

**PRELIMINARY ASSESSMENT OF PER- AND  
POLYFLUOROALKYL SUBSTANCES AT THE  
U.S. ARMY RESERVE CENTER,  
RIO VISTA, CALIFORNIA**

*Prepared for:*



**U.S. ARMY**

**ODCS, G-9, ISE BRAC**

**Final  
September 2023**

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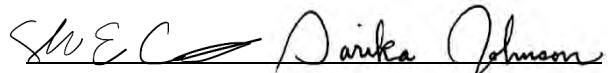
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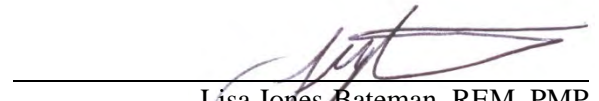
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**Contract Number W912DR-18-D-0003  
Delivery Order Number W912DR21F0140**

  
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**Final  
September 2023**

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## LIST OF ACRONYMS AND ABBREVIATIONS

AFFF	Aqueous Film-Forming Foam
amsl	Above Mean Sea Level
AOPI	Area of Potential Interest
Army	U.S. Army
AST	Aboveground Storage Tank
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNRA	California Natural Resources Agency
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
EBS	Environmental Baseline Survey
EDR	Environmental Data Resources, Inc.
GAMA-PBP	Groundwater Ambient Monitoring and Assessment Priority Basin Project
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid (aka GenX)
HQ	Hazard Quotient
IPaC	Information for Planning and Consultation
LHA	Lifetime Health Advisory
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NMFS	National Marine Fisheries Service
OSA	Open Storage Area
OSD	Office of the Assistant Secretary of Defense
OWS	Oil/Water Separator
PA	Preliminary Assessment
PAL	Project Action Limit
P.E.	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonate
PFHpA	Perfluoroheptanoic Acid
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMP	Project Management Professional
POL	Petroleum, Oils, and Lubricants
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
REM	Registered Environmental Manager
RfD	Reference Dose
RI	Remedial Investigation
RSL	Regional Screening Level
SDWA	Safe Drinking Water Act
SI	Site Inspection
T&E	Threatened and Endangered
U.S.C.	United States Code
UCMR3	Third Unregulated Contaminant Monitoring Rule
USACE	U.S. Army Corps of Engineers

## **LIST OF ACRONYMS AND ABBREVIATIONS (Continued)**

USARC	U.S. Army Reserve Center
USCG	U.S. Coast Guard
USED	U.S. Engineers Dockyard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
WWTP	Wastewater Treatment Plant

## EXECUTIVE SUMMARY

The objective of a Preliminary Assessment (PA) is to identify areas of potential interest (AOPIs) based on whether use, storage, or disposal of potential per- and polyfluoroalkyl substances (PFAS)-containing materials, including aqueous film-forming foam (AFFF), occurred in accordance with the 2018 U.S. Army (Army) *Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). A PA for PFAS-containing materials with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt (“GenX” chemicals) was completed for the Base Realignment and Closure (BRAC) property at the U.S. Army Reserve Center (USARC) Rio Vista, to assess potential PFAS release areas and exposure pathways. The entire USARC Rio Vista facility was selected for closure under BRAC, and all property (approximately 28.2 acres) has been conveyed to the city of Rio Vista. The completion of this PA included the execution of the following tasks:

- Conducted a kickoff meeting with the BRAC Office and the U.S. Army Corps of Engineers (USACE) on February 1, 2023, to present all parties’ preliminary knowledge of USARC Rio Vista and provide information to guide the PA and site visit.
- Reviewed available records (e.g., aerial photography, historical maps, technical reports, previous studies, investigations) from online sources (i.e., Internet-based searches), environmental investigations and/or regulatory programs (e.g., the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]), and internal Army documents from the Administrative Record. In addition, an Environmental Data Resources, Inc. (EDR) Report for USARC Rio Vista and any listed sites within an up to 2-mile search distance was conducted.
- Conducted a 1-day site visit on February 16, 2023, to identify potential sources of PFAS.
- Interviewed individuals with historical and present-day knowledge of operations on the BRAC property.
- Evaluated potential PFAS source areas.

In conducting the PA of the BRAC property at USARC Rio Vista, 21 areas were identified as potential PFAS sources (e.g., fire incidents, wash areas, ship/vehicle maintenance, landfills/disposal areas, hazardous storage areas). Site research conducted for this PA does not indicate that PFAS-containing materials were used, stored, and/or disposed of at any of the potential PFAS source areas. The findings of this PA do not warrant further evaluation of USARC Rio Vista in a PFAS Site Inspection (SI).

# 1. INTRODUCTION

The Army conducted this Preliminary Assessment (PA) to investigate the potential presence of per- and polyfluoroalkyl substances (PFAS) at the former U.S. Army Reserve Center (USARC) Rio Vista in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601 et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2701 et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] Part 300); and guidance documents developed by the U.S. Environmental Protection Agency (USEPA) and the Department of the Army. USARC Rio Vista is not on the National Priorities List, and the U.S. Army (Army) is responsible for compliance with CERCLA in accordance with Executive Order 12580, as amended.

The purpose of this PFAS PA is to identify locations that are areas of potential interest (AOPIs) on USARC Rio Vista based on the use, storage, and/or disposal of potential PFAS-containing materials, in accordance with the *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). The PA was conducted in general accordance with 40 CFR §300.420(b), the USEPA *Guidance for Performing Preliminary Assessments Under CERCLA* (USEPA 1991), and the *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). This report presents findings from research conducted to assess past use of materials containing PFAS and identify areas where these materials were stored, handled, used, or disposed of at the former USARC Rio Vista.

The entire former USARC Rio Vista property was evaluated and will be herein referred to as USARC Rio Vista. USARC Rio Vista is located in Rio Vista, Solano County, California, as shown in Figure 1-1.

## 1.1 PFAS BACKGROUND INFORMATION

PFAS are a group of synthetic compounds that have been manufactured and used extensively worldwide since the 1950s for a variety of purposes. PFAS are stable, man-made fluorinated organic chemicals that repel oil, grease, and water. Common industrial uses of PFAS include paints, varnishes, sealants, hydraulic fluid, surfactants, and firefighting foams. PFAS include both per- and polyfluorinated compounds. Perfluorinated compounds, such as perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA or Gen X) are a subset of PFAS with completely fluorinated carbon chains, while polyfluorinated compounds have at least one carbon chain atom that is not fully fluorinated. These six PFAS together, and for the purposes of this PA, are referred to in this report as “Target PFAS.”

USARC Rio Vista was evaluated for all potential use, storage, and/or disposal of PFAS-containing materials. A variety of PFAS-containing materials are used in relation to current and historical Army operations. However, the use, storage, and/or disposal of aqueous film-forming foam (AFFF) is the most common potential source of PFAS at U.S. Department of Defense (DoD) facilities. As such, this section is organized to summarize the AFFF-related sources followed by the remaining potential PFAS-containing materials. AFFF was used as a firefighting agent to suppress petroleum hydrocarbon fires and vapors. Firefighting foams like AFFF were developed in the 1960s (ITRC 2020a), but AFFF did not see widespread DoD use until the early 1970s. Older fire training facilities often were unlined and not constructed to prevent infiltration of firefighting foams and combustion products leaching into the subsurface. Large quantities of AFFF may have been released into the environment as a result of fire training exercises, fire responses, fire suppression system activations, and tank and pipeline leaks/spills.

Other potential PFAS sources considered include installation storage warehouses, pesticide use, automobile maintenance shops, photographic processing facilities, laundry/waterproofing facilities, car washes, stormwater or sanitary sewer components, and biosolid application areas.



Many PFAS are highly soluble in water and have low volatility due to their ionic nature. The specific gravity/relative density for PFOS and PFOA is 1.8 (ITRC 2020b). Long-chain perfluorinated compounds have low vapor pressure and are expected to persist in aquatic environments. These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable, and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis. The structure of these compounds increases their resistance to degradation; the carbon-fluorine bond is one of the strongest in nature, and the fluorine atoms shield the carbon backbone.

When PFAS are released to the environment, they can readily migrate into soil, groundwater, surface water, and sediment. Once in the environment, the compounds are persistent and may continue to migrate through airborne transport, surface water, groundwater, and/or biologic uptake. The amount of PFAS entering the environment depends on the type and amount of the PFAS material that may have been released, where and when it was used, the type of soil, and other factors. If private or public wells are located nearby, they potentially could be affected by PFAS. Similarly, surface water features may be impacted and may convey PFAS to downgradient receptors.

Of the thousands of PFAS, some are considered precursor compounds (typically polyfluoroalkyl substances). Precursor compounds can abiotically or biotically transform into PFOS and PFOA. PFOS and PFOA are referred to as terminal PFAS, meaning no further degradation products will form from them (ITRC 2020c).

## **1.2 PURPOSE AND OBJECTIVES**

The purpose of a PA under the NCP is to 1) eliminate from further consideration those sites that pose no threat to public health or the environment; 2) determine if any potential need for removal action exists; 3) set priorities for Site Inspections (SIs); and 4) gather existing data to facilitate evaluation for the release pursuant to the Hazard Ranking System, if warranted, as noted in 40 CFR §300.420(b)(1).

The primary objective of the PA is to identify and evaluate locations at USARC Rio Vista where PFAS-containing materials were used, stored, or disposed of, resulting in a potential release of PFAS to the environment, and conduct an initial assessment of possible migration pathways of potential contamination.

## **1.3 PFAS REGULATORY OVERVIEW AND SCREENING CRITERIA**

In May 2016, USEPA issued lifetime health advisories (LHAs) for PFOA and PFOS under the Safe Drinking Water Act (SDWA). To provide Americans, including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOS and PFOA in drinking water, USEPA established a health advisory (HA) level for PFOS and PFOA (individually or combined) of 70 ng/L (USEPA 2016).

In October 2019, the Office of the Assistant Secretary of Defense (OSD) issued guidance on investigating PFOS, PFOA, and PFBS at DoD restoration sites. The OSD guidance provided risk screening levels for PFOS, PFOA, and PFBS in groundwater, tap water, and soil, based on the USEPA regional screening level (RSL)\_calculator for residential and industrial reuse and using the oral reference dose of 2E-05 mg/kg-day. These screening levels are used during an SI to determine if further investigation in a Remedial Investigation (RI) is warranted.

In April 2021, USEPA issued an updated toxicity assessment for PFBS. USEPA developed chronic (0.0003 mg/kg-day) and subchronic (0.001 mg/kg-day) oral reference doses (RfDs) for PFBS as part of USEPA's toxicity assessment. The RSL for PFBS was previously calculated using the RfD of 0.02 mg/kg-day. New toxicity values resulted in revisions to the RSLs for PFBS in May 2021 (USEPA 2021).

