FINAL PRELIMINARY ASSESSMENT AND SITE INSPECTION OF PER- AND POLYFLUOROALKYL SUBSTANCES

Rock Island Arsenal, Illinois

Prepared For:
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Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

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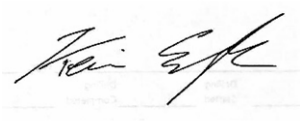

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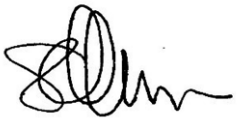

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EXECUTIVE SUMMARY

The United States. Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The PA identifies areas of potential interest (AOPIs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. This Rock Island Arsenal (RIA) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and The National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense (DoD) policy and guidance.

RIA is a 946.3-acre island in the Mississippi River, bordered by the Quad Cities (Davenport and Bettendorf, Iowa and Rock Island and Moline, Illinois). Operations at RIA are diverse and support a broad spectrum of logistics and soldier readiness functions.

The RIA PA identified 15 AOPIs for investigation during the SI phase. SI sampling results from the 14 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and PFBS. The Fire Department Boat Launch area was identified as an AOPI following observation of photographs showing firefighting foam operations being conducted in the Mississippi River, directly upgradient of the City of Rock Island drinking water intake between approximately 1969 and 1974. However, this AOPI was not included in the SI sampling because the foam released into the Mississippi River during training exercises would have been transported downstream and samples collected in the river would not have been representative of these releases. PFOS, PFOA, and/or PFBS were detected in soil and/or groundwater at 13 AOPIs; however, only four of the 14 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. The RIA PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI.

Table ES-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at RIA, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NS)		Recommendation
	GW	SO	
Building 25	No	No	No action at this time
Building 64 and 65	No	No	No action at this time
Building 66 and 69	No	No	No action at this time
Building 90	No	No	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NS)		Recommendation
	GW	SO	
Building 107	No	No	No action at this time
Building 144	NS	No	No action at this time
Building 159	Yes	No	Further study in a remedial investigation
Building 212	No	NS	No action at this time
Building 225	Yes	No	Further study in a remedial investigation
Building 341	Yes	No	Further study in a remedial investigation
Bradley Flamethrower Testing Area	Yes	No	Further study in a remedial investigation
Old Landfill	No	NS	No action at this time
Sludge Drying Beds	No	NS	No action at this time
Current Fire Training Area/Former XYZ Fire Training Area	NS	No	No action at this time
Fire Department Boat Launch Area*	NS	NS	No action at this time

Notes:

[1]The Fire Department Boat Launch Area was not sampled during the SI.

Light gray shading – detection greater than the OSD risk screening level

GW - groundwater

NS – not sampled

SO – soil

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA/SI consistent with its authority under CERCLA, 42 United States Code §§ 9600, et seq. (as amended), and the Defense Environmental Restoration Program, 10 United States Code §§ 2701, et seq. The PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at Rock Island Arsenal (RIA) based on the use, storage, and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the 2019 Office of the Secretary of Defense (OSD) PFAS risk screening levels to determine whether further investigation is warranted. This report provides the PA/SI for RIA and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

PFAS are a class of compounds that have been used in a wide range of industrial applications and commercial products due to their unique surface tension/leveling properties. Due to industry and regulatory concerns about the potential health effects and adverse environmental impacts, there has been a reduction in the manufacture and use of PFAS worldwide. In the U.S., significant reductions in the production, importation, and use of PFOS and PFOA (two individual compounds in the PFAS class) occurred between 2001 and 2015 (Interstate Technology Regulatory Council 2017). PFBS replaced PFOS in some applications and is currently used and manufactured in the U.S.

In 2016, the United States Environmental Protection Agency (USEPA) established a lifetime health advisory of 70 nanograms per liter (ng/L) in drinking water for PFOS or PFOA and for the sum of PFOS and PFOA when both are present (USEPA 2016). On 15 October 2019, the OSD provided guidance on the investigation of PFOS, PFOA, and PFBS at Department of Defense (DoD) restoration sites (OSD 2019). The 15 October 2019 Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program is provided for reference as **Appendix A**. The DoD guidance provides risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) or soil, calculated using the USEPA's Regional Screening Level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD memo, on 08 April 2021, USEPA published an updated toxicity assessment for PFBS (USEPA 2021). New PFBS risk screening levels were calculated using the USEPA's RSL calculator and the new PFBS toxicity value. The OSD risk screening levels for tap water (and used to evaluate groundwater) are 40 ng/L for PFOS and PFOA, and 600 ng/L for PFBS. The PFOS and PFOA soil screening levels for the residential and industrial/commercial scenarios are 0.13 milligrams per kilogram (mg/kg) (residential) and 1.6 mg/kg (industrial/commercial).

The soil screening levels for PFBS are 1.9 mg/kg (residential) and 25 mg/kg (industrial/commercial). These screening criteria are discussed further in **Section 6.5**.

1.2 PA/SI Objectives

This PA/SI was conducted consecutively because the results of the PA yielded AOPIs that necessitated continuing on to the SI phase in accordance with CERCLA. Consequently, this report provides the combined objectives of both PA and SI reports.

1.2.1 PA Objectives

During the PA, investigators collect readily available information and conduct site reconnaissance. This PA will evaluate and document areas where PFAS-containing materials were used, stored, and/or disposed, so the Army can distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation.

1.2.2 SI Objectives

An SI is conducted when the PA determines an AOPI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The objective of the SI is to identify whether there has been a release of PFOS, PFOA, and PFBS to the environment from any of the AOPIs identified in the PA and to determine if further investigation is warranted.

Installation-specific data quality objectives (DQOs) and the sampling design and rationale are summarized in **Sections 6.1** and **6.2**.

1.3 PA/SI Process Description

For RIA, PA/SI development followed a similar process as described in **Sections 1.3.1** through **1.3.5** below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for RIA. The PA and SI processes are documented in the PA/SI Quality Control Checklist included as **Appendix B**.

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), RIA, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 24 June 2019, approximately 8 weeks before the site visit to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

Records review was conducted before the site visit to obtain electronically available documents from the installation and external sources for review. The purpose of the records research was to identify any area

on the installation that may have been a location where PFAS-containing materials were used, stored, and/or disposed, as well as gather information on the physical setting and site history at RIA.

A read-ahead package was prepared and submitted to the appropriate POCs two weeks before the site visit. The read-ahead package contained the following information:

- The Installation Management Command operation order
- The Army PA Operations Security requirements package, which includes the antiterrorism/operations security review cover sheet (**Appendix C**)
- The PFAS PA kickoff call minutes
- An information paper on the PA portion of the Army's PFAS PA/SI
- Contact information for key POCs
- A list of the data sources requested and reviewed
- A list of preliminary locations identified during the kickoff call and pre-site visit records review to be evaluated for use, storage, and/or disposal of PFAS-containing materials, where additional information on those areas will be collected through personnel interviews, additional document review, and site reconnaissance.
- A list of roles for the installation POC to consider when recommending potential interviewees.

1.3.2 Preliminary Assessment Site Visit

The site visit was conducted from 20 to 22 August 2019. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

Personnel interviews were conducted with individuals having significant historical knowledge at RIA. The interviews focused on confirming information discussed in historical documents, collecting information that may have not been in historical documents, and corroborating other interviewees' information.

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts, and the migration potential from each AOPI (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved or unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells, if present, was also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. Photo documentation of the preliminary locations was collected, and access limitations or advantages related to potential further investigations were noted.

An exit briefing was offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The exit briefing was conducted on 22 August 2019 with the installation to discuss preliminary findings of the PA site visit.

1.3.3 Post-Site Visit

Information collected before, during, and after the visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during site visit reconnaissance. A site visit trip report was completed and provided to the installation POC, applicable USAEC POCs, and USACE regional POCs following the site visit. The information collected during the pre-site visit and site visit activities was compiled to develop the installation-specific PA portion of the PA/SI report (**Section 3**). Site data obtained during the PA were used to develop preliminary conceptual site models (CSMs) for each AOPI, which serve as the basis for developing the SI scope of work presented in an installation-specific Quality Assurance Project Plan (QAPP) Addendum. GIS data layers created for the project are included in a Spatial Data Standards for Facilities, Infrastructure, and Environment-compliant geodatabase.

1.3.4 Site Inspection Planning and Field Work

The SI process was initiated at the installation to evaluate PFOS, PFOA, and PFBS presence or absence at each AOPI and determine whether further investigation is warranted. First, an SI scoping teleconference was held between the Army PA team and RIA.

The objectives of this teleconference were to:

- discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI.
- gauge regulatory involvement requirements or preferences.
- identify specific installation access requirements and potential schedule conflicts.
- discuss general SI deliverable and field work schedule information and logistics.
- provide an updated SI deliverable and field work schedule.

Following development of the SI sampling technical approach, an SI scoping teleconference was held to obtain concurrence on the SI sampling plan from USAEC, USACE, and the installation. Additional discussion topics included:

- regulatory involvement requirements or preferences.
- identify overlapping unexploded ordinance or cultural resource areas.
- confirm the plan for investigation-derived waste (IDW) handling and disposal.

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP) was developed and finalized in October 2019 for the USAEC PFAS PA/SI (Arcadis 2019). The PQAPP details general planning processes for collecting data and describes the implementation of quality assurance (QA) and quality control (QC) activities for the SI portion for Army installations nationwide. Additionally, an installation specific QAPP Addendum was developed to define the DQOs, present the sampling design and rationale, and provide qualifications for project personnel. The SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation specific QAPP Addendum. A Site Safety and Health Plan (SSHP) was also developed as an attachment to the QAPP Addendum to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was

developed for Army installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

The DQOs, sampling design and rationale, and field methods employed for the SI are summarized from the QAPP Addendum developed for RIA (Arcadis 2020) in **Sections 6.1** through **6.3**.

After finalization of the QAPP Addendum and SSHP, field planning and coordination with the installation and subcontractors was completed. Once the schedule was determined, field teams mobilized to the installation to complete the scope of work defined in the QAPP Addendum.

1.3.5 Data Analysis, Validation, and Reporting

Environmental samples collected during the SI were submitted to a laboratory which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry and compliant with the DoD Quality Systems Manual (QSM) 5.3 (DoD and Department of Energy). Laboratory analytical results were then validated and verified by a project chemist to assess the usability of the data collected. Validated analytical results were summarized in the context of OSD risk screening levels (defined in **Section 6.5**).

2 INSTALLATION OVERVIEW

The following subsections provide general information about RIA, including the location and layout, the installation mission(s) over time, a brief site history, current and projected land use, climate, topography, geology, hydrogeology, surface water hydrology, potable wells within a 5-mile radius of the installation, and applicable ecological receptors.

2.1 Site Location

RIA is a 946.3-acre island in the Mississippi River located in Rock Island County, Rock Island, Illinois (**Figures 2-1** through **Figure 2-3**). The island, also referred to as Arsenal Island, is located within the Quad Cities metropolitan area consisting of Davenport, Iowa (population 102,157), Bettendorf, Iowa (population 34,207), Rock Island, Illinois (population 39,018) and Moline, Illinois (population 43,116) (Rock Island Arsenal 2016). Arsenal Island is divided between three organizations: RIA (866.5 acres), USACE (9.5 acres), and the U.S. Department of Veterans Affairs (70.3 acres). The U.S. Department of Veterans Affairs portion of the island includes a National cemetery and a Confederate cemetery (URS Group, Inc. 2015).

2.2 Mission and Brief Site History

RIA has been owned and operated by the U.S. government since the title to the land was obtained in 1804 through a treaty with the Sauk and Mesquaki (Fox) Native Americans. During the Civil War (1863 to 1865), the island served as a prisoner of war camp for Confederate soldiers. Early operations included forging, smithing, tinning, producing gun carriages and powder cases, manufacturing and repairing small arms, operating harness shops, and loading ammunition. Operations from World War I through the 1960s included the manufacture and/or modification of automotive vehicles, demolition bombs, bomb racks, aircraft engines, light tanks, recoil mechanisms, machine guns, rocket launchers, breech mechanisms, and Honest John and Nike Hercules launchers. Manufacturing operations have declined since World War II, except during periods of international conflict.

Although the nature of the components manufactured, fabricated, and tested at RIA have varied considerably throughout its history, the industrial processes necessary for those missions have remained relatively consistent (Science Applications International Corporation [SAIC] 1999 and URS Group, Inc. 2015).

The current mission of RIA is to manufacture artillery, gun mounts, recoil mechanisms, small arms, and spare parts, perform tool set, fabricate and assemble basic issue items. RIA also provides administrative, logistical, and facility support services for various tenants. These tenants include the Joint Manufacturing and Technology Center, U.S. Army Joint Munitions Command, First Army, Army Sustainment Command, U.S. Army Acquisition Support, Edgewood Chemical Biological Center, and Navy Surface Warfare Center Division (URS Group, Inc. 2015).

2.3 Current and Projected Land Use

RIA is currently setup as a military installation with heavy manufacturing operations, administrative offices, and residences. Approximately 75 residences are present at RIA in the center and northwestern portions of the island. The land use of the Quad Cities area varies and includes retail services, administrative and industrial areas, residential, transportation, wholesaling, warehousing, utilities, recreation, conservation areas, and a cemetery.

