



RELATIVE RISK SITE EVALUATION

Goldwater Air National Guard Base, Arizona

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 drinking water lifetime Health Advisories (HAs) for PFOS and PFOA, and health-based soil-based surface soil regional screening levels (RSLs) for PFOS, PFOA, and two RSLs, surface soil and drinking water for PFBS.

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

The Goldwater (Sky Harbor Int'l Airport) 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, scroll down the Installation List and click on Goldwater ANG, AZ, then enter the AR Number 471847 in the "AR #" field for the PA. For the SI, enter the AR Number 586439. 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

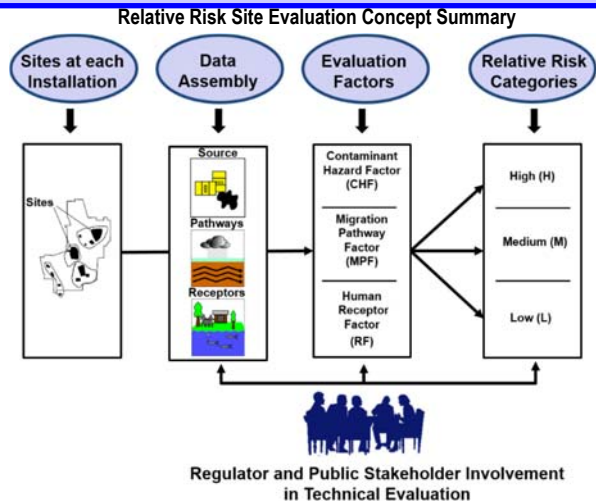
AFFF - Aqueous Film Forming Foam	PA – Preliminary Assessment
ANG - Air National Guard	PFAS - Per-and polyfluoroalkyl substances
ANGB - Air National Guard Base	PFBS – Perfluorobutanesulfonic acid
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act	PFOA - Perfluorooctanoic acid
CHF – Contaminant Hazard Factor	PFOS - Perfluorooctane sulfonate
DoD - Department of Defense	PRL - Potential Release Location
EPA – US Environmental Protection Agency	RI – Remedial Investigation
HA – Health Advisory	RRSE – Relative Risk Site Evaluation
	RSL -- Regional Screening Level
	SI – Site Inspection

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 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.



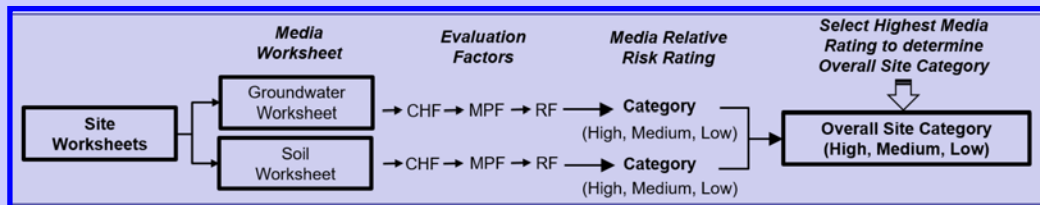
Sites at Each Installation

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

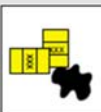


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

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 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 **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
Keith Freihofer NGB/A4VR
(240) 612-8762
keith.freihofer.1@us.af.mil

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

A. The movement of contamination at a site is evaluated and assigned a MPF rating.



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

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.

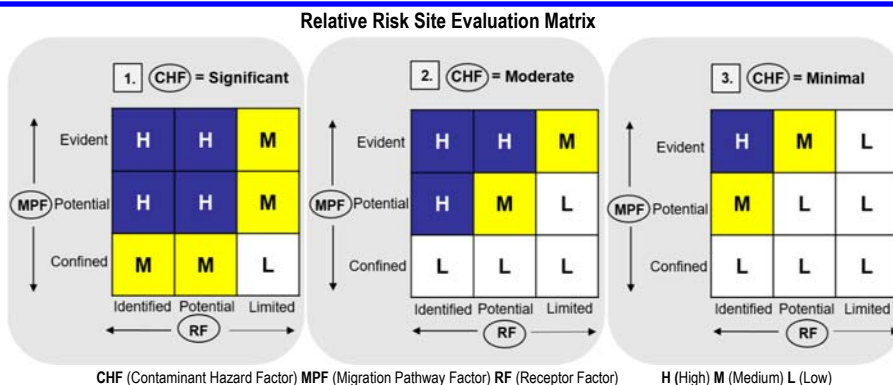


RELATIVE RISK SITE EVALUTION, cont.