In September 2021, OSD issued a revision to Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (DoD 2021). The revised memorandum accounts for the updated PFBS screening levels attributable to USEPA's reassessment of PFBS toxicity in 2021. Based on USEPA

research, the RSLs for PFOS and PFOA are calculated using an RfD of 2E-05 mg/kg-day. The RSL for PFBS is calculated using an RfD of 3E-04 mg/kg-day. When multiple PFAS are encountered at a site, a 0.1 factor is applied to the screening level when it is based on noncarcinogenic endpoints.

In May 2022, based on continued evaluation of Target PFAS by the Agency for Toxic Substances and Disease Registry and the USEPA Office of Water, USEPA provided new screening levels for PFOA, PFOS, PFNA, PFHxS, and HFPO-DA.

In July 2022, OSD issued a policy memorandum adopting these new screening levels to be used during the SI phase to determine whether further investigation in an RI is warranted. The screening levels for Target PFAS are listed in Table 1-1. This revised guidance is in effect as of July 2022 and is applicable to investigating PFOS, PFOA, PFBS, PFNA, PFHxS, and HFPO-DA at DoD restoration sites, including Base Realignment and Closure (BRAC) sites (DoD 2022). Currently, no legally enforceable Federal standards exist for PFAS in groundwater, surface water, soil, or sediment.

**Table 1-1. Project Action Limits from the 2022 OSD Memorandum**

<b>Chemical</b>	<b>Residential Tap Water HQ = 0.1 (ng/L or ppt)</b>	<b>Residential Soil HQ = 0.1 (µg/kg or ppb)</b>
HFPO-DA (GenX)	6	23
PFBS	601	1,900
PFHxS	39	130
PFNA	6	19
PFOA	6	19
PFOS	4	13

Note: The Residential Tap Water PALs are used to evaluate groundwater and surface water data. The Residential Soil PALs are used to evaluate soil and sediment data.

The Army’s strategy is to continue to assess and investigate potential releases and implement necessary response actions in accordance with CERCLA to ensure that no human health-based exposures are above the CERCLA risk-based values in drinking water. Therefore, sites where human exposure to contaminated drinking water exists will be addressed first and as quickly as possible to eliminate the exposure, and then other sites will be subsequently prioritized and sequenced to conduct the investigations and response actions necessary to characterize and, if necessary, remediate the source of PFAS contamination (U.S. Army 2018).

#### **1.4 PA METHODOLOGY**

The PA for USARC Rio Vista included a site visit, aerial photographic analysis, records review, and interviews that were conducted in accordance with the methods detailed in the Programmatic PA Work Plan (Leidos 2021). The Programmatic PA Work Plan outlines the approach and methodology for conducting the PFAS PA. As detailed in the Programmatic PA Work Plan, the PA activities focused on ascertaining and documenting the following information regarding PFAS history and use, storage, or disposal at USARC Rio Vista:

- On-post fire training activities
- Use of PFAS-based AFFF in fire suppression systems or other systems
- AFFF stored, used, and/or disposed of at buildings and crash sites (fire suppression/response)
- Activities or use of materials that are likely to contain PFAS, such as metal plating operations
- Wastewater treatment plants (WWTPs) and landfills that may have received PFAS-containing materials
- Studies conducted to assess environmental impacts at the facility
- Potential PFAS use at parcels post transfer
- Potential off-post sources that may impact USARC Rio Vista.

The data gathered during PA activities are summarized in Section 3.

## 1.5 REPORT ORGANIZATION

The contents of this PA Report are summarized below:

- **Section 2. Site Background**—This section presents site-specific information related to operational history and discusses the environmental setting. Demographics, land use, topography, geology, hydrogeology, hydrology, groundwater, potable wells, ecological receptors, and climate are described.
- **Section 3. PA Analysis**—This section provides observations and results from the PA site visit, aerial photographic analysis, records review, and interviews.
- **Section 4. Summary of PA Data**—This section provides an overview of the data collected during the PA for the different potential PFAS sources.
- **Sections 5. Summary of PA Results**—This section synthesizes the data gathered during the PA activities and determines whether each area evaluated during the PA is an AOPI or was not retained as an AOPI.
- **Section 6. Conclusions**—This section presents conclusions of the PA.
- **Section 7. References**—This section lists the references that were used in the preparation of this report.
- **Appendices**—Appendices A through F include data from field activities or related assessments:
  - Appendix A. Final Installation Kickoff Meeting Minutes
  - Appendix B. Sources/Documents Reviewed During PA
  - Appendix C. Aerial Photographs
  - Appendix D. Site Visit Photographs
  - Appendix E. Interview Notes
  - Appendix F. Environmental Data Resources, Inc. (EDR) Report.

## **2. SITE BACKGROUND**

### **2.1 SITE LOCATION**

USARC Rio Vista is located on the west bank of the Sacramento River in the city of Rio Vista, Solano County, California, approximately 48 miles southwest of Sacramento and 65 miles northeast of San Francisco. USARC Rio Vista is bounded by the Delta Marina Yacht Harbor Resort to the north, the U.S. Coast Guard (USCG) Station Rio Vista to the south, the Sacramento River to the east, agricultural land to the west, a single-family home across Beach Drive near the northwestern corner of the property, and two single family homes across Beach Drive near the southwestern corner. Figure 2-1 depicts the USARC Rio Vista site features.

### **2.2 SITE OPERATIONAL HISTORY**

USARC Rio Vista is a former shallow-draft river and harbor craft maintenance, repair, and storage facility that encompassed approximately 28.2 acres at the time of closure (CRV 2010). The installation was activated in 1911 by the U.S. Army Corps of Engineers (USACE) as the U.S. Engineers Dockyard (USED) with a mission to support the work of USACE in dredging, clearing, and surveying the Sacramento River. USACE initially developed the 32-acre site with mooring grounds, a storehouse, and a wharf and by 1929, USED had erected at least seven buildings, marine ways, a wharf, and a derrick. The facility was used for marine storage, engine and hull repair, motor launches, barge mooring, and surface maintenance of steel pontoons used for floating suction dredges. The facility was also used as winter headquarters for floating equipment used on the Sacramento, San Joaquin, and Mokelumne Rivers (CRV 2010).

By the start of World War II, the Sacramento River Flood Control Project was essentially complete, and the facility was used for the maintenance and preservation treatment of harbor craft. In October 1952, USED was declared inactive, and the following month, the property was placed in active Army status with a redesignation of the Rio Vista Transportation Corps Marine Depot. The site was used to store and maintain harbor craft, small freighters, tugs, barges, and floating cranes, some of which served in the Korean War and likely the Vietnam War. At the height of operations in the late 1950s, the facility stored more than 350 vessels, employed nearly 300 civilians, and was contributing substantially to the local economy. In 1964, approximately 4.2 acres were transferred to USCG to establish USCG Station Rio Vista. Until 1974, activities conducted at USARC Rio Vista included water, fuel, and debris removal from vessels going into wet/dry storage; propeller and rudder maintenance; painting; and the installation and testing of navigation and electronic equipment. In 1974, the facility was reassigned to the Presidio of San Francisco, and the primary mission shifted to logistics-over-the-shore training. From 1974 through 1989, the facility was used for the training of Army reserve units for amphibious assaults, ship maintenance, and deck hand instruction. By 1980, the facility was redesignated as USARC Rio Vista and was typically only used for weekend training (CRV 2010, CTC 2002, U.S. Army 2002).

In 1989, USARC Rio Vista was deactivated and became a sub-installation of Fort Lewis, Washington in 1993 when it accepted real property accountability for the site from The Presidio of San Francisco. Since deactivation in 1989, the property has seen limited use by reserve units, and the only other notable military activity was a one-time training exercise held by the U.S. Marines in 1996. The 1995 BRAC Commission recommended USARC Rio Vista for closure. Until the 2003 property transfer, the only activity was Army caretaker operations consisting of mowing the grassy open areas of the property every 2 months (CRV 2010, CTC 2002, U.S. Army 2002, USACE 2000).

### **2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE**

USARC Rio Vista is located along the southern city limits within the city of Rio Vista. The city of Rio Vista occupies approximately 7.1 square miles and has an estimated 2022 population of 10,500 (CRV 2023). It

is part of Solano County, which had an estimated 2022 population of 448,747 (U.S. Census Bureau 2023). The smaller Solano County cities of Suisun and Dixon are approximately 16 and 21 miles from the USARC, respectively. Land use in the city of Rio Vista includes the developed central “downtown” area along the river, the Rio Vista Municipal Airport and industrial areas to the north, and residential areas to the west. These areas are separated by swathes of agricultural/vacant land. Land use immediately surrounding the USARC includes a USCG search and rescue facility to the south; residential and agricultural areas to the northwest, west, and southwest; a marina to the north; and the Sacramento River to the east. In addition, the city of Rio Vista Beach WWTP is located to the south of the USCG station (CRV 2010).

The USARC was formally closed in 1995 by the BRAC Act. The Army conducted several site investigations and removal actions between 1996 and 2001. An Environmental Baseline Survey (EBS) completed in 1997 identified potential sites of contamination requiring further investigation (Woodward-Clyde 1997). Environmental investigations and remedial activities were conducted, including a comprehensive S I, an R I a Supplemental RI, and removal actions (CH2M 2002). Following joint planning by the city of Rio Vista and the Army, demolition and stabilization of buildings and facilities on the site, and removal of contamination to acceptable concentrations for reuse, the land was conveyed to the city of Rio Vista in 2003 via a quitclaim deed. The conveyance of land to the city of Rio Vista was authorized subject to the condition that the property be used for recreational purposes, which also allows limited commercial activities that support recreational uses, such as campgrounds, lodging, restaurants, and small retail shops (CRV 2010, U.S. Army 2003).

The USARC property has remained unused and abandoned following the transfer to the city of Rio Vista. The remaining former military facilities consist of approximately 24 buildings and other structures in varying states of disrepair. Access to the property is restricted by a perimeter fence with a locked gate in the northwestern corner (CRV 2010). An approximately 3-acre grassy area near the western perimeter of the property, formerly an Open Storage Area (OSA), is leased by Lindsay Transportation for use as a highway barrier storage location (CRV 2022b), and the local Rio Vista fire department has conducted live fire training activities at an undisclosed location on the property post-transfer. Proposed land use has included redevelopment into a multi-purpose community center, an estuarine research center, outdoor athletic areas, and camping facilities. However, a lack of funding and public support has resulted in no redevelopment activities to date (CRV 2010, CRV 2022b). Figure 2-2 presents the property use and transfer details since the USARC Rio Vista BRAC property was transferred to the city of Rio Vista in 2003.