The Sylvan Slough is small channel off the Mississippi River located on the south side of Arsenal Island. The Quad City Industrial Center (QCIC) lies across the Sylvan Slough from the middle portion of RIA. This 80-acre industrial park formerly housed an underground storage tank and consisted of woodworking shops, small copper and nickel-plating operations, and tractor assembly operations. Operations at the QCIC resulted in numerous spills, leaks, seeps, or releases to the Sylvan Slough which were addressed by the Illinois Environmental Protection Agency. Also, in 1993, a release of diesel fuel to the Sylvan Slough was traced to an underwater outfall that was part of a series of old storm sewers underlying the QCIC. Sampling performed in association with this release indicated the presence of polynuclear aromatic hydrocarbons and volatile organic compounds in soil and groundwater. Cleanup and correction activities conducted at the site included the emplacement of booms to collect fuel released to the Sylvan Slough, the plugging of the offending outfall, and the installation of a product recovery system (URS Group, Inc. 2015).

2.4 Climate

The climate of RIA is classified as Humid Temperate Domain and is regulated by tropical and polar air masses. Seasons consist of strong annual cycles of temperature and precipitation with hot summers and cold winters. The average annual precipitation ranges from 20 to 40 inches (SAIC 2002).

2.5 Topography

RIA is characterized by a gently rolling terrain with surface elevations ranging from 550 feet above mean sea level to 593 feet above mean sea level (SAIC 2010). The elevation of the center of the island is generally higher than the outside borders of the island and the surface runoff flows away from the center toward the south-southwest and north-northwest. The topography of the island has changed over time due to construction activities, with 80 percent (%) of the western half of the island impacted to a depth greater than 6 feet (URS 2015).

2.6 Geology

Geology at RIA consists of a thin layer of unconsolidated material overlying Paleozoic sedimentary bedrock. The unconsolidated layer ranges in thickness from zero to 20 feet below ground surface (bgs) and consists primarily of silts and clays. Below the unconsolidated layer is a Pennsylvanian Shale which can be approximately 20 feet thick in some areas, and not present in others. The Pennsylvanian Shale overlies a Devonian Limestone which ranges in thickness from 40 to 80 feet thick. The Devonian Limestone overlies a Silurian Dolomite formation which is approximately 300 feet thick (URS 2015).

2.7 Hydrogeology

Depth to groundwater at RIA ranges from a few feet to over 30 feet bgs. Groundwater at RIA is divided into three aquifers: the shallow unconsolidated aquifer, shallow bedrock aquifer, and deep bedrock aquifer. The unconsolidated aquifer is limited to the top layer and does not extend deeper than 20 feet. The shallow bedrock aquifer includes the Pennsylvanian Shale, Devonian Limestone, and Silurian Dolomite (URS 2015). These aquifers are hydrologically connected to the Mississippi River. Installation personnel have noted groundwater seeps into the Mississippi River on the southern end of the installation near the Old Landfill. The surface water seep is only observed when the Mississippi River is gaining. The deep bedrock aquifer is found in a confined sandstone aquifer approximately 1,000 feet bgs (URS 2015).

2.8 Surface Water Hydrology

Groundwater and surface water flow on the island varies depending on the location on the island. In general, the flow on the northern portion of the island is to the north-northwest and flow on the southern portion of the island is to the south-southwest. The island is situated in the Mississippi River which flows from east to west along the island. A perennial stream is located on the northeast corner of the island. On the south side of the island is the Moline Pool, which is separated from the Mississippi River by the smaller Sylvan Island. The Sylvan Slough is a small channel just to the south of Sylvan Island and Arsenal Island.

2.9 Relevant Utility Infrastructure

The following subsections provide general information regarding the installation's stormwater and wastewater management systems, as well as information on how the utility infrastructures may influence the fate and transport of PFAS at RIA.

2.9.1 Stormwater Management System Description

Surface drainage at RIA primarily flows into open ditches which flow into catch basins and then through storm drains to outfalls located around the perimeter of the island (**Figure 2-2**). Generally, surface drainage from all of the buildings located west of East Avenue, between the golf course on the north and Rodman Avenue on the south, is through storm drainpipes into the Mississippi River. The test tracks and Confederate Cemetery (central-east portion of island) drain south into the Moline Pool. The Small Arms Simulator, National Cemetery Area, and the Gymnasticator Building (far east portion of island) drain into the Sylvan Slough. The remaining areas at RIA drain southward through storm drains to eight outfalls spaced along the Sylvan Slough shoreline (**Figure 2-2**). Areas south of the warehouses (Buildings 170 through 199) and other areas along the southern side of RIA generally drain southward to the Sylvan Slough (URS Group, Inc. 2015).

2.9.2 Sewer System Description

The sanitary sewer system at RIA is separate from the storm sewer. All sanitary sewer lines lead to Building 204 on the southwest portion of the island. Building 204 serves as a lift station and transports the wastewater to the City of Rock Island treatment plant.

2.10 Potable Water Supply and Drinking Water Receptors

All potable wells were abandoned at RIA as of 2019. The site receives drinking water from the Mississippi River via a drinking water intake, located on the north-central portion of the island inside Building 9 (**Figure 2-2**). The RIA drinking water intake has been sampled for PFAS by RIA on four occasions; the highest combined concentration of PFOS/PFOA detected was 10.9 ng/L in a sample collected during September 2018 (**Table 2-1**). According to a 2019 consumer confidence report, over 80 contaminants were tested for comparison to maximum contaminant levels and all samples were below these levels (IEPA 2019).

An Environmental Data Resources, Inc. (EDR) report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. An EDR report was generated for RIA, which along with state and county GIS provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary. The EDR report providing well search results provided as **Appendix E**.

The City of Rock Island drinking water intake is located on the Mississippi River, approximately 0.1 mile off the western tip of the island, on the lock-and-dam system, downstream of six AOPIs (**Figure 2-2**).

2.11 Ecological Receptors

The PA team collected information regarding ecological receptors that was available in the installation documents. The following information is provided for future reference should the Army decide to evaluate exposure pathways relevant to the ecological receptors.

2.11.1 Plant Communities and Habitats

RIA is part of the Prairie Parkland Province ecological region and contains deciduous forest trees including cottonwood, black willow, and oak. RIA also contains areas of managed grass fields and weedy plants. Wetland areas are located on the west end of RIA at Sylvan Slough. These areas were heavily populated with silver maple (*Acer saccharinum*), box elder (*Acer negundo*), and knotweeds (*Polygonum spp.*) (URS Group, Inc. 2015).

2.11.2 Fauna

The fauna of the Arsenal Island area is consistent with that of Western Illinois and Eastern Iowa. Rodents such as squirrels (*Squirus carolinensis*) and groundhogs (*Marmota monax*) are abundant throughout RIA. Arsenal Island is also a resting spot and breeding ground for numerous migratory birds and waterfowl.

The entire eastern shoreline of Sylvan Slough is a pre-spawning staging area for walleye (*Stizostedion vitreum*) and sauger (*S. canadellse*). Sylvan Slough is also designated as a State of Illinois mussel sanctuary (URS Group, Inc. 2015).

2.11.3 Protected Species

Federally listed threatened and endangered species have been known to exist on Arsenal Island, and some migratory species have been documented as frequenting the island. Several federal and state listed

endangered species of mussels exist along Sylvan Slough including: higgins eye pearlymussel (*Lampsilis higginsii*), sheepnose mussel (*Plethobasus cyphus*) and spectaclecase mussel (*Cumerlandia monodonta*), and the near threatened butterfly mussel (*Ellipsaria lineolata*). Sylvan Island is a wintering site for the formerly listed endangered bald eagle. RIA actively participates in the U.S. Fish and Wildlife Service's Endangered Species Recovery Program for this species (URS Group, Inc. 2015).

2.12 Previous PFAS Investigations

Apart from the drinking water intake pump sampling discussed in **Section 2.10**, there have been no other PFAS investigations conducted at RIA. PFAS samples collected from eight zip codes in a 5-mile radius surrounding RIA during the third Unregulated Contaminant Monitoring Rule sampling were below detection limits.

3 SUMMARY OF PA ACTIVITIES

To document areas where any potential current and/or historical PFAS-containing materials were used, stored and/or disposed at RIA, data was collected from three principal sources of information:

1. Records review
2. Personnel interviews
3. Site reconnaissance.

These sources of data, along with their relative application to this PA, are discussed below. The specific findings of records review, personnel interviews, and site reconnaissance relevant to PFAS-containing materials at RIA are described in **Section 4**.

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various Installation Restoration Program (IRP) administrative record documents, compliance documents, RIA fire department documents, RIA directorate of public works documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for RIA is provided in **Appendix F**.

3.2 Personnel Interviews

Interviews were conducted during the site visit.

The list of roles for the installation personnel interviewed during the PA process for RIA is presented below (affiliation is with RIA unless otherwise noted).

- Directorate of Public Works – Environmental (PWE), Restoration Program Manager
- PWE, Master Planner
- PWE, Environmental Engineer
- Historian
- PWE, Environmental Engineer
- Fire Department, Fire Chief
- Fire Department, Deputy Fire Chief
- Fire Department, Lead Fire Inspector
- Chief Water System Operator
- PWE, Hazardous Materials Manager
- Safety Officer

The compiled interview logs are provided in **Appendix G**.

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at RIA during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. The site reconnaissance logs are included in **Appendix G**.

Access to existing groundwater monitoring wells, if present, was also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling.

Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review, personnel interviews, and/or site reconnaissance) and were categorized as AOPIs or as areas not retained for further investigation at this time. A summary of the observations made, and data collected through records reviews (**Appendix F**), installation personnel interviews and site reconnaissance logs (**Appendix G**) during the PA process for RIA is presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**, and further discussion regarding categorizing areas as AOPIs is presented in **Section 5.2.**

4 POTENTIAL PFAS USE, STORAGE AND/OR DISPOSAL AREAS

RIA was evaluated for all potential current and historical use, storage, and/or disposal of PFAS-containing materials. There are a variety of PFAS-containing materials 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 prevalent potential source of PFAS chemicals at DoD facilities. As such, this section is organized to summarize the AFFF-related uses first, and all remaining potential PFAS-containing materials in the subsequent section.

4.1 AFFF Use, Storage, and Disposal Areas

AFFF was developed in the mid-1960s in response to a need for firefighting foams better suited to extinguish Class B, fuel-based fires. AFFF formulations consist of water, an organic solvent, up to 5% hydrocarbon surfactants, and 1 to 3% PFAS (Interstate Technology Regulatory Council 2020). AFFF concentrate is designed to be diluted with water to become a 1, 3, or 6% foam. AFFF releases at DoD facilities may have occurred during firefighter training, emergency response actions, equipment testing, or accidental releases. The military still primarily uses AFFF for Class B fires; however, the current formulations of AFFF contain significantly lower amounts of PFOS, PFOA, and their precursors, and significant operational changes have been implemented to restrict uncontrolled releases and non-essential use of PFAS-containing foams. Army installations may still house AFFF, commonly stored in closed containers (e.g., 55-gallon drums, 5-gallon buckets), within designated storage buildings or at firehouses.

During the PA, AFFF-use and storage was identified at nine areas at RIA: Fire Department Boat Launch Area, former XYZ Fire Training Area, Current Fire Training Area, Bradley Flamethrower Testing Area, Building 90, Building 107, Building 144, Building 159, and Building 341. All nine areas were identified as AOPIs; however, the Fire Department Boat Launch Area was excluded from SI sampling. The Fire Department Boat Launch area was identified as an AOPI following observation of photographs showing foam operations being conducted in the Mississippi River, directly upgradient of the City of Rock Island drinking water intake from approximately 1969 to 1974. During operations, the foam would have quickly been transported downstream and any samples collected today would not be representative of past releases.

Firefighting training occurred at two locations at RIA: the former XYZ Fire Training Area and the Current Fire Training Area. The former XYZ Fire Training Area is located on the southern end of the island, north of the eastern end of the Old Landfill. Fire training operations ended in 1982. There are seeps located in the Mississippi River on the southern end of the island, downgradient from the former XYZ Fire Training Area and the Current Fire Training Area. The Current Fire Training Area is located directly to the east of the former XYZ Fire Training Area. Photographs taken in 2001 show the RIA fire department using AFFF at the Current Fire Training Area. Due to their overlapping proximity, the former XYZ Fire Training Area and Current Fire Training Area were combined into one AOPI.

AFFF use was suspected at the Bradley Flamethrower Testing Area and Building 90. Interviewees at RIA recalled that flamethrower testing occurred in the open area west of Building 212, now referred to as the Bradley Flamethrower Testing Area AOPI. The timeframe of the testing operations and use of AFFF at these areas is unknown. A large fire occurred in the basement of Building 90 in 1979. The methods used to extinguish the fire are unknown. Common practice indicates AFFF was likely used to extinguish the fire in this building. There is also the potential the fire hose lines containing AFFF were drained outside the building after the fire response was complete. As such, this area was classified as an AOPI.

