RELATIVE RISK SITE EVALUATION

Rosecrans Air National Guard Base, Missouri

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 (ANG). 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. 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 Rosecrans Air National Guard Base (ANGB) PFAS PA and SI can be found at the AFCEC 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, scroll down the Installation List and click on Rosecrans Memorial Airport, MO, then enter the AR Number 472854 in the “AR #” field for the PA. For the SI, enter the AR Number 583962. 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

ANG - Air National Guard

ANGB - Air National Guard Base

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

MPF – Migration Pathway Factor

PA – Preliminary Assessment

PFAS - Per-and polyfluoroalkyl substances

PFBS – Perfluorobutanesulfonic acid

PFOA - Perfluorooctanoic acid

PFOS - Perfluorooctane sulfonate

PRL - Potential Release Location

RF – Receptor Factor

RI – Remedial Investigation

RRSE – Relative Risk Site Evaluation

SI – Site Inspection

RELATIVE RISK SITE EVALUATION, cont.

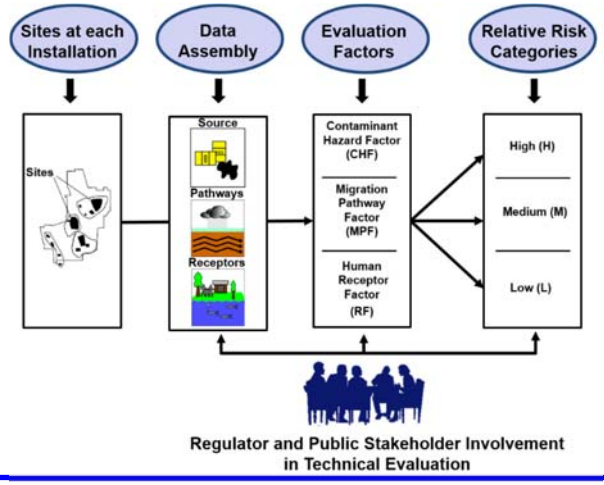
Q. What is the Relative Risk Site Evaluation (RRSE)?

A. RRSE is a methodology to sequence environmental restoration work used by the 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.

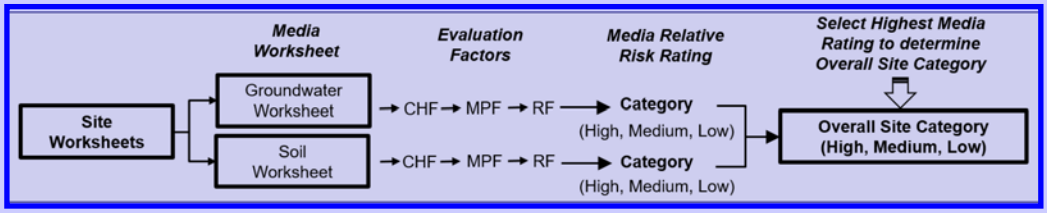
Relative Risk Site Evaluation Concept Summary



Sites at Each Installation

. 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 **CHF** is determined by dividing the maximum level for a contaminant at each site by the approved screening values (i.e., risk-based comparison values). Contaminant concentration ratios are totaled to arrive at a **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 **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?

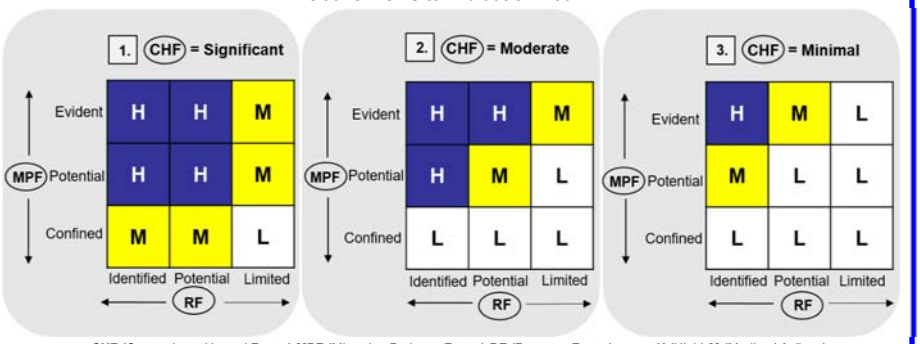
A. The **RF** is determined by a receptor's, such as humans, potential to come into contact with contaminated media. **RFs** are designated as: identified, potential, or limited **(High, Medium, and Low). Identified** rating is given when receptors are in contact or threat of contact with contaminated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