## **2.4 TOPOGRAPHY**

USARC Rio Vista is located within the Sacramento-San Joaquin Delta Basin, on the western bank of the Sacramento River, south of Cache Slough and approximately 10 miles upstream of the San Joaquin River and Suisun Bay. The Montezuma Hills lie west of the USARC, where a fault scarp extends approximately 2.5 miles parallel to the Sacramento River. The estimated height of the scarp was 100 feet before the placement of dredge fill (CRV 2010).

Topography at USARC Rio Vista is characterized by two distinct terraces separated by a slight bluff. The two terraces include a flat lower terrace along the river at an average elevation of approximately 18 feet above mean sea level (amsl) and an upper terrace at an average elevation of approximately 33 feet amsl (U.S. Geological Survey National Geospatial Dataset, as depicted in Figure 2-1). Most of the existing structures on the property are clustered on the lower terrace along the central waterfront portion of the property (CRV 2010).

## **2.5 GEOLOGY**

The dominant geologic feature relevant to USARC Rio Vista is the Great Valley (Central Valley), a northwest to southeast trending depression formed by a fold in the earth’s crust containing up to 10 miles of sediment. It extends from near Red Bluff in the north to Bakersfield in the south. The Central Valley is

interrupted by two east-west trending ridges, the Stockton Arch and the Bakersfield Arch, associated with the Stockton and White Wolf faults, respectively. The Sacramento Valley sedimentary basin is to the north of the Stockton Arch. USARC Rio Vista is located on the eastern flank of the Montezuma Hills and the western bank of the Sacramento River and on the western side of the Central Valley. Sediments in the Sacramento Valley area range in age from Jurassic to Holocene and are of both continental and marine origin. Pre-Tertiary marine rocks crop out in the western portion of the Central Valley, and post-Eocene continental rocks and deposits also are found in this area and throughout the Central Valley (CRV 2010, USACE 2000).

Most of the USARC Rio Vista property is underlain by Quaternary intertidal deposits of peaty mud associated with the Sacramento River. Moving toward the western boundary of the property, the low-lying rounded Montezuma Hills begin and extend approximately 10 miles westward. The Montezuma Hills are composed of quaternary sediments of poorly stratified, slightly consolidated deposits of gravels, sands, and clays known as the Montezuma Formation. These deposits extend to approximately 2,000 feet below ground surface (bgs) to pre-Tertiary to Eocene continental and marine rocks and deposits (CRV 2010, Graymer et al. 2002, Horizon 2017, USACE 2000).

The surface soils at USARC Rio Vista are dredge spoils from the Sacramento River and are primarily composed of fine-grained and silty sands that directly underlie the USARC. Soils from the surface to groundwater interface are generally brown, yellowish brown, or olive brown silty sands. Soil below the water table ranges from very dark gray silty sands to greenish black plastic organic clays. The Montezuma formation, typically composed of river sands, sandy silt, clayey sand, and sandy gravel, likely lies under the dredge fill material. Bedrock was not encountered at depths of 35 feet or less during previous environmental investigations (Arcadis 2001a, Arcadis 2002).

## **2.6 HYDROGEOLOGY**

USARC Rio Vista is located on the eastern portion of the Solano subbasin within the Sacramento Valley Groundwater Basin. The subbasin is bounded by the Putah Creek on the north, the Sacramento River on the east, the English Hills and Montezuma Hills on the west, the north Mokelumne River on the southeast, and the San Joaquin River on the south. The approximate surface area of the subbasin is 425,000 acres. Water-bearing units in the Solano subbasin include sedimentary continental deposits, younger and older alluvium, and the Tehama Formation (DWR 2004). The groundwater under the site is topographically controlled and flows northeast to the Sacramento River. The groundwater table in the dredge fill covering the site is variable and dependent on proximity to the Sacramento River. At USARC Rio Vista, groundwater elevations ranged from 3.17 feet amsl near the northeastern corner of the property to 22.09 feet amsl at the southwestern corner of the site. The observed site-wide groundwater flow has been generally to the northeast with an average gradient of 0.01 foot/foot (Arcadis 2002).

## **2.7 SURFACE WATER HYDROLOGY**

Surface waters in the vicinity of USARC Rio Vista include the Sacramento River, Cache Slough, Steamboat Slough, Marina Creek, and Three-mile Slough. The Sacramento River is the largest and closest surface water to the property, immediately adjacent to the east. The Sacramento River is tidally influenced in this area, with a mixed semi-diurnal tidal cycle (two high and two low tides of unequal height each lunar day) (Horizon 2017). From 1978 to 1997, the historical mean and diurnal tidal ranges at the Rio Vista monitoring station, which was located near the northern end of the USCG Station and removed in March 1997, were 3.02 and 4.08 feet, respectively (NOAA 2023).

The USARC property has no existing municipal storm drainage system. Stormwater runoff is absorbed into the soil, collected in catch basins, and discharged to the river, or flows to the river by overland flow. Ten catch basins and approximately 650 feet of storm sewers drain to the Sacramento River via outfall

pipes remaining on the property from the previous military use. The existing drainage system was determined to be inadequate for use in future development (CRV 2010).

## 2.8 WATER USAGE

The USARC Rio Vista property currently has no usable water supply infrastructure. Historically, potable water was obtained via an on-post private supply well that pumped water into a 20,000-gallon aboveground holding tank. The water was treated with chlorine and then distributed to USARC facilities by underground water mains (Woodward-Clyde 1997). The submersible pump was removed from the water supply in March 2000, and the well is no longer used to supply potable water (CH2M 2002). In addition, a pumphouse was used to pump non-potable water from the Sacramento River to feed into the fire flow pipelines that led to nine fire hydrants (CH2M 2002, CRV 2010). The existing water supply infrastructure has not been used since base closure and has been determined to be inadequate to serve new development (CRV 2010).

The city of Rio Vista uses groundwater exclusively for its municipal water supply. The city's municipal water system consists of six wells tapping into a deep aquifer, two 2-million-gallon water storage facilities, and a system of pumps and distribution pipes. The city has no central water treatment facility, and treatment instead occurs at the well head using sodium hypochlorite (CRV 2022a, CRVCDD 2002). The groundwater is sourced from the shallow Putah Fan aquifer, and the groundwater conditions in Solano County appear to be stable (SCWA 2021).

Figure 2-3 depicts the water wells within 4 miles of USARC Rio Vista. A search of the online California Natural Resources Agency (CNRA) Well Completion Report database (<https://gis.data.cnra.ca.gov/datasets/DWR::i07-wellcompletionreports/>) resulted in 75 domestic water wells located within 4 miles of the installation boundary. Additional water wells located within 4 miles of USARC Rio Vista include 232 monitoring wells and 766 unclassified water wells.

## 2.9 ECOLOGICAL PROFILE

USARC Rio Vista is located on approximately 28.2 acres of primarily developed or disturbed habitat. The majority of the property contains open areas, some of which are used for storage and testing of highway barrier systems or vacant fields. Several unused, deteriorating buildings (e.g., ship repair shop, storage, barracks) or foundations of former buildings and boat docks are present on the eastern portion of the site.

USARC Rio Vista is located along the Sacramento River and contains approximately 1,100 linear feet of riparian habitat/shoreline. Emergent fringe wetlands are present along both sides of the boat ramp, and riparian and aquatic habitat areas are present along the shoreline within and adjacent to the Sacramento River (Horizon 2017). Wetlands are not present throughout the remainder of the site (NWI 2023). The Delta tulle pea (*Lathyrus jepsonii* var. *jepsonii*), a Federal species of concern also considered rare and endangered in California by the California Native Plant Society, is documented as present within the wetland/riparian habitat of USARC Rio Vista.

Vegetation in the disturbed/developed areas is primarily herbaceous, non-native grasses and forbs, such as rip-gut brome (*Bromus diandrus*), wild oat (*Avena fatua*), Bermuda grass (*Cynodon dactylon*), rose clover (*Trifolium hirtum*), common groundsel (*Senecio vulgaris*), and broadleaf filaree (*Erodium botrys*). Yellow star-thistle (*Centaurea solstitialis*), an invasive species that grows in disturbed areas, is abundant in some portions of USARC Rio Vista. Disturbed habitat at USARC Rio Vista supports few native grasses and forbs. Native forbs in this habitat include species that are adapted to disturbance, such as telegraph weed (*Heterotheca grandiflora*), Spanish clover (*Acmispon americanus* var. *americanus*), and salt heliotrope (*Heliotropium curassavicum* var. *oculatum*). A small patch of creeping wild rye (*Leymus triticoides*), a native grass, is also present at USARC Rio Vista. This habitat also consists of some barren or graveled areas (Horizon 2017). Numerous sheoaks (*Casuarina* sp.) and other ornamental shrubs and trees are interspersed throughout the upland areas but are more common adjacent to the abandoned buildings and structures on the eastern portion of USARC Rio Vista. A narrow band (less than 50 feet in width) of riparian

woodland occurs along the banks of the Sacramento River. The dominant tree layer of this woodland is White alder (*Alnus rhombifolia*) (Horizon 2017).

The developed areas at USARC Rio Vista provide little habitat value to most wildlife species; wildlife on the property is typically composed of common species that are adapted to urban settings. Rock pigeon (*Columba livia*), western scrub jay (*Aphelocoma californica*), American crow (*Corvus brachyrhynchos*), mourning dove (*Zenaidura macroura*), cliff swallows (*Petrochelidon pyrrhonota*) and barn swallows (*Hirundo rustica*), gull (*Larus* sp.), southern alligator lizard (*Elgaria multicarinata*), California ground squirrel (*Otospermophilus beecheyi*), and black-tailed jackrabbit (*Lepus californicus*) were observed at USARC Rio Vista during reconnaissance-level surveys conducted in September 2014 (Horizon 2017). Other birds that have been observed on-post include barn owl (*Tyto alba*), northern mockingbird (*Mimus polyglottos*), european starling (*Sturnus vulgaris*), western meadowlark (*Sturnella neglecta*), belted kingfisher (*Megaceryle alcyon*), western bluebird (*Sialia mexicana*), American kestrel (*Falco sparverius*), osprey (*Pandion haliaetus*), and northern harrier (*Circus cyaneus*) (USACE 2000). Other mammals observed at USARC Rio Vista include western brush rabbit (*Sylvilagus bachmani*), house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), pocket gopher (*Thomomys bottae*), and squirrel (*Citellus spp.*) (USACE 2000). A bat habitat assessment and survey of abandoned buildings indicated past or present use of bats in seven abandoned buildings on-post, including two active maternity colonies of Brazilian free-tailed bats (*Tadarida brasiliensis*) (Horizon 2017).