AFFF storage was identified at five locations at RIA and all five of these locations were identified as AOPIs. Building 107 served as a storage area for reserve fire trucks that contained AFFF. Building 144 housed 46 gallons of AFFF concentrate for the RIA fire department prior to off-post disposal. Building 159 once served as a fire truck maintenance area. Maintenance on trucks that contained AFFF was conducted inside and outside of this building. Interviewees that work at this location indicated the storm sewer was compromised during flood events. Building 341 is a large warehouse located on the northwest portion of the island. It currently houses approximately 15 gallons of AFFF concentrate. AFFF was also housed in a foam trailer at this location until 2017. Approximately 200 gallons of AFFF concentrate was stored inside this building on a pallet with no secondary containment. From 2006 to 2008, Building 225 was remodeled to the current fire station. Personnel indicated the excavated soil from this area may have been transported to the Building 25 Soil Lay-Down Area for disposal during renovation activities. Fire trucks containing AFFF were also stored here in the past. Interviewees noted all fire trucks leaked AFFF while stored at this location.

4.2 Other PFAS Use, Storage, and/or Disposal Areas

Three areas at RIA were identified as having had, or possibly having had, metal plating operations conducted inside, including the use of chromium. These buildings are Buildings 64 and 65, Buildings 66 and 69, and Building 212.

Potential PFAS use associated with metal plating activities may also be relevant to Army installations. During metal plating operations, a metal surface may be treated with a layer of electrochemically deposited metals in an acid bath. PFAS, specifically PFOS, have been used in metal plating operations as surface tension-reducing wetting agents to mitigate the release of aerosolized chemicals into a working environment. Hard chromium plating is one type of metal plating operation where PFAS-containing mist suppressants were commonly used. Historically, it was common for spent plating baths from metal plating operations to be disposed of in a lined or unlined pit or into a sanitary or storm sewer. Therefore, PFAS present in mist suppressants during the metal plating process could be released to the environment.

Building 64 is a former chromium plating shop located in the center of the island. Building 65 was located in the courtyard of Building 64 and served as a wastewater treatment center for Building 64 but has since been demolished and the area paved over. These two buildings are collectively referred to as AOPI Buildings 64 and 65. Building 66 is located in the center of the island and formerly housed chemicals used during chromium plating operations conducted in Building 64. Building 69 is located in the center of the island where former chromium plating operations are believed to have occurred until approximately 1990. Liquid wastes were discharged to a brick sewer from a sump located at the north end of Building 69. Heavy metals including chromium were found in soil during excavation. These two buildings are collectively referred to as AOPI Buildings 66 and 69. Building 212 is the current chromium plating shop.

No mist suppressants have been used in this building within the past 10 years. The type of mist suppressant used historically during operations in this building is unknown; however, a potential use of 3M mist suppressants was noted by interviewees during the PA site visit. Building 212 also contains a wastewater pretreatment plant for effluent from metal plating operations and contains four sumps in the basement that are connected to groundwater.

Other potential PFAS use, storage, and/or disposal areas included Building 222, Building 220, and Building 32 which housed hydraulic oil and Building 25 which housed cleaners, lubricants, and preservatives (CLP). Building 162 was a former car wash located to the southwest of Building 159. Building 208 is the current paint shop where wastewater is collected and recirculated for painting applications. The Test Track/Old Quarry are located on the eastern end of the island. Pesticide use and fires extinguished with AFFF were thought possible in this area.

It was noted during a discussion with a USAEC Pest Management Consultant that the larger group of pesticides are generally not of PFAS concern. Specifically, products containing Sulfluramid (i.e., associated with insecticides) may have contained PFAS and were phased out in 1996. The USAEC Pest Management Consultant has records of pesticides used and stored at Installation Management Command installations, including RIA, and did not identify RIA as an installation ever using or storing PFAS-containing pesticides/insecticides. Additionally, the PA team reviewed available pesticide use inventory documentation provided by the installation and did not identify PFAS-containing pesticides use, storage, or disposal.

Following document research, personnel interviews, and site reconnaissance at RIA, three waste management facilities were identified as AOPIs: Old Landfill, Building 25 Soil Lay-down Area and Sludge Drying Beds. The Old Landfill is located on the southern side of the island. Historical documents indicate that electroplating solutions and wastes from other industrial processes at RIA were disposed here. Burn pits were located on the eastern side of the Old Landfill where fire training occurred. AFFF use was not verified here; however, common practice indicates the use of AFFF during fire training exercises. Seeps are also located in the Mississippi River on the eastern end of the Old Landfill, downgradient of the fire training areas and burn pits. The Sludge Drying Beds are located to the west of the Water Treatment Plant (Building 50), downgradient of the RIA drinking water intake. The drying beds are unlined, and sludge is taken offsite for disposal. The Building 25 Soil Lay-Down Area is located on the northeastern portion of the island, upstream of the RIA drinking water intake. Excavated soil from the remodeling of the RIA Fire Department (Building 225) could have been placed here.

4.3 Readily Identifiable Off-Post PFAS Sources

An exhaustive search to identify all potential off-post PFAS sources (i.e., not related to operations at RIA) is not part of the PA/SI. However, potential off-post PFAS sources within a 5-mile radius of the installation that were identified during the records search and site visit are described below.

There were two occurrences of the RIA Fire Department responding to offsite fires. The first occurred at I-80 Mile Post 27 on 16 May 2013. In this instance, foam was used on a semi-truck rollover accident involving a petroleum fire. The second occurred at I-80 Mile Post 30 on 22 November 2017. This incident resulted in the release of approximately 1,500 gallons of 3% AFFF used to extinguish another petroleum fire from a semi-truck rollover accident. Offsite sampling is outside the scope of this SI but may be included as part of further investigation.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The areas evaluated for potential use, storage and/or disposal of PFAS-containing materials at RIA were further refined during the PA process and identified either as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA/SI, 15 have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

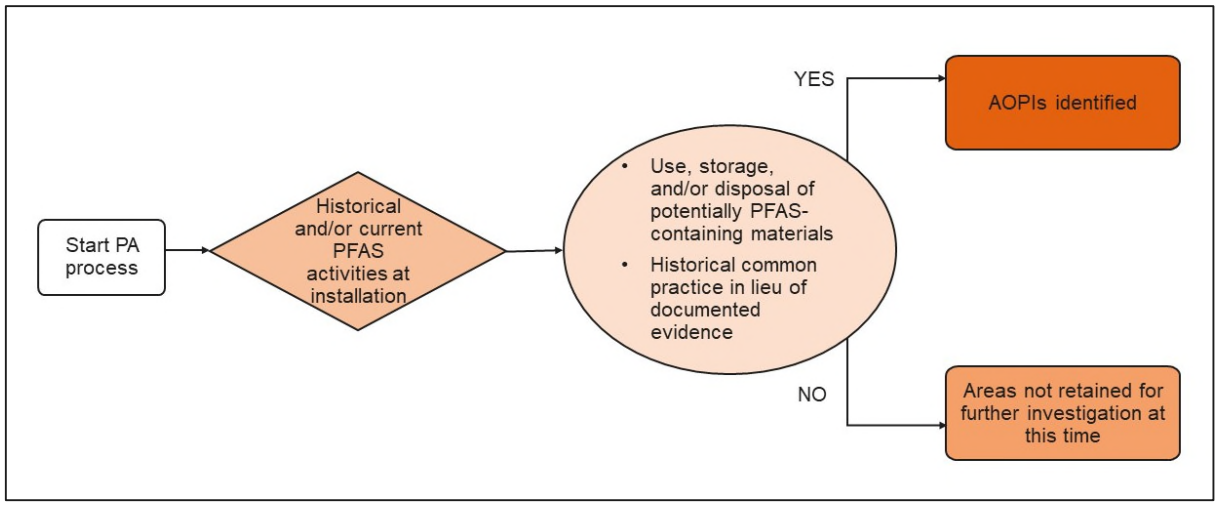

Figure 5-1: AOPI Decision Flowchart

The areas not retained for further investigation are presented in **Section 5.1**. The areas retained as AOPIs are presented in **Section 5.2**.

Data limitations for this PA/SI at RIA are presented in **Section 8**.

5.1 Areas Not Retained for Further Investigation

Through the evaluation of information obtained during records review, personnel interviews, and/or site reconnaissance, the areas described below were categorized as areas not retained for further investigation at this time.

A brief site history and rationale for areas not retained for further investigation is presented in **Table 5-1**, below.

Table 5-1. Installation Areas Not Retained for Further Investigation

Area Description	Relevant Site History	Rationale
Building 25	Building 25 is a weapons testing facility located just outside the Moline Gate. CLPs are used inside the building. The use of CLPs is limited to inside the building and they are securely stored in a flammables cabinet.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here
Building 32	Building 32 is a support building for the artillery testing range located near Building 25. Hydraulic oil is stored outside the building in 55-gallon drums on a concrete slab.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here
Building 162	Building 162 was a former car wash located to the southwest of Building 159. The nature of the materials used is unknown.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here
Building 208	Building 208 is the paint shop. This building has concrete flooring and no drains. It was noted during the site visit that wastewater was collected and recirculated for painting applications within this building.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here
Building 220	Building 220 houses hydraulic oils and had drains that lead to the street outside. Building 220 is the non-destructive testing area where film processing had taken place. Photo processing solutions were still located in a container on the ground in the photo lab. The photo lab had concrete floors with drains, but it was not determined where the drains emptied.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here
Building 222	Building 222 is the heat treat facility. Hydraulic oil is housed and used in this building during operations.	It is unlikely that any PFAS-containing products were used, stored, or disposed of here

Area Description	Relevant Site History	Rationale
Test Track/Old Quarry	The Test Track is located on the eastern end of the island. The Old Quarry is located in the center of the Test Track. Pesticides have been used around a pond in the Old Quarry, but there is no indication these contain PFAS. There was also no indication of any fires or AFFF use at the Test Track	It is unlikely that any PFAS-containing products were used, stored, or disposed of here

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Three of the AOPIs overlap with RIA IRP sites and/or Headquarters Army Environmental System (HQAES) sites (**Figure 5-2**). The AOPI, overlapping IRP site identifier, HQAES number, and current site status are discussed within each AOPI subsection presented below. At the time of this PA, none of the RIA IRP sites have historically been investigated or are currently being investigated for the possible presence of PFAS.

The AOPI locations are shown on **Figure 5-2**. Aerial photographs of each AOPI that also show the approximate extent of AFFF use (if applicable) are presented on **Figures 5-3** through **5-9** and include active monitoring wells in the vicinity of each AOPI.

5.2.1 Building 25 Soil Lay-Down Area

The Building 25 Soil Lay-Down Area is located on the northeastern portion of the island. Excavated soil from the remodeling of Building 225 (Fire Department) could have been placed here. The surrounding land surface is primarily grass. The Building 25 Soil Lay-Down Area is shown on **Figure 5-3**.

5.2.2 Buildings 64 and 65 (HQAES 17775.1012/17775.1013)

Buildings 64 and 65 are located in the center of the island and are considered a single AOPI due to their overlapping boundaries. Building 64 is a former chromium plating shop. Building 65 was located in the courtyard of Building 64 and served as the wastewater treatment center for the chromium plating operations in Building 64. Specific details regarding the chemical mist suppressants potentially used here were not available, therefore it is unknown if the chemicals were PFAS-containing materials. Building 64 is still present but Building 65 no longer exists. The courtyard area is now an asphalt and concrete covered parking lot. Buildings 64 and 65 are shown on **Figure 5-4**. Buildings 64 and 65 have previously been investigated for other contaminants including chromium, chlorinated solvents, and cyanide.

5.2.3 Buildings 66 and 69 (HQAES 17775.1014)

Buildings 66 and 69 are located next to Buildings 64 and 65 in the center of the island. Building 66 formerly contained chemicals from the chromium plating operations conducted in Building 64. Chromium

plating operations are also believed to have occurred at Building 69 until 1990. Building 69 discharged liquid wastes to a brick sewer from a sump located at the north end of the building. Heavy metals including chromium were found in soil during previous excavations. Building 66 still exists and a courtyard is present where Building 69 used to be. Similar to Buildings 64 and 65, this courtyard area consists of an asphalt and concrete covered parking area. Buildings 66 and 69 are shown on **Figure 5-4**. Buildings 66 and 69 have previously been investigated for contaminants including metals and volatile organic compounds.

5.2.4 Building 90

In 1979, a large fire occurred in the basement of Building 90. The methods used to extinguish this fire are unknown, but its timeframe suggests AFFF use. There is also the potential that the lines containing AFFF were drained outside after the fire response was complete, therefore this area is considered an AOPI. The surrounding land cover at Building 90 is primarily an asphalt lined drive and parking area, with intermittent grass. Building 90 is shown on **Figure 5-5**.

5.2.5 Building 107

Building 107 served as storage for reserve fire trucks containing AFFF. The timeframe for this storage is unknown. The surrounding land surface is primarily asphalt and concrete. Building 107 is shown on **Figure 5-6**.

5.2.6 Building 144

Building 144 housed 46 gallons of AFFF concentrate for the RIA fire department prior to disposal in 2019. The duration of this storage is unknown. The surrounding land surface is primarily asphalt and concrete. Building 144 is shown on **Figure 5-7**.