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)**.



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

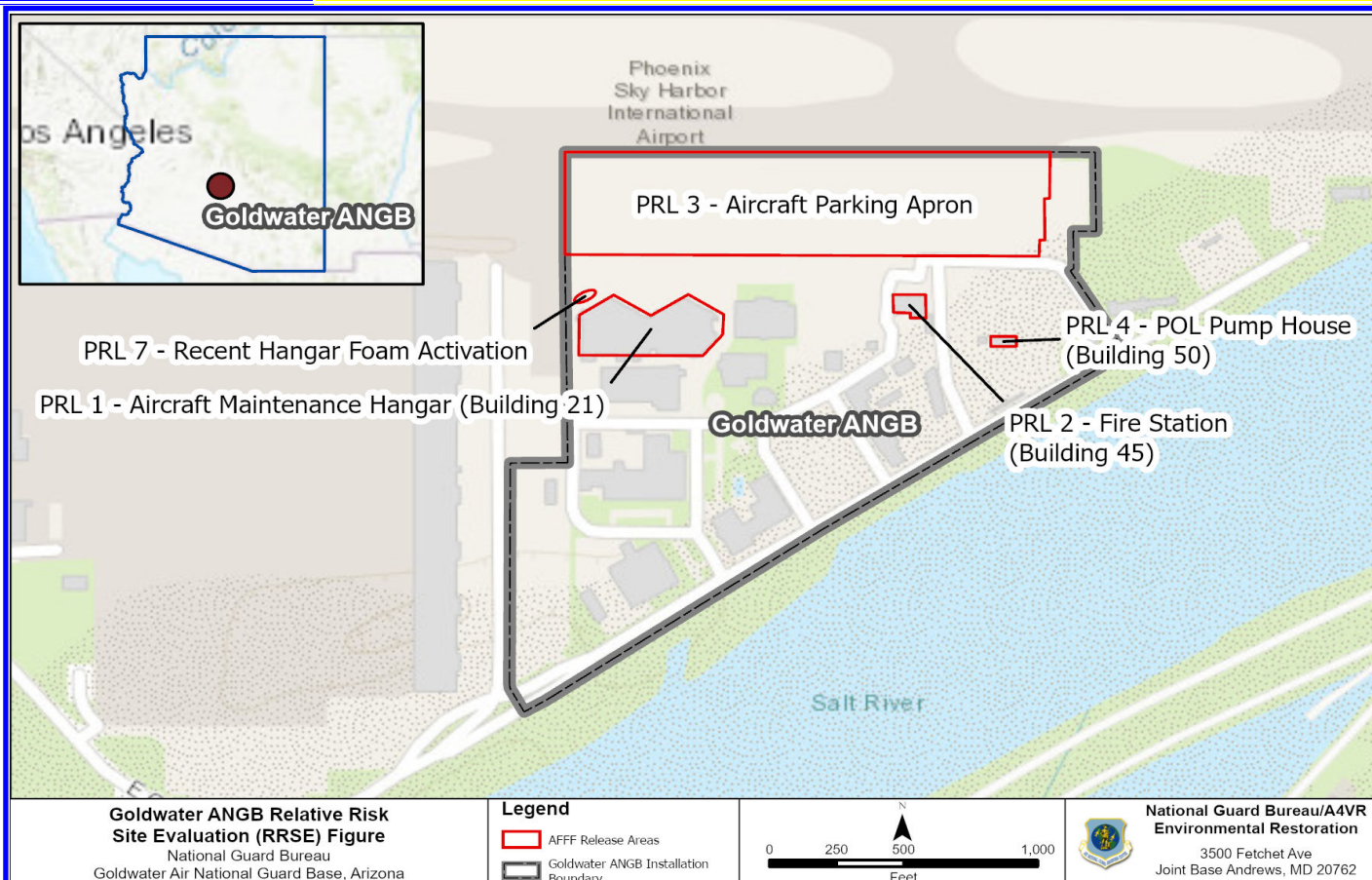
Q. How do I participate as Stakeholder?



