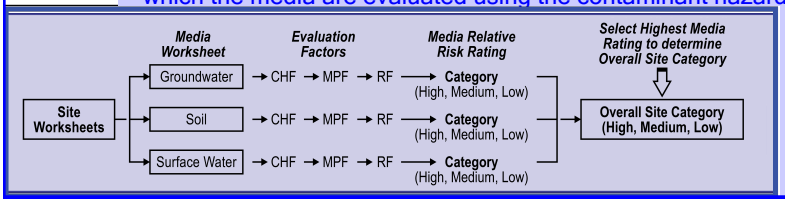


Regulator and Public Stakeholder Involvement in Technical Evaluation

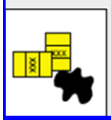
Sites at Each Installation

Q. What restoration sites are required to be evaluated in the RRSE process?

A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the RRSE process. Worksheets are developed for environmental media (such as, groundwater and surface soil) at each site. Environmental media lacking sufficient information to conduct a RRSE are assigned a "Not Evaluated" designation. The figure shows the process for which the media are evaluated using the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Each media is scored to obtain a relative risk rating of High, Medium, or Low. The highest media-specific relative risk rating determines the Overall Site Category.



Q. How is the Contaminant Hazard Factor (CHF) calculated?



A. The **CHF** is calculated by dividing the maximum concentration of a contaminant by the approved screening value, or comparison value. Contaminant concentration ratios are totaled to arrive at the **CHF.** A CHF of greater than 100 earns a **High** rating. If the CHF is 2 to 100 it earns a **Moderate** rating. A **Minimal** rating is assigned when a CHF is less than **2.**

FOR MORE INFORMATION

Air Force Civil Engineer Center Environmental Restoration Program
www.afcec.af.mil

AFCEC CERCLA Administrative Record (AR)
ar.afcec-cloud.af.mil/

Q. How is the Migration Pathway Factor (MPF) determined?

A. The movement of contamination at a site is evaluated and assigned a **MPF** rating. Ratings for MPFs are designated as: **evident**, **potential**, or **confined** (for **High, Medium, and Low**). **Evident** exposure means the contamination is at a point where exposure to humans or the environment can occur, such as at a drinking water well. **Potential** ratings are given to sites where exposure may happen. A **confined** rating is given to sites where a low possibility for exposure may occur.

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Q. How is the Receptor Factor (RF) determined?

A. The **RF** is determined by a receptor's, such as humans, potential to come into contact with contaminated media. **RFs** are designated as: identified, potential, or limited **(High, Medium, and Low). Identified** rating is given when receptors are in contact or threat of contact with contaminated media. **Potential** is given when receptor may contact contaminated media. **Limited** is given when there is little or no contact with contaminated media.

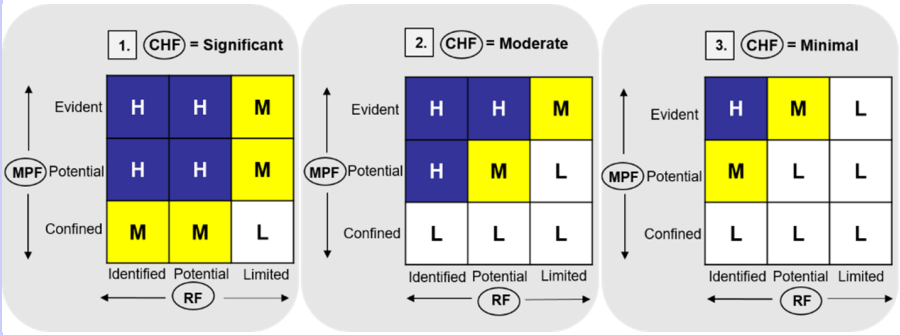
RELATIVE RISK SITE EVALUATION PROCESS, cont.