5.2.7 Building 159

Building 159 once served as a fire truck maintenance area. Trucks containing AFFF were stored here temporarily for maintenance which was conducted indoors and outdoors. The surrounding land surface is primarily asphalt and concrete. Building 159 is shown on **Figure 5-7**.

5.2.8 Building 212

Building 212 is the current chromium plating shop at RIA. Interviewees verified that mist suppressants have not been used here in the last 10 years. However, mist suppressant use prior to that is unknown. Interviewees noted that a 3M mist suppressant could have been used but could not confirm. Building 212 also houses a wastewater pretreatment plant for effluent from chromium plating operations. Four sumps are located in the building that are connected to groundwater. Building 212 is shown on **Figure 5-8**.

5.2.9 Building 225 (Current Fire Department)

Building 225 is the current RIA fire department and has been since the early 1900s. The building was remodeled to the current extents from 2006 to 2008, with some excavated soil possibly disposed of at the

Building 25 Soil Lay-Down Area. Fire trucks containing AFFF were stored here in the past and interviewees noted that all fire trucks leaked AFFF while it was housed in the trucks. The surrounding land surface is asphalt/concrete parking areas and a grass yard. Building 225 is shown on **Figure 5-6**

5.2.10 Building 341

Building 341 is a large warehouse located on the northwest portion of the island. It currently houses approximately 15 gallons of AFFF concentrate. AFFF was formerly housed in a foam trailer at this location until 2017 when the foam was used at an offsite fire. Also, approximately 200 gallons of AFFF concentrate were stored inside this building on a pallet with no secondary containment. The surrounding land surface is primarily asphalt and concrete with some grass. Building 341 is shown on **Figure 5-8**.

5.2.11 Bradley Flamethrower Testing Area

The Bradley Flamethrower Testing Area was identified as an AOPI following interviews that indicated testing of Bradley Flamethrowers in the open area west of Building 212. The timeframe of the testing operations and use of AFFF are unknown. Surface cover at this area is primarily grass and gravel. The Bradley Flamethrower Testing Area is shown on **Figure 5-8**.

5.2.12 Current Fire Training Area/XYZ Fire Training Area

The former XYZ Fire Training Area is located on the southern end of the island, north of the eastern end of the Old Landfill. There are seeps located on the southern end of the island, in the direction of groundwater flow from the XYZ Fire Training Area. The Current Fire Training Area is located directly to the east of the XYZ Fire Training Area. Photographs from 2001 show the RIA fire department using AFFF in this area. Due to their overlapping proximity, the XYZ Fire Training Area and Current Fire Training Area were combined into a single AOPI. The surrounding land surface is gravel and grass. The Current Fire Training Area/XYZ Fire Training Area are shown on **Figure 5-9**.

5.2.13 Fire Department Boat Launch Area

The Fire Department Boat Launch Area was identified as an AOPI after discovery of photographs showing the RIA fire department using foam in the Mississippi River, directly upgradient of the City of Rock Island drinking water intake. The exact timeframe is unknown, but the photograph is believed to have been taken between 1969 and 1974. During operations, the foam would have quickly been transported downstream. Surface water or sediment sampling during this SI would not capture impacts from historical releases and may capture PFAS sources that originated from locations other than RIA. As a result, SI sampling was not performed at this AOPI. SI sampling was performed at the remaining 14 AOPIs. The Fire Department Boat Launch Area is shown on **Figure 5-8**

5.2.14 Old Landfill (RIA-001/ HQAES 17775.1001)

The Old Landfill is located on the southern side of the island. Historical documents indicate that electroplating solutions and wastes from other industrial processes at RIA were disposed of here. Burn pits were located on the eastern side of the Old Landfill where fire training occurred. AFFF use was not verified here, however common practice indicates the use of AFFF during fire training exercises. Seeps

are also located on the eastern end of the Old Landfill, downgradient of the fire training areas and burn pits. A cap is present over the Old Landfill.

The Old Landfill is displayed on **Figure 5-9**. It is a grassy covered area that is exposed to seasonal flooding. The Old Landfill is listed as IRP site RIA-001 for contaminants of concern including metals, pesticides, petroleum, oil and lubricants, polycholorinated biphenyls, semivolatile and volatile organic compounds.

5.2.15 Sludge Drying Beds

The Sludge Drying Beds are located west of the Water Treatment Plant in the center of the island. The beds are unlined, and all sludge is taken offsite for disposal. PFOS and PFOA has been observed in RIA drinking water in low concentrations. Sludge from the treatment operations has the potential of concentrating those compounds. The surrounding land surface is primarily grass. The Sludge Drying Beds are shown on **Figure 5-4**.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at RIA, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at RIA at 14 of the 15 AOPIs to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. The Fire Department Boat Launch Area was not sampled during the SI sampling as noted in **Section 5.2.13**. As such, an installation specific QAPP Addendum (Arcadis 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, surface water, sediment, and groundwater pathways as potentially complete which guided the SI sampling. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in April 2020 and August 2020 through the collection of field data and analytical samples.

The SI field work was completed in accordance with the standard operating procedures (SOPs), technical guidance instructions (TGIs), sampling design, and QA/QC requirements as detailed in the QAPP Addendum (Arcadis 2020) and PQAPP (Arcadis 2019). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at RIA. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.4**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

As identified during the DQO process and outlined in the site-specific QAPP Addendum (Arcadis 2020), the objective of the SI is to identify whether there has been a release to the environment at the AOPIs identified in the PA and to determine if further investigation is warranted. This SI evaluated groundwater and/or soil for the presence or absence of PFOS, PFOA, or PFBS at each of the sampled AOPIs.

6.2 Sampling Design and Rationale

The rationale for sampling at each AOPI is illustrated on **Figure 6-1** below.

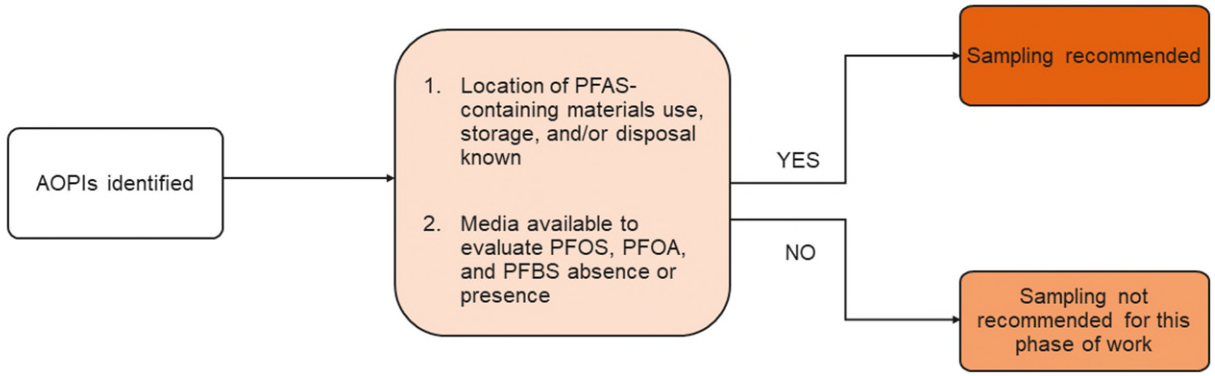

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at RIA is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Soil and groundwater samples were collected via direct-push technology (DPT) and sonic drilling at several AOPIs. When present, groundwater samples were collected from existing monitoring wells.

The sampling depths at existing monitoring wells were at the approximately the center of the saturated screened interval. **Table 6-1** includes the monitoring well construction details for the wells sampled during the SI.

6.3 Sampling Methods and Procedures

Environmental data were collected and analyzed in accordance with the PQAPP (Arcadis 2019), the SOPs and TGIs included as Appendix A to the PQAPP, the QA/QC requirements identified in Worksheet #20 of the PQAPP, the approved scope and sampling methods outlined in the site-specific QAPP Addendum (Arcadis 2020), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020). The sampling methods described in the SOPs and TGIs establish equipment requirements, procedures for preparing equipment and containers before sampling, sampling procedures under various conditions, and procedures for storing samples to ensure that sample contamination does not occur during collection and transport. In general, sampling techniques used in the SI were consistent with conventional sampling techniques used in the environmental industry, but special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019) and QAPP Addendum (Arcadis 2020). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., soil boring logs, groundwater purging logs, equipment calibration forms, tailgate health and safety forms, air monitoring forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices H** and **I**, respectively.

6.3.1 Field Methods

Groundwater samples were collected using low flow purging methods from approximately the center of the saturated screened interval at existing monitoring wells. At sampling locations where boreholes were advanced using DPT and rotary sonic methods, the drill casing was advanced using a top-down sampling method to minimize cross-contamination at depth. Soil samples were collected in PFAS-free acetate liners; a peristaltic pump with PFAS-free disposable high-density polyethylene tubing was used to collect groundwater samples through a screen-point sampler or temporary polyvinyl chloride casing.

Decontamination procedures for non-dedicated equipment used during sampling are described in **Section 6.3.5.**

6.3.2 Quality Assurance/Quality Control

Worksheets #20 of the PQAPP and QAPP Addendum provide QA/QC requirements for field duplicates, matrix spike/matrix spike duplicates, equipment blanks (EBs), and source blank for water used in the initial decontamination step for drill tooling, and field blanks for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of 1 per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS only. EBs were collected for media sampled for PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which EBs were collected include drill casing and cutting shoes, hand augers, and water-level meters as applicable to the sampled media. A source blank was collected from the water used to pressure-wash drill tooling. Analytical results for QA/QC samples are discussed in **Section 7.16**.

6.3.3 Dedicated Equipment Background

Dedicated equipment backgrounds (DEBs) were collected at a frequency of one DEB per AOPI in wells that contained dedicated equipment, per equipment type, and analyzed for PFOS, PFOA, and PFBS. When collecting samples from monitoring wells with dedicated, down-hole equipment, two water samples were taken from one monitoring well at each AOPI. One DEB sample was collected from the first water produced through the pump and tubing and was used to evaluate whether the dedicated equipment may be impacting the PFOS, PFOA, and/or PFBS results, as it is unknown if the dedicated equipment was comprised of PFAS-containing components; PFOS, PFOA, and/or PFBS concentrations in the DEBs reflect concentrations of stagnant groundwater, and they may be biased high by contributions from equipment that contains PFOS, PFOA, and/or PFBS components. The parent sample was collected after the well was purged until the field parameters stabilized. One DEB was collected from the Old Landfill from tubing installed in monitoring well POC-10. Further DEB analysis is included in **Section 7.13.1** and **Section 8**.

6.3.4 Field Change Reports

No instances of major scope modifications (i.e., those that may have had a significant impact on the project scope and/or data usability/quality, or required stop-work, and warranted discussion with USACE) were encountered during the RIA SI work.

In some cases, clarifications to the established scope of work may be needed but do not necessarily constitute a non-conformance from the sampling plans described in the QAPP Addendum. Minor modifications from and clarifications for the procedures and scope of work detailed in the QAPP Addendum and PQAPP and that did not affect DQOs are documented in Field Change Reports (FCRs) included as **Appendix J** and are summarized below:

- FCR-RIA-1: At the Current Fire Training/Former XYZ Fire Training Area, RIA-FTA-1 was moved approximately 100 feet to the east of the originally scoped position. RIA-FTA-3 was moved approximately 50 feet south of the originally scoped position. The locations were moved due to access restrictions at the original locations. Groundwater could not be obtained at the Current Fire Training/Former XYZ Fire Training Area due to shallow bedrock and a lack of groundwater in the overburden soil. The downgradient monitoring wells at the Old Landfill were deemed sufficient for determining presence/absence of PFOA, PFOS, and PFBS associated with this AOPI.
- FCR-RIA-2: Monitoring well RIA-OLF-POC-06 at the Old Landfill was underwater during the SI and was unable to be sampled. Nearby well RIA-OLF-POC-1A was selected as a replacement.
- FCR-RIA-03: At the Building 25 Soil Lay-Down Area, temporary well RIA-25-4 did not yield any water for sample collection. Additional drilling was not recommended due to concerns from the installation on the integrity of the levee.
- FCR-RIA-04: At Building 144, the temporary well at RIA-144-1 did not yield any water. An additional boring was attempted within the area cleared for utilities, which encountered bedrock at 4 feet bgs and did not yield water.
- FCR-RIA-05: At Building 225, water was not collected from all three borings attempted in April 2020 due to shallow bedrock and a lack of groundwater in the overburden soil. Downgradient groundwater samples were collected during a remobilization.
- FCR-RIA-06: At Building 107, underground utilities present forced the movement of RIA-107-1 and RIA-107-2 approximately 75 feet to the south. Also, a water sample was not collected from RIA-107-1 due to shallow bedrock and a lack of groundwater in the overburden soil.
- FCR-RIA-07: An additional mobilization was performed in September 2020 to sample groundwater at Building 225 using a rotary sonic rig and to collect groundwater samples from existing monitoring wells at Buildings 64 and 65 and Buildings 66 and 69.