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 Goldwater ANGB, AZ

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	N/A
MEDIUM	N/A
LOW	PRL 1, PRL 2, PRL 3, PRL 4, PRL 7



Notes: Aqueous Film Forming Foam (AFFF) Area is another term for Potential Release Location (PRL).

Site Background Information			
Installation:	Goldwater ANGB	Date:	10/14/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Hangar Building 21 - PRL 1	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	<p>The Aircraft Maintenance Hangar (Building 21) has been utilized since 1997 and is located in the northwest corner of the base. The Hangar is equipped with a fire suppression system (FSS). Aqueous film forming foam (AFFF) is stored in fire suppression equipment in the mechanical room. Building 21 consists of two identical hangars, each having a 1,320-gallon AFFF tank. The FSS consists of piping from the AFFF tanks to nozzles located within the main hangar area. There have been four releases of AFFF in Building 21. The 1998 release was an accidental activation of the FSS of unknown quantity. The 2002 release was 10,000 gallons of water with approximately 50 gallons of AFFF. The 2006 release was a 1,300 gallon mixture of AFFF and water released during standard maintenance of the FSS. The 2008 release included 10,000 gallons of water with approximately 50 gallons of AFFF. According to Base personnel, each release was contained in holding tanks beneath the hangars that were then pumped to the sanitary sewer system. The approximately 30 feet (ft.) long by 12 ft. wide holding tanks have a capacity of 25,000 gallons. They are located just north of the hangar at a depth of approximately 4 ft. below ground surface (bgs). The depth to bottom of the tanks is approximately 16 ft. bgs.</p> <p>Groundwater data for this PRL uses data from the downgradient monitoring well at PRL 7.</p>
Brief Description of Pathways:	<p>The Goldwater ANGB is located in the Basin and Range physiographic province, which is characterized by north to northwest trending fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basement complex (depths of several thousand ft.) that floors the geological basins and forms the mountains are composed of granite, gneiss, and schist of Precambrian-age, conglomerate of Cretaceous/Tertiary age, and andesite of Tertiary age. The valleys are filled with unconsolidated alluvium which varies in thickness from 0 ft. to more than 5,100 ft., and possibly as much as 10,000 ft. in some locations. Groundwater occurs in sedimentary deposits of the Salt River Valley area under leaky-confined to unconfined conditions. Three distinct water bearing units are identified in the sub-basins in the area: an upper alluvial unit, a middle fine-grained unit, and a lower conglomerate unit. Bedrock, consisting of metamorphic and igneous rock, underlies the basin-fill sediments and is not considered an aquifer. Depth to groundwater is approximately 103.0 to 105.73 ft bgs and generally flows to the west. In the area of the ANGB, depth to groundwater is approximately 79 ft. The base is located adjacent to the Salt River and the southern perimeter of the base is within its 100-year flood plain. The majority of surface water runoff from Goldwater ANGB flows over land and through the facility-wide stormwater drainage system, and runoff is discharged to Salt River. This PRL is the building which is surrounded by asphalt and concrete paving areas and is adjacent to the apron.</p>
Brief Description of Receptors:	<p>The City's water supply comes primarily from the Salt River Project which brings water by canal and pipeline from the Salt and Verde Rivers and the Central Arizona Project that transports Colorado River water. A small amount of water also comes from groundwater wells (2% of total supply from 20 different groundwater wells). There are no drinking water supply wells within a 3-mile radius of the ANGB. Water for the Airport and the Base is provided by the City's municipal water system. The surface water from the base is not a primary source of drinking water. A review of the Environmental Data Resources (EDR) Radius Map™ Report with Geotcheck® dated September 24, 2015, shows 859 wells within a two-mile radius of the Base and characterized more than 96 percent as monitoring wells. The only public supply is owned by the City of Goodyear (< 1 mile away) but it is listed as closed (most likely due to coliform violations). Of the 859 wells, 22 may be considered downgradient; however, none supply drinking water. The Base has a perimeter fence with access through a controlled gate. Access to the PRL would be restricted to authorized Base personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.</p>