Media Relative Risk Rating

Q. How is the media-specific relative risk rating determined?

A. Use the charts on the right to determine the media-specific relative risk rating. Start by choosing the **CHF** result in the evaluation. If the **CHF** is **Significant**, use **box 1.** If the CHF is **Moderate**, use **box 2.** if the CHF is **Minimal**, use **box 3.** Then find the **MPF** and **RF** results and move to the square where the results meet. That square indicates the media-specific relative risk rating. For example, if the **CHF** is **Significant** - go to box 1**,** if the **MPF** is **Potential,** and the **RF** is **Identified**, then the rating is High (**H**).

Relative Risk Site Evaluation Concept Summary



CHF (Contaminant Hazard Factor) **MPF** (Migration Potential Factor) **RF** (Receptor Factor) **H** (High) **M** (Medium) **L** (Low)

Overall Site Category

Q. How do I determine the Overall Site Category?

A. The highest relative risk media rating becomes the **Overall Site Category** for the site. For example, if a site has a groundwater relative risk rating of **High**, and soil relative risk rating of **Low**, then the Overall Site Category rating for the site is **High**.

Regulatory and Stakeholder Involvement

Q. How do I participate as Stakeholder?

A. To offer opportunities to participate in the RRSE process, the Air Force announces a public comment period in your local newspaper. There is also opportunity to participate during installation Restoration Advisory Boards, where active. Installation Restoration Advisory Board meetings are announced in your local newspaper.

Relative Risk Site Evaluation Summary Nashville Air National Guard Base

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	Not Applicable
MEDIUM	SS005P
LOW	PRL 5

Nashville ANGB Relative Risk Site Evaluation (RRSE) Figure
National Guard Bureau
Nashville Air National Guard Base, Tennessee

Legend
AFFF Release Areas
Nashville ANGB Installation Boundary

0 250 500 1,000
Feet

National Guard Bureau/A4VR Environmental Restoration
3500 Fetchet Ave
Joint Base Andrews, MD 20762

Site Background Information			
Installation:	Nashville Air National Guard Base	**Date:**	11/16/2023
Location:	Tennessee	**Media Evaluated:**	GW, SS
Site Name and ID:	PRL 1 - Bldg 736, Former Fire Station - SS005P	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Jenna Laube	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	PRL 1 consists of Building 736, a former fire station constructed in 1953 and approximately 21,645 square feet (ft) with a concrete foundation and concrete block with brick veneer. The southeastern portion of this building was used as the Fire Station from 1961 to 2012 and is currently unused. According to the 2001 Environmental Baseline Survey (EBS), the building used to be equipped with an oil water separator (OWS), which discharged to the sanitary sewer. At the time of the 2001 EBS, the indoor drains were self-contained and if a discharge were to occur, the building drains would be pumped out (no details provided regarding where drains were discharged). Aqueous film forming foam (AFFF) was previously stored within the former fire station in 5-gallon containers and AFFF trucks were reportedly refilled by pouring the 5-gallon containers of AFFF into the top-loading vehicles. This PRL will be investigated as PFAS Site "SS005P".
Brief Description of Pathways:	The average depth to groundwater in the area is approximately 25 ft. below ground surface, which may be affected by seasonal fluctuations, fractured bedrock, and karst features that are characteristic of the region. Wells within the aquifer commonly yield from 5 to 20 gallons per minute. Groundwater flow direction is to the north. Soils consist of dark brown loam upper layer, reddish-brown clay loam lower layer, and fragments of limestone or dark brown silt loam surface layer and a reddish-brown silty clay loam subsoil. Both are well-drained soils. Much of PRL 1 appears to be beneath a building and the surrounding area is paved. The Base is located within the drainage basin of McCrory Creek and the Stones River. Stormwater Outfalls 001 and 002 combine a few hundred feet from the Base boundary to form an unnamed tributary to McCrory Creek. McCrory Creek flows for about 4.5 miles before discharge into the Stones River downstream of J. Percy Priest Dam. Stones River eventually discharges to the Cumberland River.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water. The Base and surrounding metro area is supplied with potable water by the Metro Water Services of Davidson County, whose source is surface water from the Cumberland River. Water from the Cumberland River is treated at the K.R. Harrington water treatment plant located approximately 5.35 miles north-northeast of PRL 5/Stormwater Outfall 001. However, surface waters of the Cumberland River could be impacted by numerous other sources, including the Nashville International Airport, which is located between the ANGB and the river. Thirteen non-potable water wells are within a 2-mile radius of the Base. Use of many of these older wells was discontinued after a city ordinance required all residences to use city water. Three of these wells are located downgradient, however, groundwater is used for other purposes, such as commercial, industrial, or irrigation. Potential soil receptors include Base personnel and other authorized workers. The access to the site is restricted and fenced.

