



RELATIVE RISK SITE EVALUATION



Morris Air National Guard Base (Tucson), 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. 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 Morris Air National Guard Base (ANGB) PFAS PA and SI can be found at the Air Force CERCLA Administrative Record (AR): <https://ar.afcec-cloud.af.mil/> Scroll to the bottom of the page and click on "Continue to site", then select Air National Guard (e.g., Active, ANG, BRAC), scroll down the Installation List and click on Morris ANG Base (Tucson IAP), AZ, then enter the AR Number 474890 in the "AR #" field for the PA. For the SI, enter the AR Number 586662 (1 of 2). 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	NTA - Nozzle Testing Area
ANGB - Air National Guard Base	OWS - Oil/Water Separator
BRAC - Base Realignment and Closure	PA - Preliminary Assessment
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act	PFAS - Per- and polyfluoroalkyl substances
CHF - Contaminant Hazard Factor	PFBS - Perfluorobutanesulfonic acid
DoD - Department of Defense	PFOS - Perfluorooctane sulfonate
EPA - US Environmental Protection Agency	PFOA - Perfluorooctanoic acid
FSS - Fire Suppression System	RF - Receptor Factor
FTA - Fire Training Area	RI - Remedial Investigation
HA - Health Advisory	RRSE - Relative Risk Site Evaluation
HEF - High Expansion Foam	PRL - Potential Release Location
IAP - International Airport	SI - Site Inspection
MPF - Migration Pathway Factor	



RELATIVE RISK SITE EVALUATION, cont.

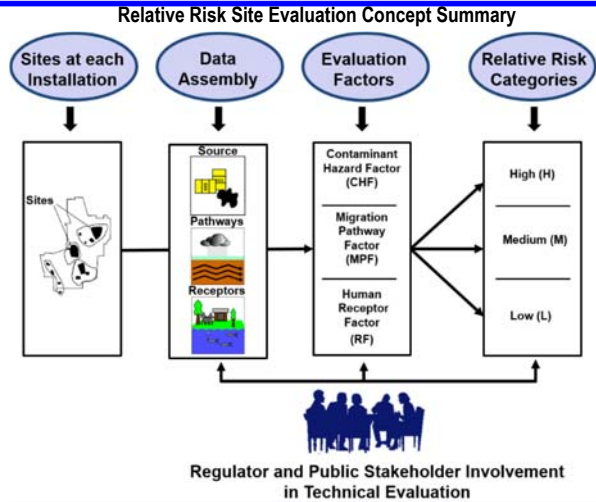


Q. What is the Relative Risk Site Evaluation (RRSE)?

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

Q. What is the RRSE framework?

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



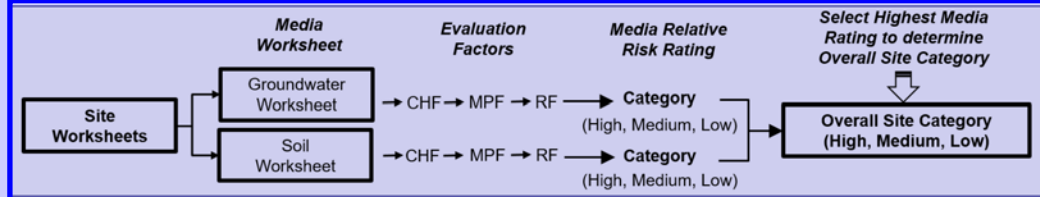
Sites at Each Installation

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

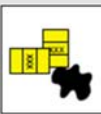


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

The figure shows the process for a media to be evaluated using the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Each media is scored to obtain a relative risk rating of High, Medium, or Low. The highest media rating determines the Overall Site Category.



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



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

FOR MORE INFORMATION

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

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

POINT OF CONTACT
Matt Voorhees NGB/A4VR
240-612-7275
matthew.voorhees.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 Migration Pathway Factor (MPF) rating.



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

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

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



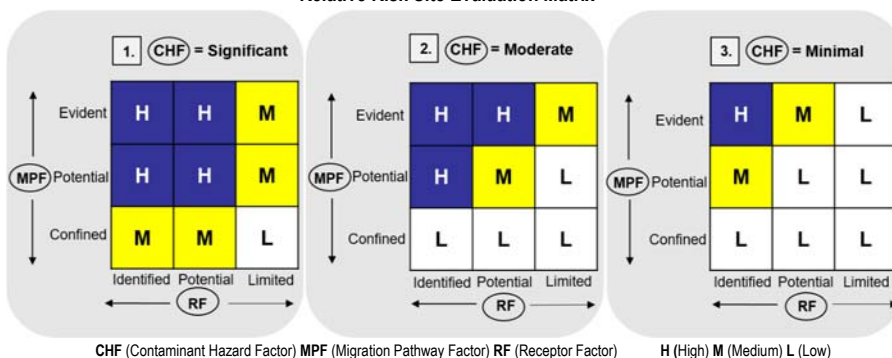
RELATIVE RISK SITE EVALUATION, cont.

