RELATIVE RISK SITE EVALUATION

Barnes Air National Guard Base, Massachusetts

Introduction

The Department of Defense (DoD) identified certain per- and polyfluoroalkyl substances (PFAS) as emerging contaminants of concern which affected installations across the Air Force. When the term "Air Force" is used in this fact sheet, it includes Air National Guard. Specifically, perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS) are components of legacy 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) issued lifetime drinking water Health Advisories (HA) for PFOS and PFOA, and health-based regional screening levels for PFBS.

The Air Force has systematically evaluated potential AFFF releases on all Installations and former Installations. It began with the Preliminary Assessments, or PAs, that identified potential release areas. First responders, fire chiefs, and hangar staff were interviewed to determine where a release or a spill may have occurred on an Installation (for example, aircraft crash site or an accidental hangar AFFF release). Once the information in the PA was collected, we began Site Inspections, or SIs, to take soil and water samples and analyzed the media for PFAS compounds at the potential release areas. The intention of the SI was to determine if a release had occurred and to determine the impacts to soil and/or groundwater. At Barnes Air National Guard Base (ANGB), an Expanded SI (ESI) was also completed. The next step in the process is called the Relative Risk Site Evaluation, or RRSE, which is a tool used to sequence Sites/Installations to begin a Remedial Investigation, or RI. Air Force Installations are at the beginning of the more detailed investigative stage, the RI, to determine, where action is needed and to identify remedial technologies.

The Barnes ANGB, PFAS PA and SI can be found at the Air Force CERCLA Administrative Record (AR): https://ar.afcec-cloud.af.mil/ Scroll to the bottom of the page and click on “Continue to site”, then select Air National Guard (e.g., Active, ANG, BRAC), scroll down the Installation List and click on Barnes ANGB then enter the AR Number 470206 in the “AR #” field for the PA. For the SI, enter the AR Number 570735. For the Expanded SI, enter the AR Number 603607 (1 of 43). Then click “Search” at the bottom of the page. Click on the spy glass to view the document.

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

Acronyms

AFFF - Aqueous Film Forming Foam
ANGB - Air National Guard Bureau
BRAC - Base Realignment and Closure
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CHF – Contaminant Hazard Factor
DoD - Department of Defense
EPA – US Environmental Protection Agency
FSS - Fire Suppression System
FTA – Fire Training Area
HA – Health Advisory
HEF - High Expansion Foam
IAP - International Airport
MPF – Migration Pathway Factor
NTA - Nozzle Testing Area
OWS - Oil/Water Separator
PA – Preliminary Assessment
PFAS - Per-and polyfluoroalkyl substances
PFBS – Perfluorobutanesulfonic acid
PFOS - Perfluorooctane sulfonate
PFOA - Perfluorooctanoic acid
RCRA – Resource Conservation and Recovery Act RF – Receptor Factor
RI – Remedial Investigation
RRSE – Relative Risk Site Evaluation
PRL - Potential Release Location
SI – Site Inspection
WWTP - Waste Water Treatment Plant

RELATIVE RISK SITE EVALUATION, cont.

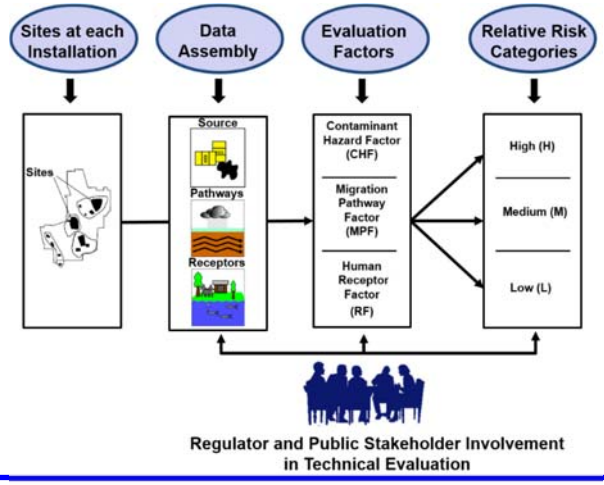
Q. What is the Relative Risk Site Evaluation (RRSE)?