Groundwater Worksheet

Installation: Nashville Air National Guard Base

Site ID: SS005P **AFFF Release Area #:** PRL 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.0270	0.6	0.0450
PFOA	0.0130	0.040	0.325
PFOS	0.0960	0.040	2.40
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**2.77**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**M**

Migratory Pathway Factor

Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	M
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Groundwater Category	**MEDIUM**

Soil Worksheet

Installation: Nashville Air National Guard Base

Site ID: SS005P **AFFF Release Area #:** PRL 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFBS	0.000990	1.9	0.000521
PFOA	0.000400	0.13	0.00308
PFOS	0.0270	0.13	0.208
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.212**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	
Limited	No potential for receptors to have access to contaminated soil	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Soil Category	**LOW**

Site Background Information			
Installation:	Nashville Air National Guard Base	**Date:**	11/16/2023
Location:	Tennessee	**Media Evaluated:**	GW, SS
Site Name and ID:	AFFF 5 - Stormwater Outfall 001 - PRL 5	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Jenna Laube	**Agreement Status (e.g., Federal Facility Agreement date signed):**	
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	PRL 5 consists of Stormwater Outfall 001, which is located near the north end of the Base and consists of a natural open flowing stream. This outfall drains the western side of the Base, including the aircraft apron. The outfall location is located near the Security Gate beneath a pedestrian bridge near the northern Base boundary. An emergency spill gate, which can be closed in the event of a spill, is located adjacent to the east of the outfall.
Brief Description of Pathways:	The average depth to groundwater in the area is approximately 25 ft. below ground surface, which may be affected by seasonal fluctuations, fractured bedrock, and karst features that are characteristic of the region. Wells within the aquifer commonly yield from 5 to 20 gallons per minute. Groundwater flow direction is to the north. Soils consist of dark brown loam upper layer, reddish-brown clay loam lower layer, and fragments of limestone or dark brown silt loam surface layer and a reddish-brown silty clay loam subsoil. Both are well-drained soils. Much of PRL 1 is vegetated. The Base is located within the drainage basin of McCrory Creek and the Stones River. Stormwater Outfalls 001 and 002 combine a few hundred feet from the Base boundary to form an unnamed tributary to McCrory Creek. McCrory Creek flows for about 4.5 miles before discharge into the Stones River downstream of J. Percy Priest Dam. Stones River eventually discharges to the Cumberland River.
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Groundwater Worksheet

Installation: Nashville Air National Guard Base

Site ID: PRL 5 **AFFF Release Area #:** PRL 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.00510	0.6	0.00850
PFOA	0.0120	0.040	0.300
PFOS	0.0660	0.040	1.65
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**1.96**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

Migratory Pathway Factor

Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	M
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Groundwater Category	**LOW**

Soil Worksheet

Installation: Nashville Air National Guard Base

Site ID: PRL 5 **AFFF Release Area #:** PRL 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFBS		1.9	
PFOA		0.13	
PFOS	0.00480	0.13	0.0369
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.0369**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	
Limited	No potential for receptors to have access to contaminated soil	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Soil Category	**LOW**