6.3.5 Decontamination

Non-dedicated reusable sampling equipment (e.g., hand augers, drill cutting shoes and casing, water-level meters) that came into direct contact with sampling media was decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019; Appendix A).

6.3.6 Investigation-Derived Waste

IDW, including groundwater, excess soil cuttings, and decontamination fluids, were placed in Department of Transportation-approved 55-gallon drums, labeled as non-hazardous, segregated by waters and soil, and transported to a staging area. The majority of soil cuttings were returned to the borehole, however excess cuttings were placed in 55-gallon drums. IDW was transported to Hazmat, Inc. in Kansas City, Missouri under waste tracking numbers NH-16559 and NH-16208.

Equipment IDW was collected in bags and disposed in municipal waste receptacles. Equipment IDW includes personal protective equipment and other disposable materials (e.g., gloves, plastic sheeting, Lexan tubes, and high-density polyethylene and silicon tubing) that may come in contact with sampling media.

6.4 Data Analysis

The subsections below summarize the laboratory analytical methods and the methodology used to evaluate data collected during the SI through data verification and usability assessments (as completed by a project chemist, independent of the project team).

6.4.1 Laboratory Analytical Methods

Analytical samples collected during the SI were submitted to Pace South Carolina (formerly Shealy Environmental Services, Inc.), an ELAP-accredited laboratory for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.5 in the PQAPP (Arcadis 2019). PFOS, PFOA, and PFBS were analyzed for in groundwater and soil samples using an analytical method that is ELAP-accredited and compliant with QSM 5.3, Table B-15 (DoD and Department of Energy).

Additionally, the following general chemistry and physical characteristic analyses were completed for select soil samples in accordance with Worksheet #18 of the QAPP Addendum (Arcadis 2020) by the analytical method noted:

- Total organic carbon (TOC) by Solid Waste Test Method 846 9060A
- Grain size analysis by American Society for Testing and Materials D422-63
- pH by Solid Waste Test Method 846 9045D.

These data are collected as they may be useful in future fate and transport studies.

The laboratory limit of detection (LOD) is defined as “the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific matrix with a specific method at 99 percent confidence” (DoD 2017). The lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias is known as the limit of quantitation (LOQ; DoD 2017). Concentrations detected between the LOD and LOQ, therefore, are considered estimates and are qualified as such on laboratory analytical reports. Instrument-specific detection limits (e.g., the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99 percent confidence; DoD 2017), as provided for each analyte by the laboratory, are reported along with the LODs and LOQs in the laboratory analytical reports included in the Data Usability Summary Report (DUSR) (**Appendix K**).

6.4.2 Data Validation

All analytical data generated during the SI, except grain size, were verified and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.3 (DoD and Department of Energy). Additionally, 10% of the data underwent Stage 4 data validation. Copies of the data validation reports for each sample delivery group are included as attachments to the DUSR in **Appendix K**.

6.4.3 Data Usability Assessment and Summary

A data usability assessment was completed for all analytical data associated with SI sampling at RIA. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix K**), was prepared in accordance with the USACE Engineer Manual 200-1-10 (USACE 2005), the Final DoD General Data Validation Guidelines (DoD 2019) and the Final DoD Data Validation Guidelines Module 3: Data Validation Procedure for Per-and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD 2020), that reviewed precision, accuracy, completeness, representativeness, comparability, and sensitivity. A statement of overall data usability is included in the DUSR.

Based on the final data usability assessment, the environmental data collected at RIA during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUSR and its associated data validation reports (**Appendix K**), and as indicated in the full analytical tables (**Appendix L**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and RIA QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at RIA are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of DUSR. Qualifiers for data shown on figures are defined in the notes of figures.

6.5 Office of the Secretary of Defense Risk Screening Levels

The OSD risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) and soil were calculated using the USEPA's RSL calculator for residential and industrial/commercial worker receptor scenarios and current toxicity values. These risk screening levels are shown in **Table 6-2**.

Table 6-2 OSD Risk Screening Levels Calculated for PFOS, PFOA, PFBS in Tap Water and Soil Using USEPA's Regional Screening Level Calculator

Chemical	Residential Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator		Industrial/Commercial Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator
	Tap Water (ng/L or ppt) [1]	Soil (mg/kg or ppm) [1,2]	Soil (mg/kg or ppm) [1,2]
PFOS	40	0.13	1.6
PFOA	40	0.13	1.6
PFBS	600	1.9	25

Notes:

1. Risk screening levels for tap water and soil provided by the OSD. 2019. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October 15 (**Appendix A)**. The risk screening levels for PFBS in tap water and soil were updated in April 2021 based on the updated toxicity values published by the USEPA (USEPA 2021).
2. All soil and data will be screened against both the Residential Scenario and Industrial/Commercial risk screening levels (if collected from less than 2 feet bgs), regardless of the current and projected land use of the AOPI.
mg/kg = milligram per kilogram
ng/L = nanograms per liter
ppm = parts per million
ppt = parts per trillion

The OSD residential tap water risk screening levels will be used to compare all groundwater data for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at RIA are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil concentrations. The data from the SI sampling event are compared to the OSD risk screening levels in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than the applicable OSD risk screening levels, further study in a remedial investigation is recommended in **Section 8**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at RIA (field duplicate results are provided in the associated tables). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020). The sample results discussion below focuses on the PFOS, PFOA, and PFBS because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 and **7-2** provide a summary of the groundwater and soil analytical results for PFOS, PFOA, and PFBS. **Table 7-3** summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. Generally, seeps aside, surface water and sediment sampling from the Mississippi River was omitted from the sampling plan due to concerns about the potential for PFOS, PFOA, and PFBS impacts from other sources. One seep location was planned for sampling at the Old Landfill but water levels were too high at the time of the field visit, and no exceedances of the OSD screening levels were observed in groundwater samples collected within the Old Landfill during the SI. **Appendix L** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at RIA with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-8** show the PFOS, PFOA, and PFBS analytical results in groundwater and soil for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and/or PFBS greater than the applicable OSD risk screening levels are highlighted in summary tables and on figures. Final qualifiers applied to the data by the laboratory and the project chemist (as defined in **Section 6.4.2**) are presented on the analytical tables. Groundwater data collected during the SI are reported in ng/L, or parts per trillion, and soil data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during low flow purging and sample collection are provided on the field forms in **Appendix I**. Soil lithological descriptions are provided on the field forms in **Appendix I**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Groundwater was generally first encountered at depths of approximately 4 to 20 feet bgs throughout the installation during the initial SI sampling. A subsequent shallow bedrock investigation at Building 225 found groundwater between 22 and 26 feet bgs.

Table 7-3 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No/NS)
Building 25 Soil Lay-down Area	No
Building 64 and 65	No
Building 66 and 69	No
Sludge Drying Beds	No
Building 90	Yes
Building 107	No
Building 144	No

AOPI Name	OSD Exceedances (Yes/No/NS)
Building 159	Yes
Building 212	No
Building 225	Yes
Building 341	Yes
Bradley Flamethrower Testing Area	Yes
Old Landfill	No
Current Fire Training Area/Former XYZ Fire Training Area	No
Fire Department Boat Launch Area[1]	NS

Notes:
[1]The Fire Department Boat Launch Area was not sampled during the SI.
Light gray shading – detection greater than the OSD risk screening level
NS – not sampled

7.1 Building 25 Soil Lay-down Area

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Building 25 Soil Lay-down Area. Surface water and sediment sampling from the Mississippi River was omitted during scoping sessions due to concerns about the potential for impacts from other sources.

7.1.1 Soil

Soil samples were collected from five locations at Building 25 (RIA-25-1 through RIA-25-5; **Figure 7-2**). Each boring included one surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOA and PFBS were not detected in any sample collected at this AOPI. PFOS was detected at RIA-25-2-SO at a concentration of 0.00055 J (estimated) mg/k, below the OSD risk screening levels.

7.1.2 Groundwater

Four groundwater samples were collected via DPT drilling and temporary well sampling at the Building 25 Soil Laydown Area (RIA-25-1 through RIA-25-3 and RIA-25-5; **Figure 7-2)**. The groundwater sample was collected at the first-encountered groundwater in the boring, which was at approximately 15 feet bgs. An additional groundwater sample was planned to be collected at this AOPI; however, as discussed in **Section 6.3.4**, a groundwater sample was not able to be collected from RIA-25-4 due to water not being present in the borehole. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected below the OSD risk screening level of 40 ng/L at RIA-25-5-GW (6.4 J- ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at RIA-25-2-GW (4.0 J- ng/L), RIA-25-3 (5.8

J- ng/L), and RIA-25-5-GW (35 J- ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L for all sample locations with concentrations ranging from 3.2 J- (RIA-25-2-GW) to 7.7 J- ng/L (RIA-25-5-GW).

7.2 Buildings 64 and 65

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Buildings 64 and 65. During the initial phase of SI sampling in April 2020, two shallow soil samples and three groundwater samples from existing monitoring wells were collected. A second mobilization was performed in September 2020 to collect an additional groundwater sample from a downgradient monitoring well to confirm the presence/absence of PFOS, PFOA, and PFBS at this AOPI.

7.2.1 Soil

Soil samples were collected from two locations at Buildings 64 and 65 (RIA-64/65-1 and RIA-64/65-2; **Figure 7-3**). Each boring included one surface soil sample from 0.75 to 2.75 feet bgs, below the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any of the soil samples.

7.2.2 Groundwater

Groundwater samples were collected from three existing monitoring wells at Buildings 64 and 65 (**Figure 7-3**). RIA-B-21S and RIA-B-9S were sampled during the spring 2020 SI sampling event. RIA-B-13S was sampled during the September 2020 remobilization. Groundwater samples were collected from approximately the center of the saturated screen which was from approximately 14 to 20 feet bgs in these wells. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected below the OSD risk screening level of 40 ng/L at RIA-B-9S (3.3 J ng/L) and RIA-B-13S (14 ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at RIA-B-21S (2.3 J ng/L) and RIA-B-13S (22 ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L at RIA-B-13S (5.5 ng/L).

7.3 Buildings 66 and 69

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Buildings 66 and 69. During the initial phase of SI sampling in April 2020, two shallow soil samples and two groundwater samples from existing monitoring wells were collected. A second mobilization was performed in September 2020 to collect an additional groundwater sample from a downgradient monitoring well to confirm PFOS, PFOA, and PFBS presence or absence at this AOPI.

7.3.1 Soil

Soil samples were collected from two locations at Buildings 66 and 69 (**Figure 7-3**). A soil sample was collected between 1.5 to 3.5 feet bgs at RIA-66/69-1 and 0.75 to 2.75 feet bgs at RIA-66/69-2, below the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any soil sample collected at this AOPI.

7.3.2 Groundwater

Groundwater samples were collected from three existing monitoring wells at this AOPI (**Figure 7-3**). RIA-B-3 and RIA-B-4 were sampled during the spring 2020 SI sampling event. RIA-B-23S was sampled during the September 2020 remobilization to confirm presence/absence of PFOS, PFOA, and PFBS constituents. Groundwater samples were collected from approximately the center of the saturated screen which was from approximately 11 to 17.5 feet bgs in these wells. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFBS were detected below the OSD risk screening level of 40 ng/L and 600 ng/L at RIA-B-23S (12 J ng/L and 3.2 ng/L, respectively). PFOA was detected below the OSD risk screening level of 40 ng/L at all locations with concentrations ranging from 3.4 J (RIA-B-4) ng/L to 5.6 ng/L (RIA-B-23S).

7.4 Building 90

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 90.

7.4.1 Soil

Soil samples were collected from four locations at Building 90 (RIA-90-1 through RIA-90-4; **Figure 7-4).** Soil samples were collected from 0 to 1, 0 to 1.8 or 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOA and PFBS were not detected in any sample (or duplicate at RIA-90-3-SO). PFOS was detected below the OSD risk screening levels at sample RIA-90-3-SO (0.0032 mg/kg [0.0024 mg/kg in duplicate]).

7.4.2 Groundwater

One groundwater sample was collected via DPT drilling and temporary well sampling at Building 90 (**Figure 7-4)**. The groundwater sample was collected at the first-encountered groundwater, at approximately 9 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS, PFOA, and PFBS were detected below their associated OSD risk screening levels at RIA-90-4 (5.7 ng/L, 23 ng/l, and 4.0 ng/L, respectively).

7.5 Building 107

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 107.

7.5.1 Soil

Soil samples were collected from two locations at Building 107 (**Figure 7-5**). Each boring included a surface soil sample collected from 0 to 1-foot bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. PFOS, PFOA, and PFBS, were not detected in either sample.

7.5.2 Groundwater

One groundwater sample was collected via DPT drilling and temporary well sampling downgradient of Building 107 (**Figure 7-5)**. The groundwater sample was collected at the first-encountered groundwater, which was at approximately 12.5 feet bgs. Two groundwater samples were planned at AOPI Building 107; however, as discussed in **Section 6.3.4**, a groundwater sample could not be collected from RIA-107-1 due to refusal from shallow bedrock and a lack of water in the overburden soil. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS, PFOA, and PFBS were detected below their associated OSD risk screening levels at RIA-107-2 (23 J- ng/L, 15 J- ng/l, and 3.0 J- ng/L, respectively).