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



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

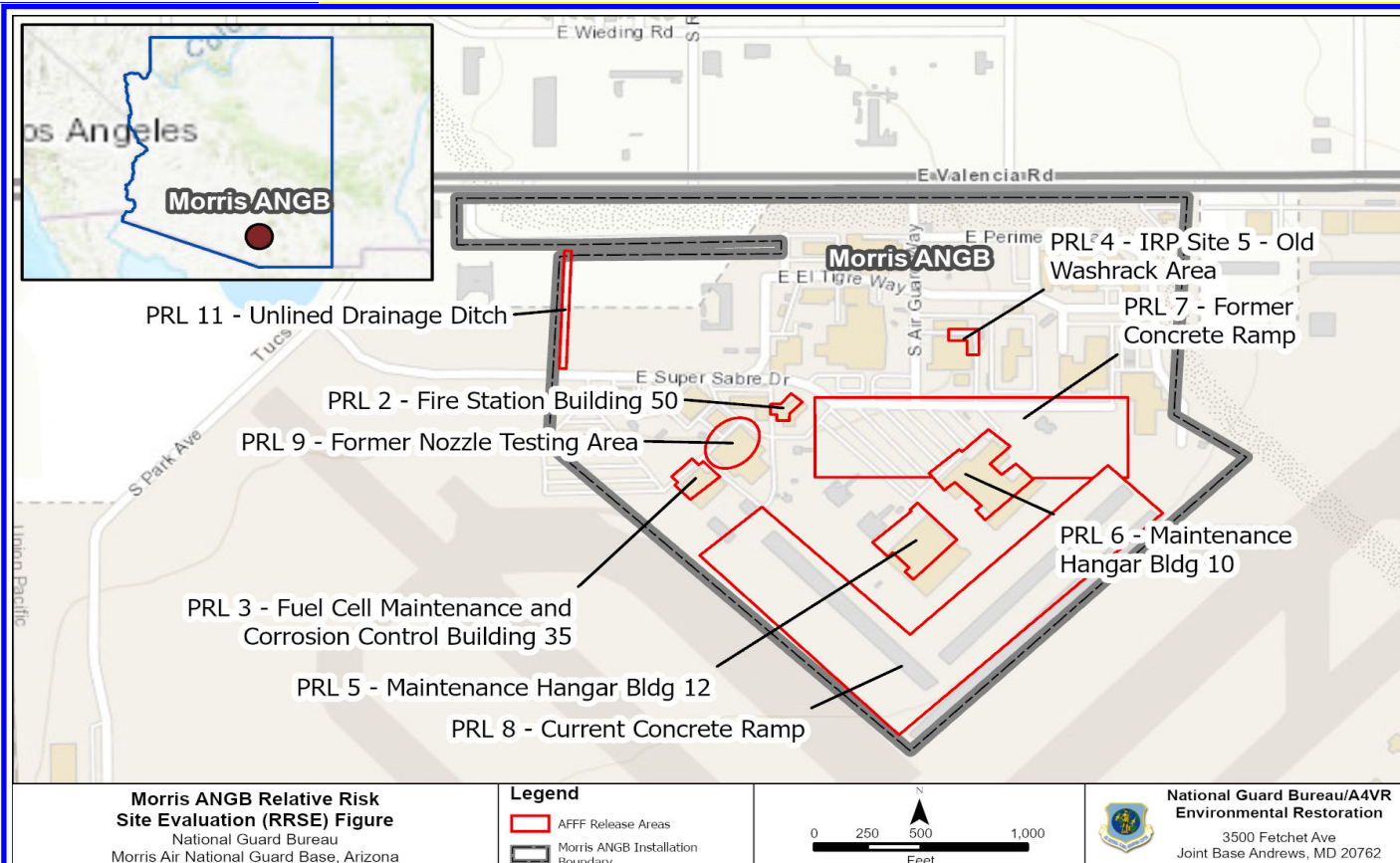
Q. How do I participate as Stakeholder?