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

Q. What is the RRSE framework?

A. The RRSE framework provides a DoD-wide approach for evaluating the relative risk to human health and the environment posed by contamination present at sites. 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 assessment: sources, pathways, and receptors to sequence restoration work. The RRSE is not a baseline risk assessment or health assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Regulators and public stakeholders in the environmental restoration process are provided the opportunity to participate in the process in accordance with the DoD Defense Environmental Restoration Program.

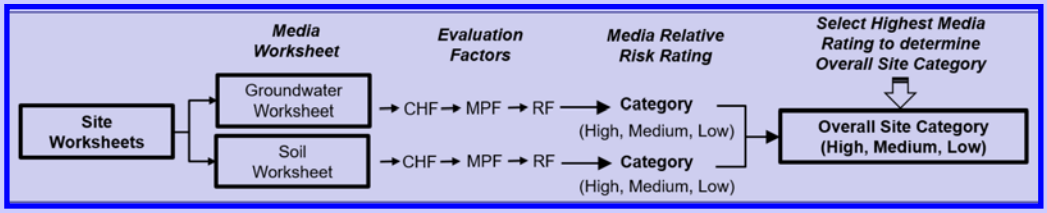
Relative Risk Site Evaluation Concept Summary



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 process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.



The figure shows the process for a media to be 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 rating determines the Overall Site Category.

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

A. The Contaminant Hazard Factor (CHF) is determined by dividing the maximum level for a contaminant at each site by the approved screening values (i.e., comparison values). Contaminant concentration ratios are totaled to arrive at a **Contaminant Hazard Factor (CHF).** A CHF sum of greater than 100 earns a **Significant (High)** ranking. **Moderate (Medium)** is when the total is 2 to 100. **Minimal (Low)** is when a CHF is less than two.

FOR MORE INFORMATION

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

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

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

A. The movement of contamination at a site is evaluated and assigned a **Migration Pathway Factor (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.

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

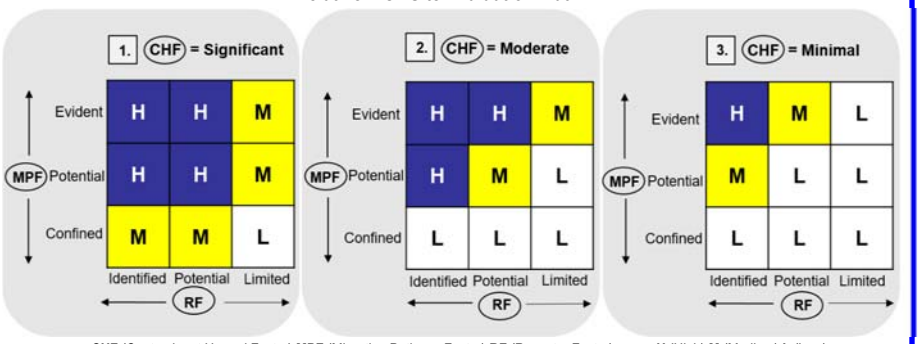
A. The **Receptor Factor (RF)** is determined by a receptor's, such as humans, potential to come into contact with contaminated media. **RFs** are designated as: identified, potential, or limited **(High, Medium, and Low). Identified** rating is given when receptors are in contact or threat of contact 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 EVALUTION, cont.

Media Relative Risk Rating

Q. How is the media relative risk rating determined?
A. Use the chart to determine the relative risk rating for each media evaluated. Start by choosing the **CHF** result of the evaluation. If the **CHF** is **Significant**, use **box 1.**; if **Moderate**, use **box 2.**; if **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 relative risk rating. For example, if the **CHF** is **Significant (go to box 1.)**, the **MPF** is **Potential** and the **RF** is **Identified**, then the rating is High (**H**).

Relative Risk Site Evaluation Matrix



CHF (Contaminant Hazard Factor) **MPF** (Migration Pathway 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**.