7.6 Building 144

The subsection below summarizes the soil PFOS, PFOA, and PFBS analytical results associated with Building 144. As discussed in **Section 6.3.4**, groundwater could not be collected from this location due to a lack of water in the overburden soil and drilling refusal from shallow bedrock.

7.6.1 Soil

A soil sample was collected from one location at Building 144 at 0.5 to 2.5 feet bgs (**Figure 7-6)**, beneath the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. PFOA, and PFBS, were not detected in the soil sample collected at this AOPI. Due to soil concentrations that were non-detect for PFOS, PFOA, and PFBS constituents, a groundwater investigation was not warranted at this AOPI as discussed during the 04 August 2020 technical project planning session.

7.7 Building 159

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 159.

7.7.1 Soil

Soil samples were collected from three location at Building 159 (**Figure 7-6)**. Soil sample RIA-159-1 was collected at 2 to 4 feet bgs and samples RIA-159-2 and RIA-159-3 were collected at 1 to 3 feet bgs, beneath the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. PFOS, PFOA, and PFBS, were not detected in soil samples collected at this AOPI.

7.7.2 Groundwater

Three groundwater samples were collected via DPT drilling and temporary well sampling at Building 159 (RIA-159-1, RIA-159-2 and RIA-159-3; **Figure 7-6)**. The groundwater samples were collected at the first-encountered groundwater, which was at approximately 10 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOA was detected at concentrations above the OSD risk screening level of 40 ng/L in samples RIA-159-2 (59 J- ng/L) and RIA-159-3 (47 J- ng/L). PFOA was detected in sample RIA-159-1 below the OSD risk screening level (16 J- ng/L). PFOS and PFBS were detected below the associated OSD risk screening levels (40 ng/L and 600 ng/L, respectively) at all locations: RIA-159-1 (4.7 J- ng/L and 4.5 J- ng/L, respectively), RIA-159-2 (20 ng/L J- and 8.3 J- ng/L, respectively) and RIA-159-3 (3.6 J- ng/L and 16 J- ng/L, respectively).

7.8 Building 212

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with Building 212. Soil samples were not collected at this AOPI because the four sumps located in the basement of Building 212 from which samples were collected are connected to the groundwater and would have been the recipient of any potential releases from the building area.

7.8.1 Groundwater

Groundwater samples were collected from four sumps in the basement of Building 212 (**Figure 7-7**). Grab groundwater samples were collected from the center of the water column, which was at approximately 4 to 10 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFOA were detected below the OSD risk screening level of 40 ng/L at all sample locations with concentrations ranging from 7.3 ng/L and 6.4 ng/L, respectively at RIA-212-P-1 to 21 ng/L and 12 ng/L, respectively at RIA-212-P-5. PFBS was also detected below the OSD risk screening level of 600 ng/L at all sample locations with concentrations ranging from 5.2 ng/L at RIA-212-P-3 to 7.9 ng/L at RIA-212-P-1.

7.9 Building 225

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 225 (Current Fire Department). During the initial phase of SI sampling conducted in April 2020, three soil samples were collected surrounding Building 225. Attempts were made to sample groundwater using a DPT rig but were unsuccessful due to refusal from shallow bedrock and the lack of water in the overburden soil. A second mobilization was performed in September 2020 to collect groundwater samples to confirm PFOS, PFOA, and PFBS presence/absence at this AOPI. During the second remobilization, two groundwater samples were collected via rotary sonic drilling at locations south and southwest (downgradient) of Building 225.

7.9.1 Soil

Soil samples were collected from three locations at Building 225 (**Figure 7-5)**. Soil samples RIA-225-1 and RIA-225-2 were collected at 0 to 2 feet bgs and sample RIA-225-3 was collected at 1 to 3 feet bgs, beneath the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS and PFOA were detected in sample RIA-225-1 at concentrations less than the OSD risk screening levels at concentrations of 0.05 mg/kg and 0.00069 J mg/kg, respectively. PFOS and PFOA were detected in sample RIA-225-2 at concentrations less than the OSD risk screening levels at concentrations of 0.0039 mg/kg and 0.00073 J mg/kg, respectively. PFBS was not detected in samples RIA-225-1 and RIA-225-2. PFOS, PFOA, and PFBS were not detected in sample RIA-225-3.

7.9.2 Groundwater

Groundwater samples were collected from two borings via rotosonic drilling and temporary well sampling at Building 225 (RIA-225-1-GW and RIA-225-2-GW**; Figure 7-5**). Grab groundwater samples were collected at first-encountered groundwater, which was at approximately 24 to 30 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFBS was detected below the OSD risk screening level of 600 ng/L at RIA-225-1-090120 (15 ng/L [15 ng/L in the duplicate]) and at RIA-225-2-090120 (20 ng/L). PFOS was detected above the OSD risk screening level of 40 ng/L at RIA-225-1-090120 (350 ng/L [360 ng/L in the duplicate]) and at RIA-225-2-090120 (250 ng/L). PFOA was detected above the OSD risk screening level of 40 ng/L at RIA-225-1-090120 (99 ng/L [95 ng/L in the duplicate]) and at RIA-225-2-090120 (210 ng/L).

7.10 Building 341

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 341.

7.10.1 Soil

Soil samples were collected from two locations at Building 341 (**Figure 7-7).** A soil sample was collected between 0 to 1-foot bgs at RIA-341-1 and 3 to 5 feet bgs at RIA-341-2, beneath the overlying asphalt. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOA and PFBS were not detected in either sample (or duplicate of RIA-341-1-SO). PFOS was detected below the OSD risk screening levels at sample RIA-341-1 (0.014 mg/kg [0.012 mg/kg in duplicate]).

7.10.2 Groundwater

Two groundwater samples were collected via DPT drilling and temporary well sampling at AOPI Building 341 (**Figure 7-7**). The groundwater sample was collected at the first-encountered groundwater, which was at approximately 10 feet bgs at RIA-341-1 and 9 feet bgs at RIA-341-2. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected above the OSD risk screening level of 40 ng/L in sample RIA-341-1 (43 ng/L). PFOS was detected below the OSD risk screening levels in sample RIA-341-1 (29 ng/L). PFOA and PFBS were detected below the OSD risk screening levels in samples RIA-341-1 (30 ng/L and 75 ng/L, respectively) and RIA-341-2 (26 ng/L and 24 ng/L, respectively).

7.11 Bradley Flamethrower Testing Area

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with the Bradley Flamethrower Testing Area. Soil samples were not collected at this AOPI due to the uncertainty of the location of any potential release. Downgradient monitoring wells were identified as being sufficient for determining presence/absence at this AOPI.

7.11.1 Groundwater

Three groundwater samples were collected from existing monitoring wells at the Bradley Flamethrower Testing Area (**Figure 7-7**). Groundwater samples were collected from approximately the center of the saturated screen which was from approximately 11 to 18.5 feet bgs in these wells. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOA was detected at concentrations above the OSD risk screening level of 40 ng/L in sample RIA-MW-4-5S (170 ng/L). PFOA and PFBS were detected below the OSD risk screening level of 40 ng/L and 600 ng/L, respectively, in samples RIA-MW-4-8S (4.3 ng/L and 2.3 J ng/L, respectively) and RIA-MW-4-23S (36 ng/L and 2.4 J ng/L, respectively). PFOS was detected below the OSD risk screening level of 40 ng/L in one sample, RIA-MW-4-5S (4.7 ng/L).

7.12 Current Fire Training Area/Former XYZ Fire Training Area

The subsection below summarizes the soil PFOS, PFOA, and PFBS analytical results associated with the Current Fire Training/Former XYZ Fire Training Area. Groundwater was not collected here due to dry overburden soil and refusal from shallow bedrock preventing DPT drilling. Downgradient monitoring wells at the Old Landfill were used to identify PFOS, PFOA, and PFBS in groundwater from the Current Fire Training Area/Former XYZ Fire Training Area. PFOS, PFOA, and PFBS constituents were detected in these monitoring wells, as discussed in **Section 7.13.1**.

7.12.1 Soil

Soil samples were collected from four locations at the Current Fire Training Area/XYZ Fire Training Area (**Figure 7-8).** RIA-FTA-1-SO, RIA-FTA-2-SO, and RIA-FTA-4-SO were collected from 0 to 2 feet bgs and RIA-FTA-3-SO was collected from 0 to 1.5 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS was detected below the OSD risk screening levels at three locations with concentrations ranging from 0.00064 J mg/kg (RIA-FTA-4-SO) to 0.0081 mg/kg (RIA-FTA-1-SO). PFOA was detected below the OSD risk screening level at one sampling location, RIA-FTA-1-SO, at a concentration of 0.00083 J mg/kg. PFOS, PFOA, and PFBS were not detected at RIA-FTA-3-SO.

7.13 Old Landfill

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with the Old Landfill. Soil samples were not collected at this AOPI due to the presence of a cap on the landfill preventing intrusive activities and samples collected from the existing monitoring wells were sufficient for identifying PFOS, PFOA, and PFBS presence/absence. In the QAPP Addendum (Arcadis 2020), a surface water sample was tentatively proposed to be collected from a seep on the southern end of the Old Landfill if it was present at the time sampling was completed. The seep was not visible during the SI field work due to the high level of the river and therefore this sample was not collected. Sediment samples were not collected in the adjacent Mississippi River because they would not be representative of activities exclusively at RIA.

7.13.1 Groundwater

Four groundwater samples were collected from existing monitoring wells at the Old Landfill (**Figure 7-8**). Groundwater samples were collected from approximately the center of the saturated screen which was from approximately 10 to 13.5 feet bgs in these wells. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected in all four samples below the OSD risk screening level of 40 ng/L with concentrations ranging from 6.1 ng/L (RIA-OLF-POC-8 [5.4 ng/L in duplicate]) to 24 ng/L (RIA-OLF-POC-1A). PFOA was detected in three of the four samples below the OSD risk screening level of 40 ng/L with concentrations ranging from 3.9 ng/L (RIA-OLF-POC-10) to 15 ng/L (RIA-OLF-POC-1A). PFOA was not detected in RIA RIA-OLF-POC-5-040820 and its duplicate. PFBS was detected in all samples below the OSD risk screening level of 600 ng/L with concentrations ranging from 3.5 J ng/L (RIA-OLF-POC-5 [3.9 ng/L in duplicate]) to 8.8 ng/L (RIA-OLF-POC-10).

Wells at the Old Landfill contained high-density polyethylene tubing with a bladder of unknown composition. One DEB sample was collected from RIA-OLF-POC-10 prior to initiating low flow sampling at the well. This sample had a detection of PFOA (100 ng/L) above the OSD risk screening level. This sample also had detections of PFOS (5.3 ng/L) and PFBS (6.7 ng/L). The companion low flow-purged sample for the well contained only 3.9 ng/L PFOA, while PFOS and PFBS concentrations were within 30% of their concentrations in the DEB sample. The comparatively elevated PFOA result in the DEB is apparently attributable to PFAS-containing components of the downhole equipment leaching PFOA into the unpurged groundwater sample. The composition of the equipment is not able to be verified. The purging appears to have largely removed the influence of PFOS, PFOA, and PFBS from the equipment on the groundwater sample.

7.14 Sludge Drying Beds

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with the Sludge Drying Beds. Soil samples were not collected at this AOPI due to restrictions preventing digging in the Sludge Drying Beds.

7.14.1 Groundwater

One groundwater sample was collected via DPT drilling and temporary well sampling downgradient of the Sludge Drying Beds (**Figure 7-3**). The groundwater sample was collected at the first-encountered groundwater, which was at approximately 15 feet bgs at RIA-SDB-1. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. PFOS, PFOA, and PFBS were not detected in this sample.

7.15 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data as they may be useful in future fate and transport studies. The soil samples were generally taken from the top two feet of soil, so this information is most relevant to the surface soil, which is likely to contain more sand and fill material at RIA. This material was sampled instead of going deeper into native soil since any AFFF releases would have occurred on the surface. The TOC in the soil samples ranged from 4,680 to 88,200 mg/kg. The TOC at this installation was within the range of typically organic content in soil (topsoil: 5,000 to 30,000 mg/kg, desert: less than 5,000 mg/kg, organic: greater than 120,000 mg/kg). The combined percentage of fines in soils at RIA ranged from 11.6 to 68.5% with an average of 28.56%. PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC, however the wide range of TOC and grain size observed in surface soil at RIA is indicative of fill material and not representative of the underlying native material. Without further profiling, no conclusions can be made regarding the mobility of PFAS constituents in soil at RIA. The percent moisture of the soil (13.93%) was typical for clay (0 to 20%). The pH of the soil was slightly alkaline (7 to 9 standard units).

7.16 Blank Samples

PFOS, PFOA, and PFBS were detected in one of 14 QA/QC samples. Other than those noted below, concentrations of PFOS, PFOA, PFBS in all other QA/QC samples were not detected.