Groundwater Worksheet

Installation: Goldwater ANGB

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.055	0.04	1.4	
PFOA	0.018	0.04	0.4	
PFBS	0.044	0.602	0.1	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.9	
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	
<u>Migratory Pathway Factor</u>				
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	
<u>Receptor Factor</u>				
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)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Groundwater Category			LOW	

Soil Worksheet

Installation Goldwater ANGB

Site ID:PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOA	0.015	0.126	0.1	
PFOS	0.0016	0.126	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		L	
Migratory Pathway Factor				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure			
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined			
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Receptor Factor				
Identified	Receptors identified that have access to contaminated soil			
Potential	Potential for receptors to have access to contaminated soil			
Limited	No potential for receptors to have access to contaminated soil		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Soil Category			LOW	

Site Background Information			
Installation:	Goldwater ANGB	Date:	10/14/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Fire Station Building 45 - PRL 2	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	<p>The Fire Station (Building 45) is inactive but had previously been utilized since 1997 and is located in the north central portion of the base. This building now houses aircraft maintenance Crew Chiefs. Currently, the Fire Department is no longer active on base and only has one full-time member, the Fire Chief. According to base personnel, there were four Fire/Crash Response vehicles stored in this building, including two P-19 vehicles (100 gallons each), one P-23 vehicle, and one P-18 vehicle. Historically, five gallon containers of AFFF were stored outside of the Fire Station for use in the fire fighting vehicles. However, AFFF was never added to the vehicles, but instead was transferred to the FSS in the Aircraft Maintenance Hangar (Building 21) (PRL 1). There were no known releases reported at the Fire Station.</p>
Brief Description of Pathways:	<p>The Goldwater ANGB is located in the Basin and Range physiographic province, which is characterized by north to northwest trending fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basement complex (depths of several thousand ft.) that floors the geological basins and forms the mountains are composed of granite, gneiss, and schist of Precambrian-age, conglomerate of Cretaceous/Tertiary age, and andesite of Tertiary age. The valleys are filled with unconsolidated alluvium which varies in thickness from 0 ft. to more than 5,100 ft., and possibly as much as 10,000 ft. in some locations. Groundwater occurs in sedimentary deposits of the Salt River Valley area under leaky-confined to unconfined conditions. Three distinct water bearing units are identified in the sub-basins in the area: an upper alluvial unit, a middle fine-grained unit, and a lower conglomerate unit. Bedrock, consisting of metamorphic and igneous rock, underlies the basin-fill sediments and is not considered an aquifer. Depth to groundwater is approximately 103.0 to 105.73 ft. bgs and generally flows to the west. In the area of the ANGB, depth to groundwater is approximately 79 ft. The base is located adjacent to the Salt River and the southern perimeter of the base is within its 100-year flood plain. The majority of surface water runoff from Goldwater ANGB flows over land and through the facility-wide stormwater drainage system, and runoff is discharged to Salt River. This PRL is the building which is surrounded by asphalt and concrete paving areas and is adjacent to the apron. There is a very small landscaped area on the west side of the building.</p>
Brief Description of Receptors:	<p>The City's water supply comes primarily from the Salt River Project which brings water by canal and pipeline from the Salt and Verde Rivers and the Central Arizona Project that transports Colorado River water. A small amount of water also comes from groundwater wells (2% of total supply from 20 different groundwater wells). There are no drinking water supply wells within a 3-mile radius of the ANGB. Water for the Airport and the Base is provided by the City's municipal water system. The surface water from the base is not a primary source of drinking water. A review of the EDR Radius Map™ Report with Geoscheck® dated September 24, 2015, shows 859 wells within a two-mile radius of the Base and characterized more than 96 percent as monitoring wells. The only public supply is owned by the City of Goodyear (< 1 mile away) but it is listed as closed (most likely due to coliform violations). Of the 859 wells, 22 may be considered downgradient; however, none supply drinking water. The Base has a perimeter fence with access through a controlled gate. Access to the PRL would be restricted to authorized Base personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.</p>