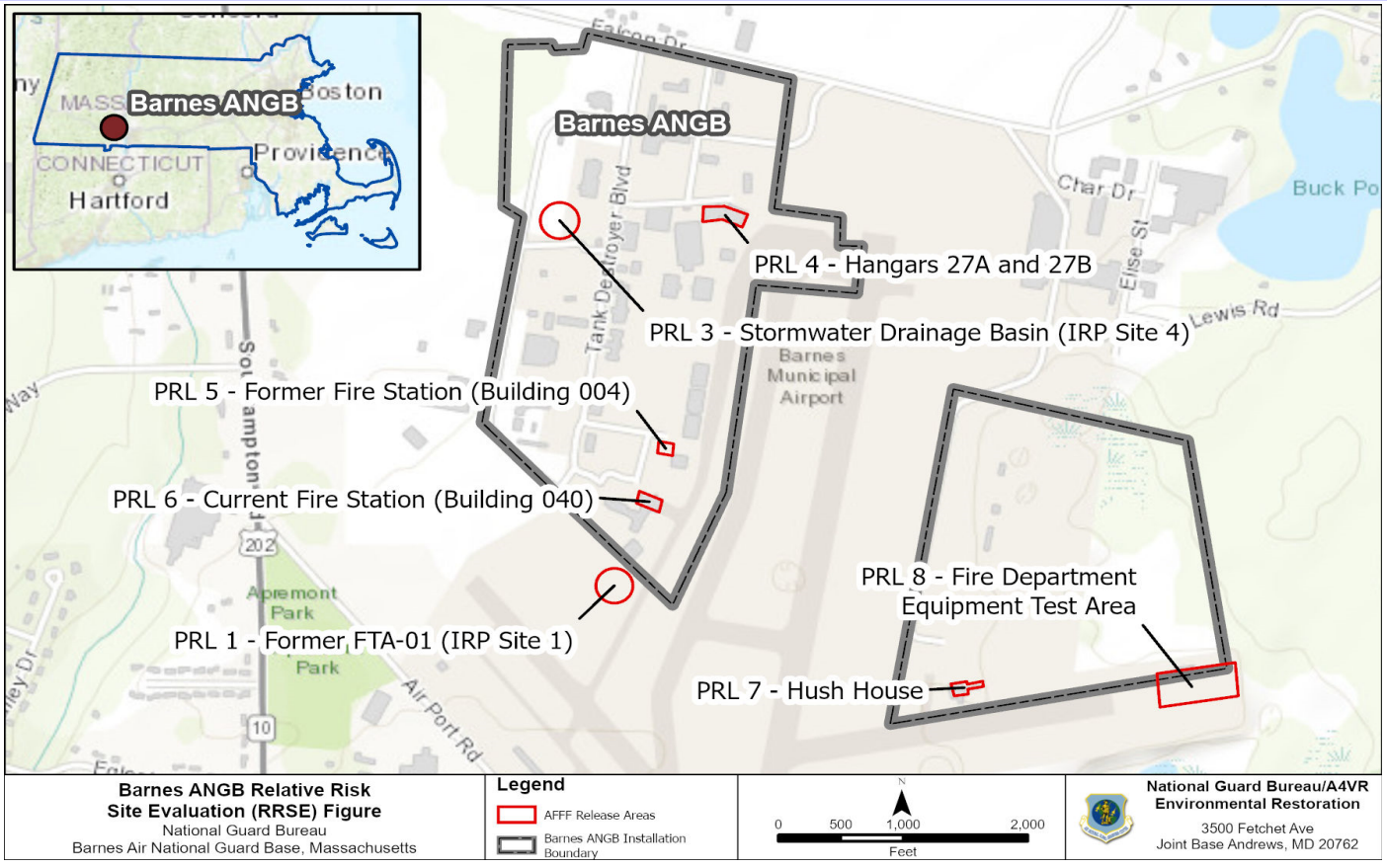
Regulatory and Stakeholder Involvement

Q. **How do I participate as Stakeholder?**

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

Relative Risk Site Evaluation Summary Barnes ANGB, MA

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	PRL 1, PRL 4, PRL 5, PRL 6, PRL 7
MEDIUM	PRL 3, PRL 8
LOW	



AFFF Area is another term for Potential Release Location (PRL)

Site Background Information			
Installation:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Former FTA-01 - PRL 1	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Former fire training area (FTA)-01 is located primarily off-Base, just south of the western parcel boundary. According to the preliminary assessment (PA), former FTA-01 was used from approximately 1950 through 1987, and aviation gasoline, waste oils, solvents, and jet propellant #4 were used as accelerants during training exercises. In spring of 2000, 3,334 tons of soil were excavated from FTA-01, and transported off-Base for use in asphalt batching. The site was not sampled for PFAS. The site achieved closure in 2002.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 feet below ground surface (bgs) and flows range from southwest to southeast. This PRL is located outside the base boundaries in a grassy area.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 Commonwealth of Massachusetts Regulations (CMR) 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a Massachusetts Department of Environmental Protection (MDEP) approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.6	0.04	40.0
PFOA	0.28	0.04	7.0
PFBS	0.1	0.602	0.2
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**47.2**
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)	H
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	
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).	H
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)	H
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)	
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).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Barnes ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.37	0.126	2.9
PFOA	0.015	0.126	0.1
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**3.1**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**M**