PFOS (11 ng/L), PFOA at (3.1 J ng/L), and (PFBS at 2.3 J ng/L) were detected below the OSD risk screening levels in the source blank sample collected on 03 April 2020 from a water source near the Current Fire Training Area/XYZ Fire Training Area. However, EBs taken on the drill tooling which used this water for decontamination had no detections. Because of the low-level detections and non-detect EBs, it was not deemed necessary to qualify the data due to the source blank detections.

The full analytical results for QA/QC samples collected during the SI are included in **Appendix L.**

7.17 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, based on the SI sampling results. The CSMs presented on **Figure 7-9** through **Figure 7-15** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

Many of the PFAS constituents found in AFFF and metal plating operations are surfactants (which do not volatilize) and are found in a charged or ionic state at environmentally-relevant pH (i.e., pH 5 to 9 standard

units). PFOS, PFOA, and PFBS are each negatively charged at environmentally-relevant pH. The media potentially affected by PFOS, PFOA, PFBS releases at Army installations are soil, groundwater, surface water, and sediment. Once released to the environment, a primary factor that inhibits the movement of PFAS constituents is the presence of organic matter and organic co-constituents in soils and sediments. Generally, PFAS constituents are mobile in the potentially affected media, and they are not known to be fully broken down by natural processes.

Based on the use, storage, and/or disposal of PFAS-containing materials at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and sediment. Release and transport mechanisms include dissolution/desorption from soil to groundwater, discharge/recharge between groundwater and surface water, and adsorption/desorption between surface water and sediment. Generic categories of potential human receptors and their associated exposure scenarios that are typically evaluated in a CERCLA human health risk assessment were considered and include on-installation site workers (e.g., industrial/commercial workers, utility workers, or future construction workers who could be exposed to chemicals in soil at an AOPI or to chemicals in tap water in an industrial/commercial building), on-installation residents (e.g., adults and children who could be exposed to chemicals in tap water in a residence), and on-installation recreational users (e.g., hikers or hunters who could be exposed to chemicals in waterways at an installation). Off-installation receptor types could include drinking water receptors (i.e., commercial/industrial workers or residents) and recreational users.

Human exposure pathways are shown as “complete, “potentially complete”, or “incomplete” on the CSM figures. A complete exposure pathway consists of a constituent source and release mechanism, a transport or retention medium, an exposure point where human contact with the contaminated medium could occur, and an exposure route at the exposure point. If any of these elements is missing, the exposure pathway is incomplete. Pathways are “potentially complete” where data are insufficient to conclude the pathway is either “complete” or “incomplete”. Additionally, the CSMs do not include ecological receptors and exposure pathways. The potential for ecological exposures to PFOS, PFOA, and PFBS may be evaluated at a future date if those pathways warrant further consideration.

Following the SI sampling, all 15 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

CSMs were developed for each individual AOPI and were combined where source media, potential migration pathways and exposure media, and human exposure pathway determinations are congruent. The following exposure pathway determinations apply to all CSMs:

- PFOS, PFOA, and PFBS were detected in groundwater at all AOPIs, except for the Sludge Drying Beds. There is still one potable well at RIA, although it is in the process of being abandoned. New potable well installations could occur, but not without directorate of public works approval per the installation's master plan and the dig permitting process. Therefore, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers, residents, and recreational users are potentially complete. There were no detections of PFOS, PFOA, and PFBS in groundwater at the Sludge Drying Beds; therefore, the groundwater exposure pathways are incomplete.

- On-installation residents are not likely to contact sediment. Therefore, the sediment exposure pathway (via incidental ingestion and dermal contact) for on-installation residents is incomplete.

Additional exposure pathway descriptions for each CSM are listed below by figure.

Figure 7-9 shows the CSM for Building 25 Soil Lay-Down Area and Building 90. The Building 25 Soil Lay-Down Area is located on the northeastern portion of the island. Excavated soil from the remodeling of Building 225 could have been placed here. The surrounding land surface is primarily grass. In 1979, a large fire occurred in the basement of Building 90. The methods used to extinguish this fire are unknown, but its timeframe suggests AFFF use. Building 90 and the Building 25 Soil Lay-Down Area are located upgradient of the RIA drinking water intake.

- PFOS and PFOA were detected in soil at both AOPIs, and site workers could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- On-installation residents and recreational users and off-installation receptors are not likely to access AOPIs. Therefore, the soil exposure pathways for these receptors are incomplete.
- PFOS, PFOA, and PFBS were detected in groundwater, and groundwater originating at these AOPIs flows off-post through the installation's northern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Surface water runoff and/or groundwater associated with the AOPIs may discharge to the Mississippi River upstream of the drinking water intake for on-installation drinking water. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- Surface water runoff and/or groundwater associated with the AOPIs may discharge to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users off-post could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-10 shows the CSM for Building 225, Building 341, and Current Fire Training Area/Former XYZ Fire Training Area. Building 225 is the current RIA fire department, in operation since the early 1900s and has been the location of fire trucks containing AFFF. Building 341 is a current and former AFFF storage area, and the Current Fire Training Area/XYZ Fire Training Area are where training with AFFF has taken place.

- PFOS and PFOA, were detected in soil at Building 225, Building 341, and the Current Fire Training Area/Former XYZ Fire Training Area, and site workers could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- On-installation residents and recreational users and off-installation receptors are not likely to access AOPIs. Therefore, the soil exposure pathways for these receptors are incomplete.

- PFOS, PFOA, and PFBS were detected in groundwater at Building 225 and Building 341, and groundwater originating at these AOPIs flows off-post through the installation's southwestern and western boundaries, respectively. Groundwater was unable to be collected from the Current Fire Training Area/Former XYZ Fire Training Area. PFOS, PFOA, and/or PFBS are potentially present in groundwater at the Current Fire Training Area/Former XYZ Fire Training Area AOPI due to presence in soil and known AFFF use at the AOPI and groundwater at the Current Fire Training Area/Former XYZ Fire Training Area flows off-post through the installation's southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River; however, the AOPIs are located downgradient and downstream of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are incomplete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- Surface water runoff and/or groundwater associated with the AOPIs may discharge to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users off-post could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-11 shows the CSM for Bradley Flamethrower Testing Area and Building 212. The Bradley Flamethrower Testing Area was identified as an AOPI following interviews that indicated testing of Bradley Flamethrowers in the open area west of Building 212. Building 212 is the current chromium plating shop at RIA. Mist suppressant use was not identified but could have occurred during past operations.

- Soil was not sampled at these AOPIs. Site workers could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- On-installation residents and recreational users and off-installation receptors are not likely to access AOPIs. Therefore, the soil exposure pathways for these receptors are incomplete.
- PFOS, PFOA, and PFBS were detected in groundwater, and groundwater originating at these AOPIs flows off-post through the installation's southwestern (Bradley Flamethrower Testing Area, Building 212). Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River; however, the AOPIs are located downgradient and downstream of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are incomplete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal

contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.

- Surface water runoff and/or groundwater associated with the AOPIs may discharge to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users off-post could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-12 shows the CSM for the Sludge Drying Beds. The Sludge Drying Beds are unlined and located in the center of the island. Low levels PFOS and PFOA have been observed in RIA drinking water and sludge from the treatment operations has the potential of concentrating those compounds.

- PFOA, PFOA, and PFBS were not sampled in soil at this AOPI. Site workers could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- On-installation residents and recreational users and off-installation receptors are not likely to access AOPIs. Therefore, the soil exposure pathways for these receptors are incomplete.
- PFOS, PFOA, and PFBS were not detected in groundwater; therefore, the groundwater exposure pathways for on- and off-installation receptors are incomplete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River; however, the AOPI is located downgradient and downstream of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are incomplete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- Surface water runoff and/or groundwater associated with the AOPI may discharge to the Mississippi River which is used for drinking water. This AOPI did not have detections in groundwater; however, stormwater runoff could carry PFOS, PFOA, and PFBS potentially present at the surface of the AOPI to the Mississippi River. Therefore, the surface water exposure pathway (via ingestion and dermal contact) for off-installation drinking water receptors is potentially complete and the surface water and sediment exposure pathway (via incidental ingestion and dermal contact) for off-installation recreators is potentially complete.

Figure 7-13 shows the CSM for Buildings 66 and 69 and Buildings 64 and 65. Building 64 is a former chromium plating shop. Building 65 was located in the courtyard of Building 64 and served as the wastewater treatment center for the chromium plating operations in Building 64. Building 66 formerly contained chemicals from the chromium plating operations conducted in Building 64. Chromium plating operations are also believed to have occurred at Building 69 until 1990. Building 69 discharged liquid wastes to a brick sewer from a sump located at the north end of the building. Both AOPIs are located in the center of the island, potentially upgradient of the RIA drinking water intake.

- PFOS, PFOA, and PFBS were not detected in soil at these AOPIs but were detected in groundwater and could still be present in soil. Site workers could contact constituents in soil via incidental ingestion,

dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.

- PFOS, PFOA, and PFBS were detected in groundwater, and groundwater originating at these AOPIs flows off-post through the installation's northern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River, and the AOPIs are potentially upstream and upgradient of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- Groundwater associated with the AOPIs may discharge to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users off-post could contact constituents in surface water and sediment in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-14 shows the CSM for Building 107, Building 159, Building 144, and the Old Landfill. Building 107 and Building 159 served as fire truck storage areas. Building 144 served as an AFFF storage area. The Old Landfill is located on the southern side of the island and is noted as a recipient of plating wastes and the location of burn pits. The Old Landfill is capped.

- PFOS, PFOA, and PFBS were not detected in soil at these AOPIs but were detected in groundwater and could still be present in soil. Site workers could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- PFOS, PFOA, and PFBS were detected in groundwater at Building 107, Building 159, and the Old Landfill. PFOS, PFOA, and PFBS was not sampled in groundwater at Building 144 due to refusal before groundwater was encountered. Groundwater originating at these AOPIs flows off-post through the installation's south-southwestern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River; however, the AOPIs are located downgradient and downstream of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are incomplete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- Groundwater associated with the AOPIs may discharge to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users

off-post could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-15 shows the CSM for the Fire Department Boat Launch Area. The Fire Department Boat Launch Area was identified as an AOPI after photographs were obtained showing the RIA fire department using foam in the Mississippi River off the northwestern portion of the installation.

- Soil is not a potential exposure medium at the Fire Department Boat Launch Area, therefore soil was not included in the CSM.
- PFOS, PFOA, and PFBS released to the Mississippi River could migrate to groundwater through surface water recharge of downstream or downgradient groundwater. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The drinking water intake for on-installation drinking water is located on the Mississippi River; however, the AOPI is located downstream of the drinking water intake. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are incomplete. On-installation site workers and recreational users could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation site workers and recreational users are potentially complete.
- PFOS, PFOA, and PFBS were potentially directly released to the Mississippi River which is used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete. Recreational users off-post could contact constituents in the Mississippi River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

8 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA/SI included two distinct efforts. The PA identified AOPIs at RIA based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release of PFOS, PFOA, and PFBS to the environment occurred.

OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at RIA. Following the evaluation, 15 AOPIs were identified.

RIA receives its drinking water from the Mississippi River via a drinking water intake, located on the north-central portion of the island at Building 50. Samples of PFAS constituents are periodically collected from the RIA drinking water intake; the highest combined concentration of PFOS/PFOA detected was 10.9 ng/L in a sample collected during September 2018 (**Table 2-1**).

Fourteen of the 15 AOPIs were sampled during the SI at RIA to identify presence or absence of PFOS, PFOA, and PFBS at each AOPI. As discussed in **Section 5.2.13**, the Fire Department Boat Launch Area was not sampled due to the nature of the release in the Mississippi River and the SI sampling being unable to capture potential impacts from historical releases. The SI scope of work was completed in accordance with the Final PQAPP (Arcadis 2019) and the RIA QAPP Addendum (Arcadis 2020).

PFOS, PFOA, and PFBS were detected in groundwater samples at all AOPIs where groundwater samples were collected, except at the Sludge Drying Beds where results were below detection limits. The greatest detection of an individual PFOS, PFOA, or PFBS was identified as PFOA at 350 ng/L at Building 225. Exceedances of the OSD risk screening level occurred at four AOPIs: Bradley Flamethrower Testing Area (one sample; PFOA only), Building 159 (two samples; PFOA only), Building 225 (two samples; PFOS and PFOA), and Building 341 (one sample; PFOS only).

All soil detections were below the OSD risk screening levels; however, PFOS and/or PFOA were detected in soil at five of the 11 AOPIs sampled (Building 25, Building 90, Building 225, Building 341, and Bradley Flamethrower Training Area). The greatest detection of an individual PFOS, PFOA, and PFBS compound was identified as PFOS at 0.05 mg/kg at 0 to 2 feet bgs at Building 225. PFBS was not detected in any sample.