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 Morris ANGB, AZ

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	PRL 2, PRL 3, PRL 4, PRL 5, PRL 6, PRL 7, PRL 8, PRL 11
MEDIUM	
LOW	PRL 9



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

Site Background Information			
Installation:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Building 50 - Fire Station - PRL 2	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Building 50, the current Fire Station, was built in 1993 where fire rescue vehicles, equipped with aqueous film forming foam (AFFF) are stored. According to the Preliminary Assessment (PA) Report, the current storage capacity of the vehicles stored within the building is approximately 1,500 to 2,100 gallons. The floor drains within Building 50 are connected to an oil/water separator (OWS), which discharges to the sanitary sewer system. There were no known releases of AFFF within Building 50 discharges outside the current Fire House.
Brief Description of Pathways:	The majority of surface water runoff from Tucson Air National Guard Base (ANGB) discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies. The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet below ground surface (bgs). The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.
Brief Description of Receptors:	The city no longer draws water from wells in the vicinity of the Base due to the presence of trichloroethylene (TCE) contaminated groundwater associated with the Tucson International Airport Area (TIAA) Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the Arizona Department of Environmental Quality (ADEQ) and per- and polyfluoroalkyl substances (PFAS) was detected above the Lifetime Health Advisory (HA). An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.059	0.04	1.5	
PFOA	0.037	0.04	0.9	
PFBS	1.2	0.602	2.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	4.4	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.16	0.126	1.3	
PFOA	0.0019	0.126	0.0	
PFBS	0.00046	1.9	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.3	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		L	
<u>Migratory Pathway Factor</u>				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure		H	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined			
Confined	Low possibility for contamination to be present at or migrate to a point of exposure			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
<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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Bldg 35 - Fuel Cell M & C Control - PRL 3	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	<p>Building 35 was built in 1989 and was previously equipped with an AFFF fire suppression system (FSS), which has since been converted to a high expansion foam (HEF) FSS. The floor drains within Building 35 are connected to an OWS, which discharges to the sanitary sewer system. There were no known releases of AFFF within Building 35 or inadvertent discharges outside the Fuel Cell Maintenance and Corrosion Control. If a release had occurred outside the collection area of the floor drains, it could potentially have drained to the Unlined Drainage Ditch (PRL 11) and then flowed to Outfall W01.</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash, a tributary of the Santa Cruz River. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.081	0.04	2.0	
PFOA	0.036	0.04	0.9	
PFBS	0.25	0.602	0.4	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	3.3	
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		M	
<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)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
<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)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.076	0.126	0.6	
PFOA	0.0036	0.126	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	
<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			
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	
<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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	IRP Site 5, Old Wash Rack Area - PRL 4	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	<p>Located on the eastern corner of Building 33, which is now the Weapons and Release Systems Shop, the old washrack area was used from 1959 until 1985 and served vehicles from the engine shop, other aircraft maintenance shops and the Building 50 - Fire Station (PRL 2). Prior to 1980, the old washrack area discharged into the Airport Wash, a tributary of the Santa Cruz River, at the base gatehouse. From 1980 until 1985, the area was connected to an OWS, which discharged to the sanitary sewer system. The old washrack area was investigated as an IRP site, which included a PA, Remedial Investigation (RI) and Focused Feasibility Study (FS). Through the Installation Restoration Program (IRP) process, volatile organic compounds (VOC) were identified in the soil and 64 pounds of VOCs were removed by soil vapor removal.</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.13	0.04	3.2	
PFOA	0.036	0.04	0.9	
PFBS	0.031	0.602	0.1	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	4.2	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.016	0.126	0.1	
PFOA	0.00019	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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Bldg 12 - Maintenance Hangar - PRL 5	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	<p>Building 12 was built in 1991 and is the only building on base that currently has an active AFFF FSS. This maintenance hangar houses a 1,200-gallon AFFF storage tank. At the time of the January 2016 PA site visit, the floor drains within Building 12 were connected to an OWS, which discharges to the sanitary sewer system. On 19 December 2017, a leak of AFFF was observed by on base personnel to be originating from the AFFF tank located in the fire suppression room of Building 12. The AFFF entered the stormwater drains outside of the building, and then discharged through Outfall W10 into the Airport Wash.</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	2.1	0.04	52.5	
PFOA	0.051	0.04	1.3	
PFBS	0.13	0.602	0.2	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	54.0	
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		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.9	0.126	7.1	
PFOA	0.0035	0.126	0.0	
PFBS	0.00039	1.9	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	7.2	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or 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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Blg 10- Maintenance Hangar - PRL 6	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	<p>Building 10 was built in 1994 and was previously equipped with an AFFF FSS, which has since been converted to an HEF FSS. At the time of the January 2016 PA site visit, floor drains within Building 10 were connected to an OWS, which discharges to the sanitary sewer system. Upon initial installation of the former AFFF FSS, the system was tested. No further information was available for the testing release, but had any AFFF left the building, it would have drained to the stormwater drains outside of the building, and discharged through Outfall W10 into the Airport Wash.</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 6

AFFF Release Area #: AFFF 6

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.054	0.04	1.4	
PFOA	0.035	0.04	0.9	
PFBS	0.034	0.602	0.1	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.3	
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		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 6