The U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System Information for Planning and Consultation (IPaC) tool identifies 10 federally listed (1 bird, 1 reptile, 2 amphibians, 2 fish, 1 insect, and 3 crustaceans) threatened and endangered (T&E) species as potentially occurring (i.e., known or expected to be on or near) at USARC Rio Vista (USFWS 2023). The federally listed T&E species include species such as the California clapper rail (*Rallus longirostris obsoletus*), giant garter snake (*Thamnophis gigas*), California red-legged frog (*Rana draytonii*), and delta smelt (*Hypomesus transpacificus*). One candidate species, the monarch butterfly (*Danaus plexippus*), was identified by IPaC as potentially occurring at USARC Rio Vista (USFWS 2023). The potential for these T&E and candidate species to occur does not mean the species are present at USARC Rio Vista. For example, blue elderberry, the host plant for the federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), is not present at USARC Rio Vista and the beetle is not likely on-post. No known or expected federally listed T&E species occur on the terrestrial portion of USARC Rio Vista (Horizon 2017). The delta smelt is known to occur in the vicinity of USARC Rio Vista and may potentially be present in the aquatic habitat associated with the Sacramento River.

Ten migratory birds of particular concern are identified by the IPaC tool as potentially occurring on USARC Rio Vista. These birds include species such as the Bullock's oriole (*Icterus bullockii*), golden eagle (*Aquila chrysaetos*), Nuttall's woodpecker (*Picoides nuttalli*), and short-billed dowitcher (*Limnodromus grieseus*) (USFWS 2023).

USARC Rio Vista is not critical habitat for any species. However, the portion of the Sacramento River adjacent to USARC Rio Vista has been identified by USFWS as critical habitat for Delta smelt (*Hypomesus transpacificus*) (USFWS 2023) and has been proposed as critical habitat for Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*). In addition, in 2009, the National Marine Fisheries Service (NMFS) designated the Sacramento River as critical habitat for the Southern Distinct population of North American Green Sturgeon (*Acipenser medirostris*) (Horizon 2017).

Marine species under the protection of the NMFS and federally listed T&E species (e.g., humpback whales [*Megaptera novaeangliae*], winter-run, spring-run, fall- and late-fall-run chinook salmon [*Oncorhynchus tshawytscha*], Central Valley steelhead [*O. mykiss*], and green sturgeon [*Acipenser medirostris*]) may be present in the adjacent Sacramento River for migration, spawning, or when disoriented during migration (Horizon 2017).



## 2.10 CLIMATE

Hot dry summers and mild rainy winters characterize the Mediterranean climate of the Sacramento Valley. During the year, the temperature may range from 20 to 115 degrees Fahrenheit with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is approximately 20 inches, and the rainy season generally occurs from November through March (Weatherspark 2023). The prevailing winds are moderate in strength and vary from moist clean breezes from the south to dry land flows from the north. The Sacramento Valley is bounded by the North Coast Ranges on the west and the Sierra Nevada on the east. The intervening terrain is relatively flat. The mountains surrounding the Sacramento Valley basin create a barrier to airflow, which can trap air pollutants under certain meteorological conditions. The highest frequency of air stagnation occurs in the autumn and early winter when large high-pressure cells collect over the Sacramento Valley. The lack of surface wind during these periods and the reduced vertical flow caused by less surface heating reduces the influx of outside air and allows air pollutants to become concentrated in a stable volume of air. The surface concentrations of pollutants are highest when these conditions are combined with temperature inversions that trap pollutants near the ground (CRV 2010).

### 3. PA ANALYSIS

The primary components of the PA are records reviews, analysis of aerial photographs, a site visit, and interviews. The following sections summarize the methods used and activities conducted for the USARC Rio Vista PA.

#### 3.1 RECORDS REVIEW

Prior to the records review, site visit, and interviews, a kickoff meeting was held between the BRAC Office, USACE, and Leidos on February 1, 2023. The kickoff meeting was conducted to present all parties' preliminary knowledge of USARC Rio Vista and provide information to guide the PA and site visit. The final kickoff meeting minutes are presented in Appendix A.

Preliminary research was conducted prior to the site visit to determine the potential for use, storage, or disposal of PFAS-containing materials, including AFFF, if the following activities were conducted at USARC Rio Vista:

- On-post fire training
- Use of PFAS-based AFFF in fire suppression systems or other systems
- AFFF used, stored, or disposed of at buildings and emergency response sites
- Activities or materials used that are likely to include PFAS-containing materials
- Studies conducted to assess the environmental impacts of PFAS-containing materials
- Review of potential off-post sources.

The records review included a combination of Internet-based searches and reviews of aerial photography, historical maps, technical reports, previous studies, and investigations available online. In addition, an EDR search of state and Federal environmental databases for USARC Rio Vista and any listed sites within a 1-mile search distance was conducted (EDR 2023). The EDR report is included in Appendix F.

As part of the records review, a search was conducted of the California Department of Toxic Substances Control EnviroStor online document database website (<https://www.envirostor.dtsc.ca.gov/public/>), which provides digital copies of cleanup action reports, regulatory activities, environmental data, maps, and other documents. The records review also evaluated available environmental investigations conducted under CERCLA and the Resource Conservation and Recovery Act (RCRA). Additional documents discovered in the Administrative Record managed by the Rio Vista Public Library were also reviewed, which included hard copies of installation inspection reports. Table 3-1 lists the documents reviewed that are relevant to the evaluation of AOPIs in this PA. A complete list of documents reviewed is included in Appendix B.

**Table 3-1. Summary of Relevant Records Reviewed**

Document Title	Author	Date	Relevance
<i>Environmental Baseline Survey Report, Rio Vista Army Reserve Center, California</i>	Woodward-Clyde	March 1997	Information for AOPIs Background Information Previous Investigation Information Geology and Groundwater Information
<i>Site Inspection Report Comprehensive Site Inspection USARC, Rio Vista, California</i>	USACE	February 1999	Information for AOPIs Background Information Previous Investigation Information Geology and Groundwater Information

**Table 3-1. Summary of Relevant Records Reviewed (Continued)**

<b>Document Title</b>	<b>Author</b>	<b>Date</b>	<b>Relevance</b>
<i>Request for No Further Action, Area 11: Unofficial Landfill, Former U.S. Army Reserve Center, Rio Vista, Solano County, California</i>	Arcadis	March 2000	Information for AOPIs Previous Investigation Information
<i>Environmental Assessment for Disposal and Reuse of the Rio Vista Army Reserve Center, California</i>	USACE	October 2000	Information for AOPIs Background Information Geology and Hydrology Information Post-closure Information
<i>Final Remedial Investigation Report, USARC, Rio Vista, California</i>	Arcadis	June 2001	Information for AOPIs Background Information Geology and Hydrology Information
<i>Revised No Further Action Record of Decision/Remedial Action Plan, RVARC, Solano County, California</i>	Arcadis	February 2002	Information for AOPIs Background Information Geology, Hydrology, and Surface Water Information
<i>Base Realignment and Closure (BRAC) Project Management Plan (PMP) Rio Vista Army Reserve Center, California</i>	CTC	March 2002	Information for AOPIs Background Information
<i>Final Finding of Suitability to Transfer, U.S. Army Reserve Center Rio Vista, California</i>	CH2M	May 2002	Information for AOPIs Background Information Previous Investigation Information Property Transfer Information
<i>Base Disposal Support Package Checklist: United States Army Reserve Center, Rio Vista, California – Quit Claim Deed</i>	U.S. Army	June 2002	Information for AOPIs Background Information Previous Investigation Information
<i>Report to the City Council Rio Vista Army Reserve Center Redevelopment Project Area, USARC, Rio Vista, California</i>	RSG	April 2010	Information for AOPIs Background Information Previous Investigation Information
<i>Delta Research Station Project: Estuarine Research Station and Fish Technology Center Final Environmental Impact Report/Environmental Impact Statement, Volume 1</i>	Horizon	February 2017	Information for AOPIs Background Information Demographics Water/Land Use Geology, Surface Water, and Groundwater Information Infrastructure

Information gathered during the records review resulted in identifying data gaps and enabled elimination of several areas based on their historical use. Data gaps associated with historical operations and the use, storage, or disposal of PFAS-containing materials contributed to a conservative approach for identifying AOPIs. However, areas with little potential to result in a PFAS release (i.e., residential buildings and administrative areas) were eliminated for further evaluation early in the PA process.

Areas that were identified to have potentially used, stored, or disposed of PFAS-containing materials or had the potential for an AFFF release were further evaluated (see Section 4.2).

### 3.2 AERIAL PHOTOGRAPHIC ANALYSIS

The PA included review of 18 historical aerial photographs spanning from 1937 to 2020, as presented in the EDR report (2023) and [www.historicaerials.com](http://www.historicaerials.com). The aerial photographs were analyzed to identify activities or developments that may suggest the potential use, storage, or disposal of PFAS-containing materials, including AFFF, at USARC Rio Vista (e.g., evidence of fire training activities, such as fire pits or burns cars); however, no conclusions on the use, storage, or disposal of PFAS-containing materials were drawn from the aerial photograph review. The EDR aerial photographs are included in Appendix C. The aerial photographic analysis is summarized as follows:

- **1937** – Development at the USARC Rio Vista property is concentrated in the central-eastern third of the property, on the lower terrace along the riverbank. Several buildings are present, including Buildings T-43 and T-7. Several repair wharf/dock structures and the former skidway are present. A road is visible running through the center of the upper terrace. The upper terrace appears to be relatively undeveloped and consisting primarily of grassy vegetation with scattered shrubby vegetation.
- **1952** – The installation location has become increasingly developed. Development on the upper terrace includes paving the center road, the construction of Buildings T-50 and T-44, and the construction of an unidentified building to the north of Building T-50. In addition, an unidentified building is visible to the south of Building T-50 and partially on the land that was later transferred to USCG. On the lower terrace, Building T-11 has replaced three unidentified buildings previously in its footprint, and Buildings T-1, T-2, T-9, T-15, T-19, and T-22 are visible. Additional repair wharf/dock structures have been constructed, and the former skidway has been replaced with the marine railway. The westernmost one-third of the USARC Rio Vista property remains undeveloped, but it appears that the shrubby vegetation has been removed.
- **1957** – Limited changes have occurred with respect to existing structures; the unidentified building to the south of Building T-50 has been demolished and the footprint of Building T-11 more closely resembles its current footprint. An unidentified structure is visible to the west of Building T-44. The gas pumps and former fuel storage shed are visible near Building T-44. The grassy undeveloped areas in the southern portion of the installation, as well as the land that was later transferred to USCG, have been divided into several OSAs and are being used for ship storage. The location of the unofficial landfill/burn pit remains undeveloped. Off-post to the south, Rio Vista's Beach WWTP is present.
- **1964** – The OSAs on the southern portion have been cleared of most stored vessels, and the land transferred to USCG has been cleared of all structures and stored vessels. The number of repair wharfs/dock structures has decreased. A covered OSA has replaced the unidentified structure observed to the west of Building T-44. Building T-54 is present. A helipad is visible in the otherwise undeveloped grassy area at the location of the unofficial landfill/burn pit. Automobiles appear to be parked on the eastern edge of the grassy area with the helipad.
- **1968** – The helipad is no longer visible, and disturbance/scarring is visible at the location of the unofficial landfill/burn pit and the waste oil/petroleum, oil, and lubricants (POL) trench. Three unidentified structures are visible to the south of the unofficial landfill/burn pit. Nearly all remaining undeveloped grassy areas on the northern/northwestern portions of the installation have been divided into OSAs. Vessels and various unidentified equipment are haphazardly stored in all the OSAs, as well as various open spaces between existing buildings/structures, throughout the property. An unidentified structure (possibly a covered parking area based on where automobiles were parked in the 1964 image) is visible along the eastern edge of the OSA where the unofficial landfill/burn pit and waste oil/POL trench are located. The covered OSA to the west of Building T-44 has been removed. Several unidentified structures are visible to the north of Building T-11 in the vicinity of the marine railway. Off-post, the USCG property has been developed with several buildings and mooring structures.