Groundwater Worksheet

Installation Goldwater ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFBS	0.24	0.602	0.4	
PFOA	0.021	0.04	0.5	
PFOS	0.046	0.04	1.2	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.1	
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)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Groundwater Category			LOW	

Soil Worksheet

Installation Goldwater ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOA	0.0023	0.126	0.0	
PFOS	0.22	0.126	1.7	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.8	
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	
<u>Migratory Pathway Factor</u>				
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	
<u>Receptor Factor</u>				
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:	Goldwater ANGB	Date:	10/14/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Apron - PRL 3	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	<p>The apron is the parking area for the KC-135 aircraft and is located on the northern side of the base. The apron is concrete and contains a hydrant system utilized for refueling the aircraft. Stormwater on the apron would flow in a southern direction and enter the stormwater conveyance system through three storm drain inlets. The western-most storm drain inlet associated with the Apron is located just north of the Aircraft Maintenance Hangar (Building 21) (PRL 1). Another associated storm drain inlet is located just north of Squadron Operations, Building 26 (not a PRL and not further discussed within this site investigation (SI)). The storm inlets discharge to the Salt River through outfall 10. There were no known releases reported by base personnel.</p> <p>Groundwater data for this PRL uses data from the co-located monitoring well at PRL 2.</p>
Brief Description of Pathways:	<p>The Goldwater ANGB is located in the Basin and Range physiographic province, which is characterized by north to northwest trending fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basement complex (depths of several thousand ft.) that floors the geological basins and forms the mountains are composed of granite, gneiss, and schist of Precambrian-age, conglomerate of Cretaceous/Tertiary age, and andesite of Tertiary age. The valleys are filled with unconsolidated alluvium which varies in thickness from 0 ft. to more than 5,100 ft., and possibly as much as 10,000 ft. in some locations. Groundwater occurs in sedimentary deposits of the Salt River Valley area under leaky-confined to unconfined conditions. Three distinct water bearing units are identified in the sub-basins in the area: an upper alluvial unit, a middle fine-grained unit, and a lower conglomerate unit. Bedrock, consisting of metamorphic and igneous rock, underlies the basin-fill sediments and is not considered an aquifer. Depth to groundwater is approximately 103.0 to 105.73 ft. bgs and generally flows to the west. In the area of the ANGB, depth to groundwater is approximately 79 ft. The base is located adjacent to the Salt River and the southern perimeter of the base is within its 100-year flood plain. The majority of surface water runoff from Goldwater ANGB flows over land and through the facility-wide stormwater drainage system, and runoff is discharged to Salt River. This PRL is the apron which is a concrete paving area.</p>
Brief Description of Receptors:	<p>The City's water supply comes primarily from the Salt River Project which brings water by canal and pipeline from the Salt and Verde Rivers and the Central Arizona Project that transports Colorado River water. A small amount of water also comes from groundwater wells (2% of total supply from 20 different groundwater wells). There are no drinking water supply wells within a 3-mile radius of the ANGB. Water for the Airport and the Base is provided by the City's municipal water system. The surface water from the base is not a primary source of drinking water. A review of the EDR Radius Map™ Report with Geoscheck® dated September 24, 2015, shows 859 wells within a two-mile radius of the Base and characterized more than 96 percent as monitoring wells. The only public supply is owned by the City of Goodyear (< 1 mile away) but it is listed as closed (most likely due to coliform violations). Of the 859 wells, 22 may be considered downgradient; however, none supply drinking water. The Base has a perimeter fence with access through a controlled gate. Access to the PRL would be restricted to authorized Base personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.</p>