AFFF Release Area #: AFFF 6

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.068	0.126	0.5
PFOA	0.00052	0.126	0.0
PFBS	0.00044	1.9	0.0
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
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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Former Concrete Ramp - PRL 7	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	<p>Located near Building 10 (PRL 6) and Building 12 (PRL 5), typical operations at the Former Concrete Ramp, such as parking, fueling or minor maintenance of aircraft, may have resulted in the periodic release of AFFF to the concrete, which would runoff to the grassy areas near the ramp, and then on to Outfalls W10, W13, and W14 into the Airport Wash. In addition, base personnel specifically recalled AFFF application for fuel spills and also during a civilian aircraft crash in the southeast portion of the ramp</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.12	0.04	3.0	
PFOA	0.041	0.04	1.0	
PFBS	2.8	0.602	4.7	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	8.7	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.066	0.126	0.5	
PFOA	0.00056	0.126	0.0	
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	
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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Current Concrete Ramp - PRL 8	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Similar to the Former Concrete Ramp (PRL 7), located near Buildings 10 (PRL 6) and 12 (PRL 5), typical operations within the Current Concrete Ramp, such as parking, fueling or minor maintenance of aircraft, may have resulted in the periodic release of AFFF to the concrete. The runoff from this area would flow to the grassy areas near the ramp, and then on to Outfall W14 into the Airport Wash.
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.14	0.04	3.5	
PFOA	0.046	0.04	1.2	
PFBS	0.34	0.602	0.6	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	5.2	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.13	0.126	1.0	
PFOA	0.00032	0.126	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.0	
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			
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).			
Soil Category			LOW	

Site Background Information			
Installation:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Soil
Site Name and ID:	Former Nozzle Testing Area - PRL 9	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	<p>This former Nozzle Testing Area (NTA), currently a paved parking lot, was historically used for testing fire equipment containing AFFF. The dates of the tests and the quantities released are unknown. After testing activities, the AFFF would be sprayed down with water to wash out into the storm drains. The runoff from this area would flow to Outfall W01 into the Airport Wash. PRL 9 is located in between PRLs 2 and 3.</p>
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 9

AFFF Release Area #: AFFF 9

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.015	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			
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:	Morris ANGB (Tucson)	Date:	9/22/2021
Location (State):	Arizona	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Unlined Drainage Ditch - PRL 11	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Matt Voorhees	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Stormwater runoff from the southern portion of the Current Concrete Ramp (PRL 8), the Former NTA (PRL 9) and Building 35 – Fuel Cell Maintenance and Corrosion Control (PRL 3) all flows through this ditch, which is typically dry.
Brief Description of Pathways:	<p>The majority of surface water runoff from Tucson ANGB discharges to the facility-wide stormwater drainage system, which is comprised of manmade drainage ditches and storm drainage culverts, and ultimately discharges to Airport Wash. Some storm runoff flows into a grate inlet at the wash rack and is discharged to an OWS and then to the sanitary sewer system. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies.</p> <p>The aquifer system in the Tucson area is composed of alluvial sediments. The aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. The upper aquifer consists of sands, sandy clays, and clayey sands that extend to a depth of 140 feet bgs. The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet bgs to an unknown depth. Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet per mile. The soil on the Base is the Sahuarita-Mohave and Cave complex, which are deep and well-drained soils composed of gravelly sandy loam.</p>
Brief Description of Receptors:	<p>The city no longer draws water from wells in the vicinity of the Base due to the presence of TCE contaminated groundwater associated with the TIAA Superfund Site. Several wells outside of the Tucson area are private and according to the PA several residents have refused to stop using their wells despite the low levels of TCE. Much of the groundwater is extracted by the TIAA groundwater extraction system downgradient of the site. Multiple private (previously unidentified) drinking water wells have been identified down gradient of the Base. Nine of these wells were sampled by the ADEQ and PFAS was detected above the Lifetime HA. An alternate drinking water supply has been provided to the affected residents. Much of the installation is paved with very little exposed soil. Humans may be exposed to surface and sub - surface soils during routine activities or during construction and excavation activities. The site is secured with fencing and is adjacent to the TIAA site.</p>

Groundwater Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 11

AFFF Release Area #: AFFF 11

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.75	0.04	18.8	
PFOA	0.26	0.04	6.5	
PFBS	0.27	0.602	0.4	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	25.7	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		H	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined			
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		H	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)			
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)			
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H	
Groundwater Category			HIGH	

Soil Worksheet

Installation: Morris ANGB (Tucson)

Site ID: PRL 11

AFFF Release Area #: AFFF 11

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0013	0.126	0.0
PFOA	0.0057	0.126	0.0
PFBS	0.00051	1.9	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		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