- **1972** – An unidentified structure has been constructed directly adjacent and to the south of Building T-50. The three unidentified structures to the south of the unofficial landfill/burn pit have been removed, and the area has been converted back to an OSA. Vessels are stored at the location of the unofficial landfill/burn pit but scarring/disturbance is visible in between the vessels. No scarring or other evidence of the waste oil/POL trench is visible. The unidentified structure on the eastern edge of the same OSA has been removed. Automobiles appear to be parked in the northwestern corner of the installation. Three unidentified structures and Facility T-38 are present to the west and southwest of Building T-44. A large ship is moored on the northern shore, to the south of the marine railway. Most of the stored vessels and equipment are in the southern OSAs. The unidentified structures near the marine railway have been removed.
- **1974** – The unofficial landfill/burn pit is no longer covered by stored vessels and disturbance/scarring is visible. No other significant changes are visible.
- **1978** – Disturbance is not visible at the location of the unofficial landfill/burn pit. The OSAs appear to be empty, but several large vessels are moored along the eastern installation boundary. Building T-54 and the unidentified building to the south of Building T-50 have been removed.
- **1979** – Poor image resolution. Dark scarring/disturbance is visible at the location of the unofficial landfill/burn pit.
- **1984** – All OSAs except the one to the west of Facility T-38 have been cleared of stored vessels/equipment. The unofficial landfill/burn pit location appears disturbed and unvegetated. Building T-45 and nearly all unidentified structures have been removed. Several ships are moored at the repair wharf/dock structures.
- **1987** – Poor image resolution. No significant changes are visible.
- **1993** – Vessels and equipment are stored in the west-southwestern-most OSAs. Three long, unidentified structures are visible in the OSA to the south of Building T-42. The repair wharf/dock structures are nearly empty.
- **2005 and 2006** – All stored vessels have been removed from the OSAs. The unidentified structure to the north of Building T-50 has been removed. The three long unidentified structures to the south of Building T-42 have been removed. Building T-44 has been removed, but the foundation is still present. Facility T-33 and the Fuel Storage Shed have been removed. All but two repair wharf/dock structures have been removed. Building T-22 appears as several disconnected structures instead of one continuous building.
- **2009 to 2020** – Most of the smaller structures have been removed. Remaining structures/structure footprints at the USARC Rio Vista property include Buildings T-44, T-50, and Facility T-38 on the upper terrace, and Buildings T-7, T-9, T-11, T-19, and T-43 on the lower terrace. In 2009, two large ships were moored off the repair wharf/dock structures. Shrubby vegetation has become more apparent in the OSAs.

### 3.3 PA SITE VISIT

Prior to the site visit, the PA team corresponded with Army personnel to coordinate site visit dates, gain access to the facility, and identify potential interviewees. The USARC Rio Vista PA site visit was conducted on February 16, 2023. The PA site visit included a site walk and visual inspection of all readily accessible areas at USARC Rio Vista to identify potential sources of PFAS. In addition, the Rio Vista Fire Department was visited, and interviews were conducted with fire department personnel regarding historical fires and fire response procedures. Appendix D contains photographs from the PA site visit.

### 3.4 SUMMARY OF INTERVIEWS

A PFAS PA questionnaire for gathering information related to PFAS usage at USARC Rio Vista from key personnel was developed and provided to the Army BRAC Environmental Coordinator prior to the site visit, but no response was provided. No former Army personnel with direct knowledge of historical operations at USARC Rio Vista were identified during this PA. However, in-person interviews were conducted with current personnel from the Rio Vista Fire Department as well as the current Army BRAC Coordinator during the site visit. None of the individuals interviewed were aware of any use, storage, or disposal of PFAS-containing materials, including AFFF, occurring at USARC Rio Vista. Completed interview forms with notes from in-person interviews are included in Appendix E. Table 3-2 summarizes the interviews conducted and the pertinent information provided.

**Table 3-2. Interviews Conducted for PA**

Title	Date	Information Provided
Captain – Rio Vista Fire Department	In-person interview on February 16, 2023	<p>The Rio Vista Fire Captain has been employed at the fire department for approximately 35 years. He provided the following information:</p> <ul style="list-style-type: none"> <li>• AFFF was not used to extinguish the 2001 dock fire.</li> <li>• The Rio Vista Fire Department has historically conducted live fire training at the installation (post BRAC transfer). No AFFF was used during training activities, only water.</li> </ul>
Army BRAC Environmental Coordinator	In-person interview on February 16, 2023	<p>The Army BRAC Environmental Coordinator has been in his role at USARC Rio Vista for approximately 23 years. He provided the following information:</p> <ul style="list-style-type: none"> <li>• A former civilian USARC Rio Vista employee has historically made claims regarding the disposal of hazardous substances at the installation, including the alleged use of a waste oil/POL trench, during the environmental investigations conducted in the 1990s. These claims were investigated by the Army and determined to be inaccurate.</li> </ul>

## 4. SUMMARY OF PA DATA

### 4.1 PREVIOUS PFAS INVESTIGATIONS

In 2012, USEPA published the Third Unregulated Contaminant Monitoring Rule (UCMR3), which required nationwide public water systems (i.e., waterworks) to sample for a list of 30 unregulated contaminants, including 6 PFAS chemicals (i.e., PFOS, PFOA, PFBS, PFNA, perfluoroheptanoic acid [PFHpA], and PFHxS). Although the Rio Vista Public Water System was not included during the UCMR3 sampling, USEPA published the Fifth Unregulated Contaminant Monitoring Rule (UCMR5) in 2021, which expanded the list to 29 PFAS and included more public water systems serving populations less than 10,000 (USEPA 2023). As part of the UCMR5 sampling, subject to the availability of USEPA appropriations, the Rio Vista Public Water System may be included for sampling between January 2023 and December 2025 (Ca SWRCB 2023).

In 2019, the California Groundwater Ambient Monitoring and Assessment Priority Basin Project (GAMA-PBP) added PFAS to the large list of chemicals analyzed in samples to assess the geographical distribution of PFAS in groundwater used for drinking water. From May 2019 to September 2020, the GAMA-PBP collected samples from 107 public supply wells and 104 domestic wells throughout the State of California, including one of the city of Rio Vista's public supply wells (SOL-01). Although at least one PFAS was detected in 49 of the 211 (23 percent) GAMA-PBP samples, no PFAS were detected in SOL-01 (Kent 2021, CA GeoTracker 2023).

No site-specific PFAS investigations have been conducted at USARC Rio Vista prior to this PA.

### 4.2 EVALUATED SITES

During the PA records reviews, interviews, aerial photographic analysis, and site reconnaissance, available documentation and physical evidence were examined for areas having a potential historical PFAS release. As noted in the 2018 Army Guidance for Addressing PFAS document, "At Army installations, the primary mechanism for releases of PFAS is through the historic use (post-1972) of Aqueous Film Forming Foam (AFFF), a product applied during firefighting and firefighting-related training. AFFF for firefighting was, and is, generally used in areas where fuel- or petroleum-based fires may have occurred, such as in the vicinity of aviation assets, fuel farms, or aircraft crash sites. The Army's current practice is not to use AFFF for petroleum-based training fires. Other known sources of environmental releases of PFAS include mist suppressants for metal plating operations and landfills and wastewater treatment plants that have inadvertently accepted PFAS containing materials" (U.S. Army 2018). For USARC Rio Vista, the areas evaluated include ship and vehicle maintenance shops, wash areas, a former fuel station, dumps and disposal areas, hazardous storage areas, burn areas, fire hose storage, and the area of a 2001 dock fire, as shown in Figure 4-1 and described in the following sections.

#### 4.2.1 AFFF Use, Storage, or Disposal

Documentation specifying the use of AFFF at USARC Rio Vista during Army ownership and operation was not identified during the records reviews, aerial photographic analysis, or interviews. AFFF is not currently known to be stored at USARC Rio Vista. No evidence of AFFF use, storage, or disposal was identified. However, information on activities during the operational period of the facility were limited. The areas identified as potential areas of historical AFFF usage are discussed below.

No facilities designated for fire protection are known to have been present at USARC Rio Vista. In addition, no records of past use of USARC Rio Vista for fire training activities were identified. However, a fire hose storage building (former Building T-54) was located behind the Vehicle Maintenance Shop (Building T-50) (Woodward-Clyde 1997). The precise dates of use are unknown, but aerial images suggest Building T-54 was built between 1957 and 1964 and demolished between 1974 and 1978. Records documenting the

historical use of this building were unavailable during the PA research. The only other fire protection infrastructure at the facility included a river-intake fire flow pump that could be used to deliver water to the nine fire hydrants via the fire flow pipelines (Horizon 2017).

In 2001, a fire occurred at the ship repair dock near the marine railway (RSG 2010). USARC Rio Vista was vacant and under Army ownership at the time of the fire. The Rio Vista Fire Department has mutual aid agreements with neighboring departments and other Solano County fire departments; the Rio Vista Fire Department would be the first to respond to a fire at USARC Rio Vista, and the nearest department with a mutual aid agreement is the Montezuma Fire Protection District (Horizon 2017, USACE 2000). According to firefighters employed at the time of the fire and interviewed during this PA, the Rio Vista Fire Department responded to the fire and AFFF was not used. The cause of the fire was not identified.

#### **4.2.2 Metal Plating Operations**

No current or historical metal plating operations were identified at USARC Rio Vista.

#### **4.2.3 Wastewater Treatment Plants**

No wastewater treatment facilities were identified at USARC Rio Vista. A 1974 real property report allegedly indicates that historically, a septic system and leach field were present at USARC Rio Vista, but no evidence of such a system was identified during subsequent environmental investigations. Review of historical aerial photographs did not indicate the presence of a leach field at the facility. Sanitary wastewater generated at USARC Rio Vista was pumped through a lift station (former Building T-14) and ultimately sent to the city of Rio Vista treatment facility (U.S. Army 2002, USACE 2000).