Groundwater Worksheet

Installation: Goldwater ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.046	0.04	1.2	
PFOA	0.021	0.04	0.5	
PFBS	0.24	0.602	0.4	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.1	
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)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Groundwater Category			LOW	

Soil Worksheet

Installation Goldwater ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFBS	0.00045	1.9	0.0	
PFOA	0.0061	0.126	0.0	
PFOS	0.051	0.126	0.4	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.5	
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	
<u>Migratory Pathway Factor</u>				
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	
<u>Receptor Factor</u>				
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:	Goldwater ANGB	Date:	10/14/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	POL Pumphouse Bldg 50 - PRL 4	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	The petroleum, oils and lubricants (POL) pumphouse is Building 50 and started operations in 1997. Two 201-gallon tanks of AFFF located within Building 50 provides fire protection for the fuel tanks. If a fire were to occur at the POL storage tank area, fire-fighting vehicles would connect with ports on the exterior of the pumphouse and add water into the FSS. The water would then mix with the AFFF concentrate located in the holding tanks and be discharged inside the top of the two aboveground POL storage tanks. No leaks or inadvertent discharges have been reported at the POL pumphouse.
Brief Description of Pathways:	The Goldwater ANGB is located in the Basin and Range physiographic province, which is characterized by north to northwest trending fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basement complex (depths of several thousand ft.) that floors the geological basins and forms the mountains are composed of granite, gneiss, and schist of Precambrian-age, conglomerate of Cretaceous/Tertiary age, and andesite of Tertiary age. The valleys are filled with unconsolidated alluvium which varies in thickness from 0 ft. to more than 5,100 ft., and possibly as much as 10,000 ft. in some locations. Groundwater occurs in sedimentary deposits of the Salt River Valley area under leaky-confined to unconfined conditions. Three distinct water bearing units are identified in the sub-basins in the area: an upper alluvial unit, a middle fine-grained unit, and a lower conglomerate unit. Bedrock, consisting of metamorphic and igneous rock, underlies the basin-fill sediments and is not considered an aquifer. Depth to groundwater is approximately 103.0 to 105.73 ft. bgs and generally flows to the west. In the area of the ANGB, depth to groundwater is approximately 79 ft. The base is located adjacent to the Salt River and the southern perimeter of the base is within its 100-year flood plain. The majority of surface water runoff from Goldwater ANGB flows over land and through the facility-wide stormwater drainage system, and runoff is discharged to Salt River. This PRL is the building which is surrounded by asphalt and concrete paving areas and is adjacent to the apron.
Brief Description of Receptors:	The City's water supply comes primarily from the Salt River Project which brings water by canal and pipeline from the Salt and Verde Rivers and the Central Arizona Project that transports Colorado River water. A small amount of water also comes from groundwater wells (2% of total supply from 20 different groundwater wells). There are no drinking water supply wells within a 3-mile radius of the ANGB. Water for the Airport and the Base is provided by the City's municipal water system. The surface water from the base is not a primary source of drinking water. A review of the EDR Radius Map™ Report with Geospatial® dated September 24, 2015, shows 859 wells within a two-mile radius of the Base and characterized more than 96 percent as monitoring wells. The only public supply is owned by the City of Goodyear (< 1 mile away) but it is listed as closed (most likely due to coliform violations). Of the 859 wells, 22 may be considered downgradient; however, none supply drinking water. The Base has a perimeter fence with access through a controlled gate. Access to the PRL would be restricted to authorized Base personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Goldwater ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFBS	0.077	0.602	0.1	
PFOA	0.023	0.04	0.6	
PFOS	0.047	0.04	1.2	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.9	
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	
<u>Migratory Pathway Factor</u>				
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	
<u>Receptor Factor</u>				
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)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Groundwater Category			LOW	