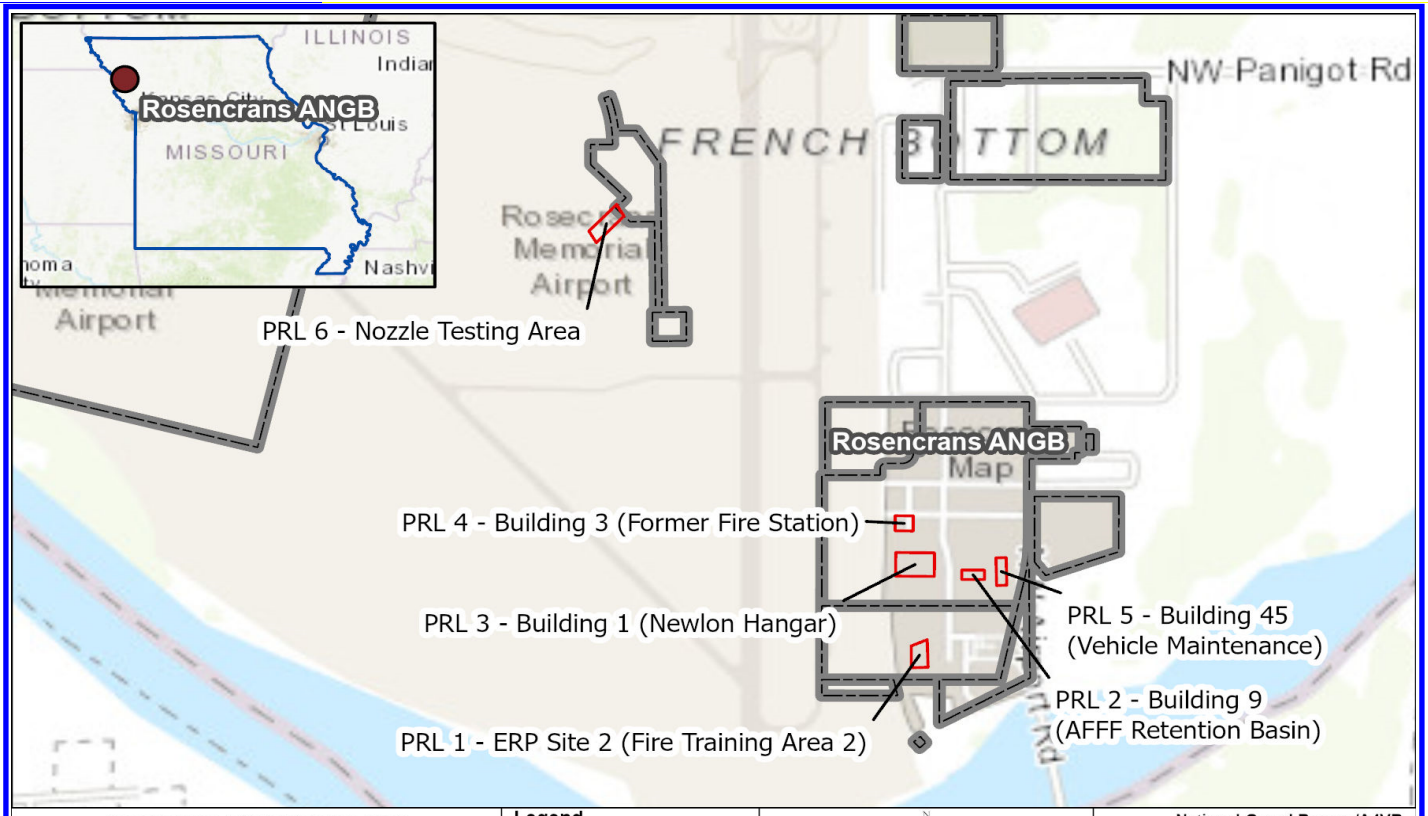
Regulatory and Stakeholder Involvement

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 Rosecrans ANGB, MO

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	PRL 1, PRL 4
MEDIUM	PRL 3, PRL 6
LOW	PRL 2, PRL 5



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

Site Background Information			
Installation:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Fire Training Area (FTA) 2 (Environmental Restoration Program Site 2) - PRL 1	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Rosecrans Air National Guard Base (ANGB) is the home of the 139th Air Wing (AW) in St. Joseph, Missouri, and is located in the southeastern corner of the Rosecrans Memorial Airport. The Base occupies approximately 142 acres adjacent to the Rosecrans Memorial Airport and is situated in Buchanan County, approximately 3 miles northwest of St. Joseph. FTA 2 (ERP Site 2) is located near the southwestern corner of the Base and was used for fire training exercises and changing fuel filters. Jet propulsion fuel No. 4 was disposed of in circular bermed burn pits. Base personnel were uncertain when the FTA was last utilized but believed it to be in the early 1990s and were uncertain if aqueous film forming foam (AFFF) was utilized at FTA 2.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 feet (ft.) of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. above mean sea level (AMSL). The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 feet of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. below ground surface (bgs). Soil samples were collected from a grassy area at the PRL.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base, according to Base personnel. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the Environmental Data Resources (EDR) Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the Missouri Department of Natural Resources (MDNR) database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Private potable wells may be present hydraulically downgradient between a 1 to 4 mile radius of the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation Rosecrans Air National Guard Base