#### **4.2.4 Landfills and Disposal Areas**

The four former disposal areas identified at USARC Rio Vista are described below:

- ***Unofficial Landfill/Burn Pit – 1970s:*** One unofficial landfill/burn pit was identified at USARC Rio Vista. The landfill was located on a flat, open, grassy areas on the upper terrace, to the southwest of Former Building T-22. Several former employees interviewed during environmental investigations conducted in the 1990s stated that the landfill received demolition debris, treated wood, and woody vegetation debris. They also indicated that wood products were burned in the landfill (CTC 2002, Woodward-Clyde 1997). Disturbance and staining at the unofficial landfill/burn pit is visible in aerial images from 1968, 1972, 1974, 1979, and 1984. During subsequent investigations conducted by the Army between 1997 and 1999, disposed of materials encountered and removed from the landfill area included metal debris, paint cans, and a metal container containing an unidentified oily substance. In addition, the presence of the suspected burn area containing metal debris and wood was confirmed at the eastern end of the landfill (Arcadis 2000, CH2M 2002, CTC 2002).
- ***Waste Oil/POL Trench – Pre-1970:*** A former civilian employee interviewed during the 1997 EBS (Woodward-Clyde 1997) stated that a 600-foot unshored waste oil/POL trench located on the eastern edge of the grassy area adjacent to the unofficial landfill/burn pit was used prior to 1970 to dispose of used engine and transmission oil. Disturbance in the area of the suspected waste oil/POL trench is visible in a 1968 aerial photograph. However, results of Army investigations conducted between 1996 and 2001 did not identify any physical, visual, chemical, or anecdotal evidence of the waste oil/POL trench (Arcadis 2002).
- ***Incinerator (former Structure T-15) – Pre-1968:*** An incinerator was located in the vicinity of the Battery Shop (Building T-7). The incinerator was a cylindrical steel structure approximately 10 feet long and 3.5 feet in diameter that sat on concrete footings. A small opening on the lower east end of the incinerator may have been used to discharge burned materials directly into the river. It is unknown what was burned in the incinerator, and it has not been used since 1967. Multiple metals,



including lead and arsenic, as well as dioxins and furans were detected in soils sampled at the incinerator. In 2000, the incinerator and concrete footings were removed and soil underneath the footprint of the incinerator was removed (Arcadis 2002, CH2M 2002, USACE 1999).

- **Battery Shop Acid Pit – 1958-1989:** An acid pit was located outside the eastern Battery Shop (Building T-7) entrance. Etching on the floor of the battery shop was observed during the 1997 EBS (Woodward-Clyde 1997). Subsequent environmental investigations identified elevated concentrations of lead and the presence of slightly to strongly basic soil in the area outside the battery shop, which is what was considered the acid pit. It is believed that soils were affected by electrolyte solution from the batteries stored in the shop, but no evidence of disposal, such as lead debris or battery casings, was identified. In 2000, soil was removed as part of the Interim Removal Action to 5 feet bgs at the Battery Shop Acid Pit (Arcadis 2002, CH2M 2002, CTC 2002). Additional details or documentation on the acid pit were not identified during this PA.

#### 4.2.5 Other Potential Sources of PFAS

In addition to AFFF-related PFAS sources, other potential sources of PFAS may be associated with the use of some types of pesticides, car washes, engine lubricants, paint shops, laundry or waterproofing facilities, and photographic processing facilities. Document research and the site visit resulted in identification of other potential PFAS sources at USARC Rio Vista. The potential non-AFFF PFAS sources at USARC Rio Vista are described below:

- **Maintenance Activities** – Ship and vehicle maintenance activities were conducted at former Buildings T-2, T-5, T-6, and T-44, and Buildings T-9, T-11, and T-50. Typical maintenance activities conducted at USARC Rio Vista included the removal of water, fuel, and debris from vessels going into storage; propeller and rudder maintenance; painting; and the installation and testing of navigational and electronic equipment. Former Buildings T-2, T-5, and T-6 were winch sheds used to remove ships from the water for repair, scraping, sandblasting, painting, and storage. The area between these three buildings was used for painting operations. Former Building T-44 and Buildings T-9 and T-11 were major ship repair shops, with Building T-11 containing a sump and an oil/water separator (OWS) that were cleaned out in 2000 (Arcadis 2002, CH2M 2002, CTC 2002). Building T-50 served as the Vehicle Maintenance Shop. The precise operational period of these facilities is unknown, but peak use likely occurred between 1952 and 1974, with reduced use in the 1970s and 1980s as USARC Rio Vista transitioned to a training-focused facility. No known PFAS-containing materials were used at these facilities.
- **Wash Areas** – Three wash areas were identified at USARC Rio Vista during this PA: a boat/vehicle wash pad at former Building T-19, a boat/vehicle wash pad at Facility T-38, and an equipment wash area located on the paved area between Buildings T-9 and T-11. The types of equipment cleaned at the equipment wash area is unknown (Arcadis 2002). Although a list of products used for the wash area is not available, it is understood that common products used in vehicle washing may have contained minor amounts of PFAS-containing materials and would not be considered a significant source of PFAS contamination. As a result, the potential PFAS impacts were determined to be unlikely.
- **Former Fuel Pumps (Facility T-33) and Fuel Shed** – Facility T-33 was the on-post fueling station at USARC Rio Vista. A 1,000-gallon underground storage tank (UST) was removed from the area in 1992, and two 500-gallon aboveground storage tanks (ASTs) were likely in the fuel shed used to store diesel and gasoline (USACE 2000). The presence of a fire suppression system at this location is not documented, and no known PFAS-containing materials are stored at this location.

- **Hazardous Storage Areas** – Hazardous materials at USARC Rio Vista were stored at former Building T-1, Building T-43, and Paint Lockers A and B. Hazardous materials stored in these locations primarily consisted of flammable materials and paint. The northern end of former Building T-22 contained a wood-framed, plastic-lined box filled with sand and was used to contain petroleum products and other unknown hazardous waste prior to disposal (CTC 2002, Woodward-Clyde 1997). No known PFAS-containing materials were stored at these buildings.

During the document research and site visit, no additional potential use, storage, or disposal of PFAS-containing materials were identified.

### **4.3 POTENTIAL OFF-POST AND POST-TRANSFER PFAS SOURCES**

The search to identify potential off-post PFAS sources (i.e., not related to operations at USARC Rio Vista), although not exhaustive, included review of significant potential contributors (i.e., airports, fire stations, solid waste landfills, WWTPs, car washes, and metal plating facilities). In addition, EDR conducted a search of state and Federal environmental databases for the USARC Rio Vista property and adjacent properties (EDR 2023). Most of the surrounding area consists of rural/residential and commercial property. Figure 4-2 shows the fire stations, airports, WWTPs, solid waste landfills, and car washes located within a 5-mile radius of USARC Rio Vista. No metal plating facilities were within a 5-mile radius.

The Rio Vista Fire Department is the closest fire station and would respond to incidents on the USARC Rio Vista property. According to fire department personnel interviewed as a part of this PA, the fire department has historically conducted live fire training on the USARC Rio Vista property post-transfer. These training activities occurred in an unknown location and used water only; no AFFF was used during the training activities.

## 5. SUMMARY OF PA RESULTS

The areas evaluated for potential PFAS use and/or storage at USARC Rio Vista were further refined during the PA process and categorized either as an AOPI or not retained. All areas evaluated are areas not retained as AOPIs and are discussed in Section 5.1.

### 5.1 AREAS NOT RETAINED AS AOPIs

Based on analysis of information obtained during this PA, the areas described below were not retained as AOPIs. These areas were previously identified as potential PFAS sources (e.g., AFFF storage, car washes, automobile maintenance, paint shops, photographic processing, pesticide use or storage, WWTPs, landfills) at USARC Rio Vista. However, PA research does not indicate that PFAS-containing materials were used, stored, or disposed of at these areas. A brief site history and the rationale for eliminating the areas as AOPIs are presented in Table 5-1.

**Table 5-1. Summary of Areas Not Retained as AOPIs at USARC Rio Vista**

Area Description	Approximate Dates of Operation	Relevant Site History	Rationale
Fire Hose Storage (Former Building T-54)	1957 – 1978	Records documenting the historical use of this building were unavailable during the PA research. Aerial images suggest that Building T-54 was built between 1957 and 1964 and demolished between 1974 and 1978.	No evidence of use, storage, or disposal of PFAS-containing materials. Exact dates of operation unknown. Historical use of building unknown. No facilities at USARC Rio Vista designated for fire protection.
Fire at Ship Repair Dock	2001	The ship repair dock at the northeastern corner of the facility was severely damaged when it caught fire in 2001 (RSG 2010). AFFF was not used according to Rio Vista Fire Department firefighters who responded to the fire. The facility was inactive at the time of the incident and the cause of the fire is unknown.	No evidence of AFFF use to extinguish the fire.
Helipad	1964	Aerial imagery from 1964 indicates a helipad in the vicinity of the unofficial landfill/burn pit. The helipad was not present prior to 1964 and was absent by 1972. Automobiles appeared to be parked on the eastern edge of the grassy area surrounding the helipad.	Dates of operation precede likely use of AFFF or PFAS-containing materials. No evidence of use, storage, or disposal of PFAS-containing materials.
Unofficial Landfill/Burn Pit	1970s	Anecdotal evidence from former employees interviewed during the 1997 EBS and 1998 Historical Research Report indicated the presence of a landfill located southwest of former Building T-22. The landfill reportedly was used to dispose of demolition debris, as well as to burn wood, vegetation, discarded furniture, pallets, and treated wood (USACE 1999).  Investigative activities at the site uncovered and removed metal debris, paint cans, and an oil drum. Evidence of a burn area was identified at the eastern end of the unofficial landfill area (Arcadis 2000, Arcadis 2002, USACE 1999).	No evidence of disposal of PFAS-containing materials.