Soil Worksheet

Installation: Goldwater ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOA	0.00031	0.126	0.0	
PFOS	0.00077	0.126	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0	
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		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:	Goldwater ANGB	Date:	10/14/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Recent Hangar Foam Activation - PRL 7	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary

Brief Site Description:	On January 20, 2016, the Aircraft Maintenance Hangar (Building 21 - PRL 1) experienced an inadvertent activation of the AFFF cannons. The system only partially discharged (one cannon), and the incidence received a quick response. The discharge was due to malfunctions in the AFFF control panel and other factors that have been addressed by Civil Engineering and contractor personnel. AFFF was discharged to a very small soil area adjacent to the northwest corner of the Hangar (PRL 1).
Brief Description of Pathways:	The Goldwater ANGB is located in the Basin and Range physiographic province, which is characterized by north to northwest trending fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basement complex (depths of several thousand ft.) that floors the geological basins and forms the mountains are composed of granite, gneiss, and schist of Precambrian-age, conglomerate of Cretaceous/Tertiary age, and andesite of Tertiary age. The valleys are filled with unconsolidated alluvium which varies in thickness from 0 ft. to more than 5,100 ft., and possibly as much as 10,000 ft. in some locations. Groundwater occurs in sedimentary deposits of the Salt River Valley area under leaky-confined to unconfined conditions. Three distinct water bearing units are identified in the sub-basins in the area: an upper alluvial unit, a middle fine-grained unit, and a lower conglomerate unit. Bedrock, consisting of metamorphic and igneous rock, underlies the basin-fill sediments and is not considered an aquifer. Depth to groundwater is approximately 103.0 to 105.73 ft. bgs and generally flows to the west. In the area of the ANGB, depth to groundwater is approximately 79 ft. The base is located adjacent to the Salt River and the southern perimeter of the base is within its 100-year flood plain. The majority of surface water runoff from Goldwater ANGB flows over land and through the facility-wide stormwater drainage system, and runoff is discharged to Salt River. This PRL is a very small soil area next to Building 21 (PRL 1) and is surrounded by asphalt and concrete paving areas (Google Earth image shows this as a gravel covered landscaped area).
Brief Description of Receptors:	The City's water supply comes primarily from the Salt River Project which brings water by canal and pipeline from the Salt and Verde Rivers and the Central Arizona Project that transports Colorado River water. A small amount of water also comes from groundwater wells (2% of total supply from 20 different groundwater wells). There are no drinking water supply wells within a 3-mile radius of the ANGB. Water for the Airport and the Base is provided by the City's municipal water system. The surface water from the base is not a primary source of drinking water. A review of the EDR Radius Map™ Report with Geotcheck® dated September 24, 2015, shows 859 wells within a two-mile radius of the Base and characterized more than 96 percent as monitoring wells. The only public supply is owned by the City of Goodyear (< 1 mile away) but it is listed as closed (most likely due to coliform violations). Of the 859 wells, 22 may be considered downgradient; however, none supply drinking water. The Base has a perimeter fence with access through a controlled gate. Access to the PRL would be restricted to authorized Base personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Goldwater ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFBS	0.044	0.602	0.1	
PFOA	0.018	0.04	0.4	
PFOS	0.055	0.04	1.4	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.9	
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	
<u>Migratory Pathway Factor</u>				
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	
<u>Receptor Factor</u>				
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)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Groundwater Category			LOW	

Soil Worksheet

Installation Goldwater ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOA	0.001	0.126	0.0	
PFOS	0.0066	0.126	0.1	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		L	
Migratory Pathway Factor				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure			
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		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	