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	H
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	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H

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	**MEDIUM**

Site Background Information			
Installation:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater
Site Name and ID:	Stormwater Drainage Basin - PRL 3	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	According to the PA, the retention basin is approximately 100 ft. wide by 200 ft. long, and designed to percolate stormwater to the subsurface. In the 1980s and early 1990s, the Base converted from septic systems to the city's sanitary sewer system. Prior to the conversion, floor drains in buildings and hangars on the flight line discharged to the stormwater drainage basin. Although there are no known releases of aqueous film forming foam (AFFF) to the stormwater drainage basin, AFFF releases had the potential to impact the basin. The floor drains currently discharge to the sanitary sewer system. The site was investigated under the Installation Restoration Program (IRP) program, which did not include PFAS, and closed in 1998 with a No Further Action (NFA) decision.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multip detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. This PRL is located in a grassy area surrounded by wooded trees.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

Site ID: PRL 3 **AFFF Release Area #:** AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.022	0.602	0.0
PFOS	0.00684	0.04	0.2
PFOA	0.00276	0.04	0.1
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.3**
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)	H
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)	
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).	H
	Groundwater Category	**MEDIUM**

Site Background Information			
Installation:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Hangars 27A & 27B - PRL 4	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The fire suppression system (FSS) in Hangars 27A and 27B were converted from AFFF to high expansion foam (HEF) in the early 2000s. Two 50-gallon deck guns with AFFF remained in use after the FSS was converted to HEF. According to the PA, the hangars have floor drains that discharge to the City's sanitary sewer system through an oil/water separator (OWS). Prior to the early 1990s, the floor drains would have discharged to the stormwater drainage basin at PRL 3. There are no documented releases of AFFF at Hangars 27A and 27B.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. This PRL is primarily surrounded by concrete and asphalt paved areas
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

Site ID: PRL 4 **AFFF Release Area #:** AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.34	0.04	8.5
PFOA	0.017	0.04	0.4
PFBS	2	0.602	3.3
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**12.2**
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)	H
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)	
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).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Barnes ANGB

Site ID: PRL 4 **AFFF Release Area #:** AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.00199	0.126	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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	M
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

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:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Former Fire Station Bldg 004 - PRL 5	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The former Barnes ANGB fire station was in use from the 1940s until approximately 1992 when the new fire station was built. There was no record of a release found during the PA; however, AFFF was likely used and stored given the time frame that the fire station was in operation. Floor drains were present, which according to the PA discharged to the sanitary sewer system through an OWS. However, prior to connection to the city's sanitary sewer system, the floor drains likely discharged to a dry well.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. This PRL location is covered with asphalt so infiltration to groundwater or contact with surface soil limits exposure pathways. Groundwater flows are to the southeast at this PRL.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.022	0.602	0.0
PFOS	0.12	0.04	3.0
PFOA	0.046	0.04	1.2
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**4.2**
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)	H
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)	
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).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Barnes ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.208	0.126	1.7
PFOA	0.00329	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**1.7**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Current Fire Station Bldg 040 - PRL 6	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The current fire station was built in 1992 and houses three fire department crash trucks. At the time of the PA, the crash trucks contained a combined 320 gallons of 3% AFFF, and an additional 250 gallons of 3% AFFF was stored in 5-gallon totes. When needed, the totes were used to manually refill the reservoirs in the crash trucks. As of late 2016, AFFF is no longer used at Building 040. There were no floor drains present during the PA site visit; however, the fire station originally contained floor drains which discharged to the sanitary sewer via an oil/water separator. The floor drains were eliminated as part of a facility upgrade in 2010. There have been no known releases of AFFF.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. This PRL location is mostly building but the soil samples were taken from grassy areas immediately adjacent to the building. Groundwater flows are to the southeast at this PRL.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

Site ID: PRL 6 **AFFF Release Area #:** AFFF 6

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.4	0.04	35.0
PFOA	0.16	0.04	4.0
PFBS	0.13	0.602	0.2

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	39.2
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)	H
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)	
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).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Barnes ANGB