**Table 5-1. Summary of Areas Not Retained as AOPIs at USARC Rio Vista (Continued)**

Area Description	Approximate Dates of Operation	Relevant Site History	Rationale
Waste Oil/POL Trench	Pre-1970	Anecdotal evidence from a former employee indicated that prior to 1970, used engine and transmission oil were disposed of in an unlined 600-foot-long trench located to the west of former Building T-22 (Arcadis 2001b). Several investigations were conducted, but no physical, visual, chemical, or anecdotal evidence of the alleged waste oil/POL trench were identified (Arcadis 2002).	Dates of operation precede likely use of AFFF or PFAS-containing materials. No evidence of disposal of PFAS-containing materials.
Incinerator (former Structure T-15)	Unknown – 1967	An incinerator was located in the vicinity of the Battery Shop (Building T-7). It is unknown what was burned in the incinerator, and it has not been used since 1967. Multiple metals, including lead and arsenic, as well as dioxins and furans were detected in soils sampled at the incinerator. In 2000, the incinerator and concrete footings were removed and soil underneath the footprint of the incinerator was removed (Arcadis 2002, CH2M 2022, USACE 1999).	Dates of operation precede likely use of AFFF or PFAS-containing materials. No evidence of disposal of PFAS-containing materials.
Battery Shop Acid Pit	1958 – 1989	An acid pit was located outside the eastern Battery Shop (Building T-7) entrance. It is believed that soils were affected by electrolyte solution from the batteries stored in the shop, but there were no other signs of battery disposal, such as lead debris or battery casings. Additional details or documentation on the operational history of the acid pit were not identified during this PA. In 2000, soil from the acid pit was removed to 5 feet bgs as part of the Interim Removal Action (Arcadis 2002, CH2M 2002, CTC 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.
Ship Repair Shop (Building T-9)	1952 – 1989	Building T-9 is a major repair shop that reportedly had a sump and associated OWS, but the sump has not been located during previous investigations (CTC 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.
Ship Repair Shop (Building T-11)	1952 – 1989	Building T-11 is a major repair shop that contained a sump that did not discharge to any other location, and in 2001, sediment and water were pumped from the sump and disposed of off-post (Arcadis 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.
Winch/Storage Sheds (former Building T-2, former Building T-5, and former Building T-6)	1952 – 1989	These buildings were located near the marine railway and used to remove ships from the water for repair, scraping, sandblasting, painting, and storage. The area to the west of former Buildings T-5 and T-6 and to the south of former Building T-2 was known as the Paint Refinishing Area and used for painting operations (CTC 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.

**Table 5-1. Summary of Areas Not Retained as AOPIs at USARC Rio Vista (Continued)**

<b>Area Description</b>	<b>Approximate Dates of Operation</b>	<b>Relevant Site History</b>	<b>Rationale</b>
Warehouse/Ship Repair Shop (former Building T-44)	1952 – 1989	Former Building T-44 was used as a warehouse and ship repair shop (Woodward-Clyde 1997).	No evidence of use, storage, or disposal of PFAS-containing materials.
Vehicle Maintenance Shop (Building T-50)	1952 – 1989	Building T-50 was a vehicle maintenance shop located near the southwestern boundary of the facility. Treated timber was historically stored to the north of Building T-50 (Woodward-Clyde 1997).	No evidence of use, storage, or disposal of PFAS-containing materials.
Wash Pad at former Building T-19	1966 – 1989	Building T-19 was formerly an oil storage shed that was demolished, and the foundation was subsequently used as a wash pad (CTC 2002). The wash pad was primarily used for vehicle and boat cleaning and has no associated sump, but the pad slopes to the south and drains to an area of sandy soil (Arcadis 2001b, USACE 1999).	No evidence of use, storage, or disposal of PFAS-containing materials.
Wash Pad at Facility T-38	1964 – 1989	Facility T-38 was used as a vehicle and boat wash pad. A dry well/sump and three manholes were associated with the wash pad. No evidence of liquid releases to underlying soil were identified. The sump associated with the wash rack was cleaned and filled with concrete in 2001 (Arcadis 2001b, CTC 2002). Aerial images suggest the facility was constructed between 1964 and 1967.	No evidence of use, storage, or disposal of PFAS-containing materials.
Equipment Wash Area	Unknown – 1989	The equipment wash area was located on the paved area between the ship repair shops (Buildings T-9 and T-11). The types of equipment cleaned and the cleaning compounds used are unknown (Arcadis 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.
Former Fuel Pumps and Fuel Shed (Facility T-33)	1956 – 1989	Facility T-33 was the on-post fueling station (i.e., gas pumps) at USARC Rio Vista. A 1,000-gallon UST was removed from the area in 1992, and two 500-gallon ASTs were likely in the fuel sheds used to store diesel and gasoline (USACE 2000). The presence of a fire suppression system at this location is unknown.	No evidence of use, storage, or disposal of PFAS-containing materials.
Hazardous Storage at former Building T-1	Pre-1952 – 1989	Former Building T-1 was a flammable materials storage shed. It was used to store paint and was removed in 2001 (CTC 2002, Woodward-Clyde 1997).	No evidence of use, storage, or disposal of PFAS-containing materials.

**Table 5-1. Summary of Areas Not Retained as AOPIs at USARC Rio Vista (Continued)**

Area Description	Approximate Dates of Operation	Relevant Site History	Rationale
Hazardous Waste Storage Area at former Building T-22	Pre-1952 – 1989	Building T-22 was a dirt-floored, three-sided storage shed used for storing vehicles, lumber, and pipes. The hazardous waste storage area was located at the northern end of Building T-22 and consisted of a wood framed, 10- by 18-foot plastic lined box filled with 6 to 8 inches of sand (CTC 2002). The area was used to contain petroleum products and other unknown hazardous waste prior to disposal (Woodward-Clyde 1997). The sand and containment area were removed in 1997 (USACE 1999).	No evidence of use, storage, or disposal of PFAS-containing materials.
Hazardous Storage at Building T-43	Pre-1937 – 1989	Building T-43 was used for flammable materials storage, primarily paint (Woodward-Clyde 1997).	No evidence of use, storage, or disposal of PFAS-containing materials.
Lockers A and B	Unknown	Storage lockers A and B were wood-floored sheds used for hazardous material storage, primarily flammable materials and paint. The lockers were removed in 2000 (Arcadis 2001b, CTC 2002).	No evidence of use, storage, or disposal of PFAS-containing materials.

## 5.2 AOPIs

Based on analysis of information obtained during document research, personnel interviews, and site reconnaissance, no areas at USARC Rio Vista were categorized as AOPIs.

## 5.3 DATA LIMITATIONS

The data limitations relevant to the development of this PA for PFAS at USARC Rio Vista are discussed below.

A comprehensive well survey was not completed as a part of this PA; therefore, the information reviewed regarding off-post wells is limited. The EDR well search report (Appendix F) and the online CNRA Well Completion Report database (<https://gis.data.cnra.ca.gov/datasets/DWR::i07-wellcompletionreport>) were referenced when identifying potential off-post drinking water receptors.

The searches for ecological receptors and off-post PFAS sources were limited to easily identifiable and readily available information. An online database was referenced when identifying the ecological profile for this site (USFWS 2023).

Records reviewed during the PA process were limited to documents dated 1997 and later, after installation closure. These records were limited in information regarding chemicals used and stored at the installation; PFAS-containing materials, including AFFF use; procurement records; and training records. Generally, interviews are crucial to understanding past practices and identifying the potential for use, storage, or disposal of PFAS-containing materials because records are often not available after installation closure. However, no former Army personnel were identified for interviews in this PA.

Conclusions and recommendations presented in this report are based on available information, professional judgement, and industry best practices. Multiple sites were eliminated based on the lack of evidence of PFAS-containing material use, AFFF use and storage, and dates of operation that precede PFAS use.

## 6. CONCLUSIONS

This PA was conducted in accordance with DoD, Army, and USEPA guidance documents. Programmatically, the Army has focused its PFAS PA efforts on identifying locations where a potential for a release of PFAS exists (i.e., those locations where PFAS-containing materials were used, stored, or disposed of). Locations on Army installations with the greatest likelihood of releases of PFAS were evaluated as part of this PA, including emergency equipment storage areas, historical fires, dumps and disposal areas, hazardous material storage areas, and burn areas. However, other potential sources of PFAS at the installation were considered and have been documented in this PA. A combination of document review, Internet searches, interviews with fire department personnel, and an installation site visit were used to identify specific areas of suspected PFAS use and releases at USARC Rio Vista.

The entire USARC Rio Vista property was assessed; 21 preliminary areas were identified and evaluated for potential use, storage, and/or disposal of PFAS-containing materials; and these areas were further refined during the PA process. In accordance with the established process for the PA and based on historical activities at the installation, none of the preliminary areas have been identified as AOPIs.

Given the findings of this PA, further evaluation in a PFAS SI is not warranted at USARC Rio Vista.

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## **FIGURES**



C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_1-1\_Rio\_Vista\_AR\_Installation\_Location.mxd



C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_2-1\_Rio\_Vista\_AR\_Site\_Features.mxd






<b>LEGEND:</b> BRAC Parcel Boundary Elevation Contour (10 ft) Building Waterbody Road Stream Inferred Groundwater Flow Direction		<b>NOTES:</b> 1. Background Source: ESRI World Imagery (Vivid/Maxar, 11/2021). 2. Parcel boundaries are estimated based on the March 2003 Quitclaim Deed. 3. Inferred Groundwater Flow Direction is from the 2002 NFA ROD/RAP (Arcadis 2002). 4. USGS National Elevation Dataset (NED), USGS National Hydrography Dataset (NHD).	 		 
<b>SITE FEATURES</b> U.S. ARMY RESERVE CENTER RIO VISTA RIO VISTA, CALIFORNIA		FIGURE 2-1	DATE: 5/11/2023		



C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_2-2\_Rio\_Vista\_AR\_Parcel\_Transfer\_Map.mxd

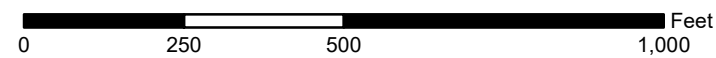


**LEGEND:**

-  BRAC Parcel Boundary
-  Lease to Lindsay Transportation
-  Parcel Transfer

**NOTES:**

1. Background Source: ESRI World Imagery (Vivid/Maxar, 11/2021).
2. Parcel boundaries are estimated based on the March 2003 Quitclaim Deed.
3. Lease boundary estimate based on the August 10, 2022 Rio Vista Planning Commission Meeting Agenda (RVPC 2022).