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	4.2	0.04	105.0
PFOA	0.48	0.04	12.0
PFBS	0.2	0.602	0.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	117.3
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	H

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	**HIGH**

Soil Worksheet

Installation Rosecrans ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.085	0.126	0.7
PFOA	0.006	0.126	0.0
PFBS	0.012	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.7
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	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:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 9 AFFF Retention Basin - PRL 2	**Phase of Execution (e.g., RI, Record of Decision**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date**	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	An AFFF retention basin is located in Building 9. This drainage basin receives any potential AFFF releases from Building 1 (Newlon Hangar) or high expansion foam (HEF) releases from Building 8 (Fuel Cell Hangar). Any releases to the floor or trench drains in these hangars drain via gravity to this basin. The basin is poured concrete, approximately 16 ft. wide by 70 ft. long by 8 ft. deep. According to the preliminary assessment (PA), any AFFF retained in the basin is periodically pumped out and disposed of offsite or metered to the sanitary sewer per authorization from the local wastewater treatment plant. No documented AFFF releases into the retention basin from Building 1 have occurred. One HEF release from Building 8 occurred in approximately 2004 that would have been captured by the retention basin. Images show that Building 9 was demolished (including the basin) sometime between March and May 2019. The May 2019 image shows only an area of bare dirt.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 ft. of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. AMSL. The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. Regionally, the surficial alluvium and, to a lesser extent, the underlying Pennsylvanian-age aquifer are utilized as a drinking water source. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 ft. of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. bgs. Soil samples were collected from a bare area at this PRL.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the EDR Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the MDNR database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation Rosecrans ANGB

Site ID: PRL 2 **AFFF Release Area #:** AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.011	0.04	0.3
PFOA	0.014	0.04	0.4
PFBS	0.0098	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.6
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	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	
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)	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	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 Rosecrans ANGB

Site ID: PRL 2 **AFFF Release Area #:** AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.007	0.126	0.1
PFOA	0.00067	0.126	0.0
PFBS	0.00014	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
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	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:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 1 Newlon Hangar - PRL 3	**Phase of Execution (e.g., RI, Record of Decision**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	Building 1 - Newlon Hangar is the main aircraft maintenance hangar on Base. According to the 2019 SI, this hangar was equipped with an AFFF fire suppression system (FSS) in 2000 utilizing an approximate 300-gal capacity AFFF storage supply tank. Any AFFF releases from the hangar FSS would drain via gravity through dedicated gravity drains to the AFFF retention basin located in Building 9. No documented releases of AFFF from this hangar have occurred.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 ft. of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. AMSL. The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. Regionally, the surficial alluvium and, to a lesser extent, the underlying Pennsylvanian-age aquifer are utilized as a drinking water source. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 ft. of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen, and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. bgs. Soil samples were collected from asphalt and grassy areas surrounding Building 1.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the EDR Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the MDNR database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation Rosecrans ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.95	0.04	23.7
PFOA	0.31	0.04	7.8
PFBS	0.065	0.602	0.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	31.6
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)	
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 Rosecrans ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.038	0.126	0.3
PFOA	0.002	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.3**
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:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 3 Former Fire Station - PRL 4	**Phase of Execution (e.g., RI, Record of Decision**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The former Base Fire Station was located in Building 3 situated just east of the flight apron. This fire station was vacated in 2014, when the new fire station (Building 302) was completed. At the time of the PA, the building was being renovated as an aerospace ground equipment facility. AFFF was previously stored within the former fire station. Drums of AFFF were formerly stored outside the fire station along the southern wall. An AFFF storage tank (estimated 500 gal) was previously located in the upstairs of Building 3 and was used to temporarily store AFFF and fill the fire vehicles on an as-needed basis. No known releases of AFFF have occurred at Building 3. Incidental releases would have historically gone to the trench drains and to the sanitary sewer. Fire vehicles utilizing AFFF that were stored in Building 3 and their capacity included the following: Oshkosh Stryker (Crash 2) Vehicle - 210-gal AFFF; Oshkosh TI-1500 (Crash 3) Vehicle - 210-gal AFFF; KME Rapid Intervention Vehicle - 57-gal AFFF; E-1 P-23 (Crash 6) Vehicle - 500-gal AFFF; KME P-22 (Engine 4) - 25-gal AFFF; and Foam Trailer - 1,050-gal AFFF.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 ft. of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. AMSL. The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. Regionally, the surficial alluvium and, to a lesser extent, the underlying Pennsylvanian-age aquifer are utilized as a drinking water source. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 ft. of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen, and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. bgs. Soil samples were collected from a grassy area north and south of the building.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the EDR Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the MDNR database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation Rosecrans ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	34	0.04	850.0
PFOA	5.1	0.04	127.5
PFBS	3.3	0.602	5.5
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**983.0**
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**	**H**