Site ID: PRL 6 **AFFF Release Area #:** AFFF 6

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.172	0.126	1.4
PFOA	0.000922	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**1.4**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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	M
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**LOW**

Site Background Information			
Installation:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Hush House - PRL 7	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The hush house was initially constructed in 1995, and is located on the eastern parcel, near Sierra Taxiway. The FSS contained AFFF from 1995 until the early 2000s when it was converted to HEF. Floor drains are present which discharge to the sanitary sewer system through an OWS. There have been three known discharges (two tests and one accidental release); however, most of the foam release was likely captured in the floor drains. At least one of the discharges likely released AFFF; however, it is not known if the other two releases were AFFF or HEF.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. This PRL location is mostly building but the soil samples were taken from grassy areas immediately adjacent to the building. Groundwater flows are to the southeast at this PRL.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

Site ID: PRL 7 **AFFF Release Area #:** AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.634	0.04	15.9
PFOA	0.068	0.04	1.7
PFBS	0.0535	0.602	0.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	17.6
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)	H
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)	
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).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Barnes ANGB

Site ID: PRL 7 **AFFF Release Area #:** AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.00153	0.126	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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	M
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**LOW**

Site Background Information			
Installation:	Barnes ANGB	**Date:**	9/29/2021
Location (State):	Massachusetts	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Fire Dept Equipment Test Area - PRL 8	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Bill Myer	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	FD equipment testing occurred primarily off-Base at the eastern end of Sierra Taxiway, mostly south of the eastern Base parcel. The area is grassy approximately 150 by 65 feet. It was used for fire-training exercises in the late 1950s and potentially used for waste storage. Three known foam tests or AFFF releases have occurred, all in the mid-1990s; however, testing practices prior to 1993 are unclear. The amount of AFFF used is unknown, and use of foam for equipment testing purposes ceased at least 15 years ago.
Brief Description of Pathways:	Barnes ANGB and the Westfield-Barnes Municipal Airport lie across a localized surface drainage divide that trends north-south generally along runway 2-20. The main base complex is located on the western side of the divide (~112 acres), while the munitions facilities are located on the eastern side of the divide (~70 acres). Stormwater run-off from the east location is discharged through a series of channels and flows towards Pond Brook while the western drainages flow into Arm Brook. Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the Base. The detention basins percolate stormwater to the subsurface through highly transmissivity glacial outwash sand gravel deposits. The dominant surface soil types in the base vicinity are the Hinckley loamy sand and urban land. The area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by the Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater is found ranging from 17 to 62 ft bgs and flows range from southwest to southeast. Groundwater flows are to the southwest at this PRL. This PRL is at the eastern end of the runway and has a minimal grass strip on the north, east, and south side of the runway.
Brief Description of Receptors:	Receptors could include airfield staff and Barnes ANG Base staff. Groundwater from the Barnes Aquifer is withdrawn by the City of Westfield from a series of nine municipal water supply wells. Two of the city's water supply well fields, are located approximately ½ mile southeast from the Barnes ANG Base and two additional public water supply wells, are located south of Barnes ANG Base, approximately 1.75 miles and 2.5 miles respectively which were taken out of service in 2016 due to high levels of PFAS. Aquifer protection areas (Zones II and III delineation) have been determined for municipal wells pursuant to 310 CMR 22.00 (dated 31 December 1993). In addition, there are 25 private drinking water wells within a 2-mile radius of Barnes ANG Base. According to the Environmental Data Resources Radius Report, Barnes ANGB is in a MDEP approved zone II aquifer. The SI did not identify which wells were the closest downgradient wells. The Expanded SI noted that multiple downgradient private wells have detected concentrations of PFAS compounds. The Expanded SI also noted that at least some of the PFAS contamination in the public water supply wells is likely attributed to Barnes ANG Base. Barnes ANG Base is a controlled access installation with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Barnes ANGB

Site ID: PRL 8 **AFFF Release Area #:** AFFF 8

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.0066	0.602	0.0
PFOA	0.0059	0.04	0.1
PFOS	0.009	0.04	0.2

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.4
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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)	H
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)	
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).	H
	Groundwater Category	**MEDIUM**

Soil Worksheet

Installation Barnes ANGB

Site ID: PRL 8 **AFFF Release Area #:** AFFF 8

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.00913	0.126	0.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

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	M
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**LOW**