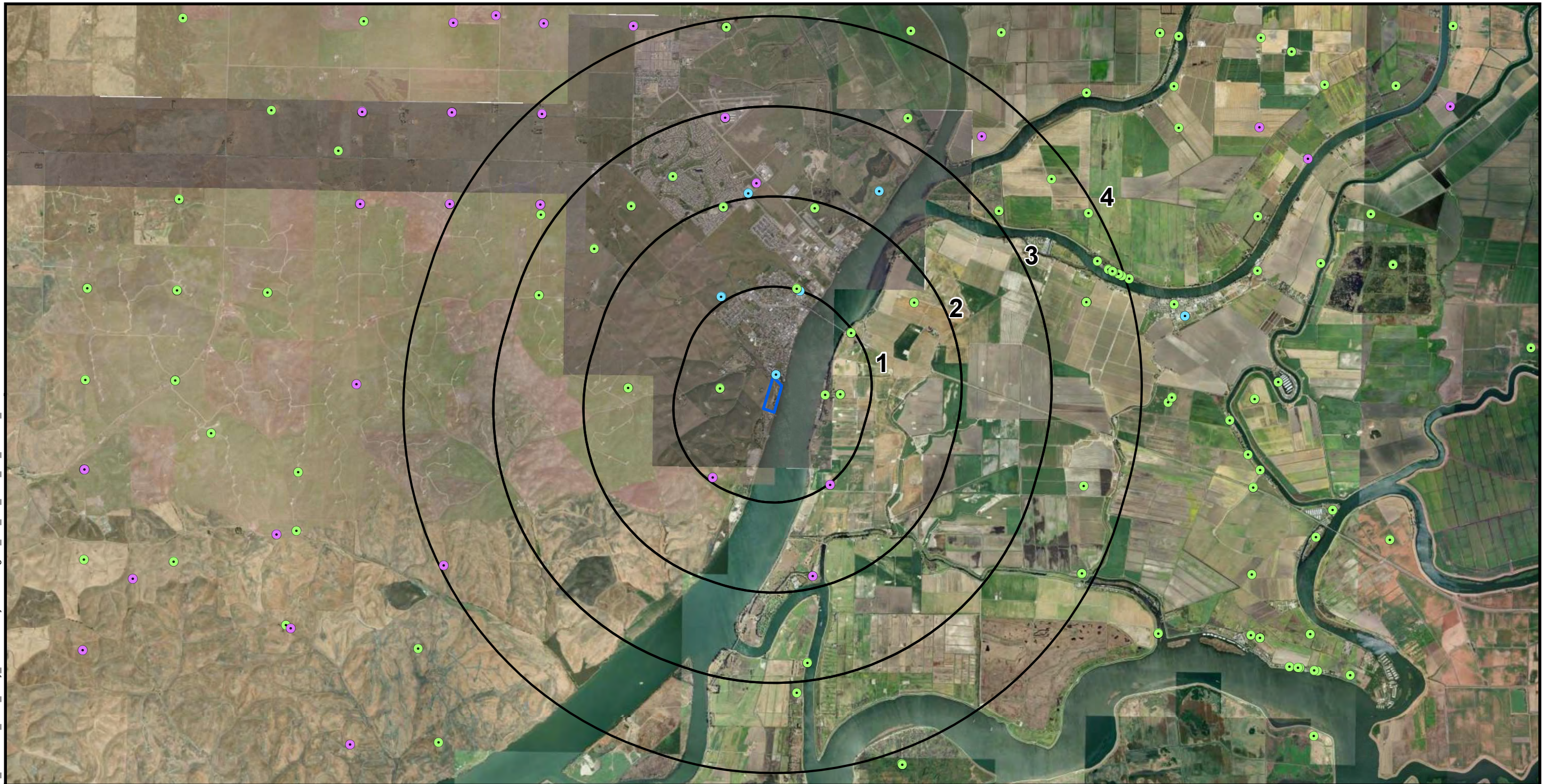
CAI STATE PLANE  
(NAD83)








	
<b>PARCEL TRANSFER MAP</b>	
U.S. ARMY RESERVE CENTER RIO VISTA RIO VISTA, CALIFORNIA	
FIGURE 2-2	DATE: 5/11/2023



C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_2-3\_Rio\_Vista\_AR\_Potable\_Wells.mxd

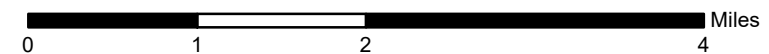


**LEGEND:**

-  BRAC Parcel Boundary
-  Irrigation Well
-  Distance Ring
-  Domestic Water Well
-  Public Water Well

**NOTES:**

1. Background Source: ESRI World Imagery (Vivid/Maxar,11/2021).
2. Parcel boundaries are estimated based on the March 2003 Quitclaim Deed.
3. Well Data Source: California Natural Resources Agency; Unclassified wells not shown.



CAI STATE PLANE  
(NAD83)





**POTABLE WELLS WITHIN A 4-MILE RADIUS**  
U.S. ARMY RESERVE CENTER RIO VISTA  
RIO VISTA, CALIFORNIA



FIGURE 2-3	DATE: 5/11/2023
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C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_4-1\_Rio\_Vista\_AR\_Evaluated\_Sites.mxd



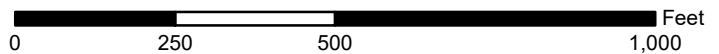
Structure Number	Description
T-54	Fire Hose Storage
T-7	Battery Shop
T-15	Incinerator
T-2	Ship/Vehicle Maintenance Areas
T-5	
T-6	
T-9	
T-11	
T-44	
T-50	Wash Pads
T-19	
T-38	Fuel Pumps
T-33	
T-1	Hazardous Storage Areas
T-22	
T-43	
Locker A	
Locker B	

**LEGEND:**

- BRAC Parcel Boundary
- Evaluated Site
- Former Structure

**NOTES:**

1. Background Source: ESRI World Imagery (Vivid/Maxar, 11/2021).
2. Parcel boundaries are estimated based on the March 2003 Quitclaim Deed.
3. Evaluated locations are estimated locations (Woodward-Clyde 1997, USACE 1999-2000, Arcadis 2001-2002, CRV 2010).



CAI STATE PLANE (NAD83)



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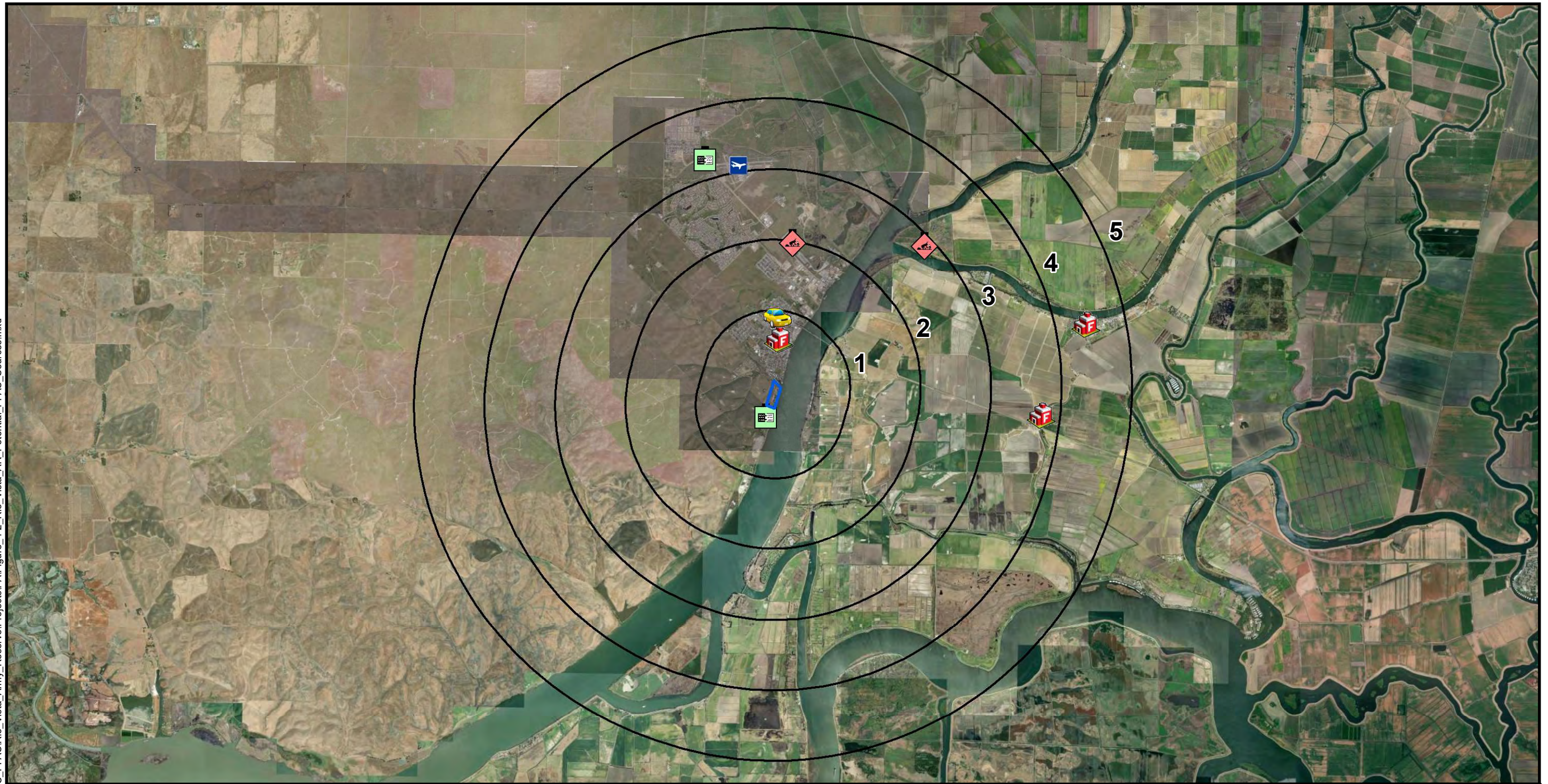
**EVALUATED SITES**  
U.S. ARMY RESERVE CENTER RIO VISTA  
RIO VISTA, CALIFORNIA

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FIGURE 4-1	DATE: 8/15/2023
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C:\Data\Civil\_Transfer\GIS\BRAC\_PFA\Rio\_Vista\_Army\_Reserve\Projects\PA\Figure\_4-2\_Rio\_Vista\_AR\_Potential\_PFAS\_Sources.mxd

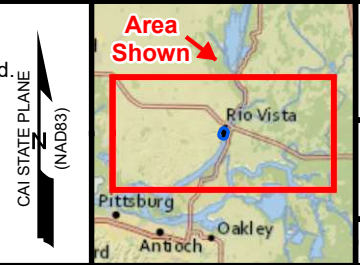
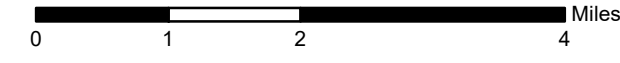




**LEGEND:**

-  BRAC Parcel Boundary
-  Solid Waste Landfill
-  Fire Station
-  Distance Ring
-  Airport
-  Waste Water Treatment Plant
-  Car Washes

**NOTES:**

1. Background Source: ESRI World Imagery (Vivid/Maxar, 11/2021).
2. Parcel boundaries are estimated based on the March 2003 Quitclaim Deed.
3. California State GeoPortal/ESRI (WWTP, Solid Waste Landfills, Airports).
4. Homeland Infrastructure Foundation Level Data (Firestations).
5. Car wash facilities (Google 2023).



 US Army Corps of Engineers	
<b>POTENTIAL PFAS SOURCES WITHIN A 5-MILE RADIUS U.S. ARMY RESERVE CENTER RIO VISTA RIO VISTA, CALIFORNIA</b>	
<b>FIGURE 4-2</b>	<b>DATE: 5/11/2023</b>