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	**HIGH**

Soil Worksheet

Installation Rosecrans ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.3	0.126	2.4
PFOA	0.0038	0.126	0.0
PFBS	0.0003	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.4
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	
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	**MEDIUM**

Site Background Information			
Installation:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 45 Vehicle Maintenance - PRL 5	**Phase of Execution (e.g., RI, Record of Decision**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date**	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	An incidental release of AFFF/water mixture occurred to the ground surface in a grassy area north of the Vehicle Maintenance Area (Building 45). An estimated 15 gal of AFFF foam concentrate were released during the event via one of the fire truck water cannons. The release area extended approximately 100 yard to 120 yard long by approximately 10 yard wide off the northern edge of the Building 45 maintenance parking area. The release sprayed over the western edge of the drainage pond located in this general location.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 ft. of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. AMSL. The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. Regionally, the surficial alluvium and, to a lesser extent, the underlying Pennsylvanian-age aquifer are utilized as a drinking water source. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 ft. of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen, and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. bgs. Soil samples were collected from a grassy area in the vicinity of a storm culvert in the southern portion of the PRL closest to Building 45.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the EDR Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the MDNR database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation: Rosecrans ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.0099	0.04	0.2
PFOA	0.018	0.04	0.4
PFBS	0.05	0.602	0.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.8
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 Rosecrans ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0093	0.126	0.1
PFOA	0.00033	0.126	0.0
PFBS	0.000086	1.9	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.1**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
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	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:	Rosecrans ANGB	**Date:**	10/14/2021
Location (State):	Missouri	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Nozzle Testing Area - PRL 6	**Phase of Execution (e.g., RI, Record of Decision**	N/A
RPM's Name:	Jody Murata	**Agreement Status (e.g., Federal Facility Agreement date**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	ANG conducts foam conductivity testing and firefighting vehicle performance testing on an annual basis. Testing is currently conducted on the Installation on the mid-air field concrete pad/former taxiway, southwest of the Munitions Building 93. Prior fire equipment testing (approximately pre-2006) was conducted on the flight apron-concrete ramp. Foam and water released during testing are allowed to dissipate from the concrete surface.
Brief Description of Pathways:	The uppermost soils encountered at Rosecrans ANGB consist of more than 60 ft. of alluvium, which may be composed of a variety of materials ranging from silty clay to sand and gravel. The top of a several hundred-foot sequence of Pennsylvanian-age shale, limestone, and sandstone occurs below the facility at an elevation of approximately 750 ft. AMSL. The Base is located in a region of dissected glacial till plains locally eroded by the Missouri River and its tributaries. Regionally, the surficial alluvium and, to a lesser extent, the underlying Pennsylvanian-age aquifer are utilized as a drinking water source. The Base is located on the relatively level and roughly one-mile wide Missouri River floodplain on a point bar within an abandoned meander of the Missouri River. The old Missouri River channel, now known as Browning Lake, lies within 700 ft. of the southern Base boundary. The lake serves as a recreational area for boaters, fishermen, and waterfowl hunters. The Missouri River and Browning Lake water levels influence groundwater flow on the Base. During low river and lake levels, groundwater discharges to these surface water features. During periods of high water and flooding, the Missouri River and Browning Lake recharge the alluvial aquifer, causing a reversal in groundwater flow direction. The groundwater information collected from existing monitoring wells confirmed a primarily southern flow of shallow groundwater. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 6 ft. to 10.5 ft. bgs. Soil borings were installed in the concrete of the old aircraft taxiway and the grassy area northeast of Building 93.
Brief Description of Receptors:	Groundwater in the vicinity of the Base is not used for drinking water, and no drinking water wells are located at the Base. The St. Joseph Municipal Water Supply, whose source is an intake on the Missouri River, supplies potable water to the area. A review of the EDR Radius Map™ Report with Geocheck®, showed no private wells or public water system wells identified within a one mile radius of the Base; however, multiple domestic wells were identified in the MDNR database within a four mile radius of the Base. Most of the wells are located east, southeast, and south of the Base; however, all appear to be located on the opposite side of the Missouri River from the Base. Access to the Base is restricted to authorized personnel by a controlled check point and surrounded with a perimeter fence. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site monitoring wells at varying concentrations.

Groundwater Worksheet

Installation Rosecrans ANGB

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.2	0.04	5.0
PFOA	0.031	0.04	0.8
PFBS	0.013	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	5.8
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 Rosecrans ANGB

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0055	0.126	0.0
PFOA	0.00043	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**