Following the SI sampling, all 15 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have potentially complete or complete exposure pathways. PFOS, PFOA, and/or PFBS was detected in soil and/or groundwater in 13 out of the 15 AOPIs. In addition, soil exposure pathways for on-installation site workers are potentially complete at nine AOPIs. Soil exposure pathways for on-installation site workers are complete at five AOPIs. Due to a lack of land use controls off-installation and downgradient of RIA, the groundwater exposure pathways for off-installation receptors are also potentially complete for 14 AOPIs. Surface water is used for drinking water at RIA and there is a potentially complete drinking water exposure pathway for on-installation site workers and residents at four AOPIs. On-installation site workers and recreational users may contact surface water and sediment in the Mississippi

River; therefore, the surface water and sediment incidental ingestion and dermal contact exposure pathways for on-installation site workers and recreational users are potentially complete. Surface water is used for drinking water off-installation and off-installation recreational users could contact constituents in surface water and sediment; therefore, surface water and sediment exposure pathways are potentially complete for off-installation receptors for 15 AOPIs.

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for future study in a remedial investigation or no action at this time is based on the comparison of the SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the AOPIs identified at RIA, PFOS, PFOA, and PFBS sampling and recommendations for each AOPI; further investigation is warranted at RIA. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1 Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at RIA, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NS)		Recommendation
	GW	SO	
Building 25	No	No	No action at this time
Building 64 and 65	No	No	No action at this time
Building 66 and 69	No	No	No action at this time
Building 90	No	No	No action at this time
Building 107	No	No	No action at this time
Building 144	NS	No	No action at this time
Building 159	Yes	No	Further study in a remedial investigation
Building 212	No	NS	No action at this time
Building 225	Yes	No	Further study in a remedial investigation
Building 341	Yes	No	Further study in a remedial investigation
Bradley Flamethrower Testing Area	Yes	No	Further study in a remedial investigation
Old Landfill	No	NS	No action at this time
Sludge Drying Beds	No	NS	No action at this time
Current Fire Training Area/Former XYZ Fire Training Area	NS	No	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NS)		Recommendation
	GW	SO	
Fire Department Boat Launch Area*	NS	NS	No action at this time

Notes:
*- The AOPI was not sampled during this SI but may be sampled during further investigations.
GW - groundwater
NS – not sampled
SO – soil

Data collected during the PA (**Section 3**, **Section 4**, and **Section 5**) and SI (**Section 6** and **Section 7**) were sufficient to draw the conclusions summarized in this section. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at RIA are discussed below.

Records gathered for the use, storage and/or disposal of PFAS-containing materials were reviewed during the PA process. Documentation specific to AFFF may have been limited (e.g., each AFFF use; procurement records, documentation of AFFF used during crash responses or fire training activities) due to lack of recordkeeping requirements for the full timeline of common AFFF practices. Anecdotal accounts of AFFF use (and therefore likely PFOS, PFOA, and PFBS use) were limited to available installation personnel, whose knowledge of AFFF use may have been restricted by their time spent at the installation or previous roles held that limited their relevant knowledge of potential AFFF (or other PFAS-containing material) use.

A comprehensive well survey was not completed as part of this PA; therefore, the information reviewed regarding off-post wells is limited to what is contained in the off post well search results (**Appendix E**).

The searches for ecological receptors and off-post PFOS, PFOA, and PFBS sources were not exhaustive and were limited to easily identifiable and readily available information evaluated during the relevant documents research, installation personnel interviews, and site reconnaissance.

There is one existing drinking water well at RIA that is in the process of being abandoned. There is also no restriction on the installation of future potable wells at RIA. New potable well installations will not occur without directorate of public works approval per the installation's master plan and the dig permitting process.

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to results from the on-post drinking water source, not residential wells. The majority of wells sampled at RIA did not contain dedicated equipment. However, wells at the Old Landfill contained dedicated high-density polyethylene tubing with an attached bladder of unknown composition. The DEB sample collected at the Old Landfill from RIA-POC-10 had higher PFOA concentrations than the low flow-purged sample (100 ng/L in the DEB and 3.9 ng/L in the low flow-purged sample). Because other PFAS constituents in the well did not vary substantially between the DEB and the low flow-purged sample, the comparatively elevated PFOA result in the DEB is apparently attributable to PFAS-containing components of the downhole equipment leaching PFOA into the unpurged groundwater sample. The purging appears to have largely removed the influence of PFAS constituents from the equipment on the groundwater sample, but this remains a data gap since

the composition of the equipment is unknown. This may be an indicator of an influence of the equipment on the stagnant water in the well.

Available data, including PFOS, PFOA, and PFBS, is listed in **Appendix L**, which were analyzed per the selected analytical method.

Results from this PA/SI indicate further study in a remedial investigation is warranted at RIA in accordance with guidance provided by the OSD.

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ACRONYMS

%	percent
AFFF	aqueous film-forming foam
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLP	cleaners, lubricants, and preservatives
CSM	conceptual site model
DEB	dedicated equipment background
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FCR	Field Change Report
GIS	geographic information system
GW	groundwater
HQAES	Headquarters Army Environmental System
IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram (parts per million)
ng/L	nanograms per liter (parts per trillion)
NS	not sampled

OSD	Office of the Secretary of Defense
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
PWE	Directorate of Public Works – Environmental
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QCIC	Quad City Industrial Center
QSM	Quality Systems Manual
RIA	Rock Island Arsenal
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
TGI	technical guidance instruction
TOC	total organic carbon
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

TABLES

Table 2-1 - Historical PFAS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

ARCADIS Design & Consultancy for natural and built assets

		Location	RIA Drinking Water Intake			
		Sample ID	RIA Building 50	Tap 01 - Bldg #50	Bldg 50 TAP 01	RIA Bldg 50
		Sample Date	11/26/2016	3/7/2018	6/26/2018	9/17/2018
Units	OSD Risk Screening Level	LHA	ng/L	ng/L	ng/L	ng/L
Perfluorooctane sulfonate (PFOS)	40	70	**4.65**	**6.34**	**4.59**	**7.9**
Perfluorooctanoic acid (PFOA)	40	70	**2.76**	**3.26**	**2.42**	**3**
Perfluorobutanesulfonic acid (PFBS)	40,000	NA	**22.2**	**8.32**	**4.88**	**21**

Notes:
Bold - Detected result above the level of detection

Acronyms:
Bldg - building
ID - identification
LHA - United States Environmental Protection Agency Lifetime Health Advisory
ng/L - nanograms per liter
OSD - Office of the Secretary of Defense
RIA - Rock Island Arsenal

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

Area of Potential Interest	Sampling Location ID[1]	Total Well Depth (ft bgs)	April 2020 Depth to Groundwater from MP (ft)	Screened Interval (ft bgs)	Casing Diameter (inches)
Buildings 64 and 65	RIA-B-21S-040720	9.65	20.78	7.41 - 17.41	2
	RIA-B-9S-040720	11.28	18.19	5.33 - 15.33	2
	RIA-B-13S	19.5	9.15 [2]	10-20	2
Buildings 66 and 69	RIA-B-3-040720	17.5	9.94	12.09 - 17.09	2
	RIA-B-4-040720	9.91	18.00	11.87 - 16.87	2
	RIA-B-23S	16.5	8.85 [2]	6.5-16.5	2
Building 212	RIA-212-P-1	4.3	2.81	NA	10
	RIA-212-P-3	8	10.05	NA	10
	RIA-212-P-5	1.25	8.00	NA	10
	RIA-212-P-6	10	0.47	NA	10
Bradley Flamethower Testing Area	RIA-MW-4-5S	13.3	13.50	8.30 - 13.30	2
	RIA-MW-4-23S	12	12.00	7 - 12	2
	RIA-MW-4-8S	15	15.00	5 - 15	2
Old Landfill	RIA-OLF-POC-05	15.1	12.33 [3]	5.1 - 15.1	2
	RIA-OLF-POC-1A	19.67	12.99 [3]	NA	2
	RIA-OLF-POC-08	18.24	14.49 [3]	6.93 - 15.58	2
	RIA-OLF-POC-10	20.7	17.79 [3]	9.18 - 17.84	2
Building 25 Soil Lay-down Area	RIA-25-1-GW-040120	14	8.6	9-14	2
	RIA-25-2-GW-040120	15	11.18	10-15	2
	RIA-25-3-GW-040120	15	10.9	10-15	2
	RIA-25-5-GW-040120	15	9.9	10-15	2
Building 90	RIA-90-4-GW-040320	8.9	7.99	3.9-8.9	2
Building 107	RIA-107-2-GW-040320	12.5	7.83	7.5-12.5	2
Building 159	RIA-159-1-GW-040120	10	5.37	5-10	2
	RIA-159-2-GW-040120	10	8.59	5-10	2
	RIA-159-3-GW-040120	10	5.83	5-10	2
Building 225	RIA-225-1-GW-090120	30	18.23	25-30	2
	RIA-225-2-GW-090120	24	15.12	19-24	2
Building 341	RIA-341-1-GW-040220	10.35	8.76	5.35-10.35	2
	RIA-341-2-GW-040220	8.7	6.79	3.7-8.7	2
Sludge Drying Beds	RIA-SDB-1-GW040120	15	8.38	10-15	2

Notes:
1. Permanent wells were not installed at the DPT sampling locations. The total depth listed indicates the total depth of the temporary borehole.
2. August 2020 depth to water
3. April 2018 depth to water

Acronyms/Abreviations:
bgs - below ground surface
ft - feet
ID - identification
MP - measuring point
NA - not available

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

AOPI	Sample/Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tapwater Risk Screening Level	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Building 25 Soil Laydown Area	RIA-25-1-GW-040120	04/01/2020	N	3.9	UJ-	3.9	UJ-	**4.0**	J-
	RIA-25-2-GW-040120	04/01/2020	N	3.9	UJ-	**4.0**	J-	**3.2**	J-
	RIA-25-3-GW-040120	04/01/2020	N	4.4	UJ-	**5.8**	J-	**4.4**	J-
	RIA-25-5-GW-040120	04/01/2020	N	**6.4**	J-	**35**	J-	**7.7**	J-
Buildings 64 and 65	RIA-B-21S-040720	04/07/2020	N	3.9	U	**2.3**	J	3.9	U
	RIA-B-9S-040720	04/07/2020	N	**3.3**	J	3.8	U	3.8	U
	RIA-B-13S	09/01/2020	N	**14**		**22**		**5.5**	
Buildings 66 and 69	RIA-B-3-040720	04/07/2020	N	3.8	U	**4.1**		3.8	U
	RIA-B-4-040720	04/07/2020	N	3.8	U	**3.4**	J	3.8	U
	RIA-B-23S	09/01/2020	N	**12**		**5.6**		**3.2**	**J**
Building 90	RIA-90-4-GW-040320	04/03/2020	N	**5.7**		**23**		**4.0**	J
Building 107	RIA-107-2-GW-040320	04/03/2020	N	**23**	J-	**15**	J-	**3.0**	J-
Building 159	RIA-159-1-GW-040120	04/01/2020	N	**4.7**	J-	**16**	J-	**4.5**	J-
	RIA-159-2-GW-040120	04/01/2020	N	**20**	J-	**59**	J-	**8.3**	J-
	RIA-159-3-GW-040120	04/01/2020	N	**3.6**	J-	**47**	J-	**16**	J-
Building 212	RIA-212-P-1-040720	04/07/2020	N	**7.3**		**6.4**		**7.9**	
	RIA-212-P-3-040720	04/07/2020	N	**17**		**8.8**		**5.2**	
	RIA-212-P-5-040720	04/07/2020	N	**21**		**12**		**5.6**	
	RIA-212-P-6-040720	04/07/2020	N	**13**		**11**		**8.2**	
Building 225	RIA-225-1-090120	09/01/2020	N	**350**		**99**		**15**	
	RIA-225-1-090120/RIA-2251-GW-090120	09/01/2020	FD	**360**		**95**		**15**	
	RIA-225-2-090220	09/02/2020	N	**250**		**210**		**20**	
Building 341	RIA-341-1-GW-040220	04/02/2020	N	**29**		**30**		**75**	
	RIA-341-2-GW-040220	04/02/2020	N	**43**		**26**		**24**	
Bradley Flamethrower Testing Area	RIA-MW-4-5S-040720	04/07/2020	N	**4.7**		**170**		4.0	U
	RIA-MW-4-8S-040820	04/08/2020	N	3.7	U	**4.3**		**2.3**	J
	RIA-MW-4-23S-040820	04/08/2020	N	3.7	U	**36**		**2.4**	J

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

AOPI	Sample/Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tapwater Risk Screening Level	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Old Landfill	RIA-OLF-POC-1A-040820	04/08/2020	N	**24**		**15**		**4.5**	
	RIA-OLF-POC-5-040820	04/08/2020	N	**6.3**		4.0	U	**3.5**	J
	RIA-DUP-02-GW-040820/ RIA-OLF-POC-5-040820	04/08/2020	FD	**5.6**		3.9	U	**3.9**	
	RIA-OLF-POC-8-040820	04/08/2020	N	**6.1**		**5.8**		**4.5**	
	RIA-DUP-01-GW-040820/ RIA-OLF-POC-8-040820	04/08/2020	FD	**5.4**		**5.4**		**4.7**	
	RIA-OLF-POC-10-040820	04/08/2020	N	**6.9**		**3.9**		**8.8**	
	RIA-OLF-POC-10-040820/RIA-OLF-DEB-POC-10-040820	04/08/2020	DEB	**5.3**		**100**		**6.7**	
Sludge Drying Beds	RIA-SDB-1-GW-040120	04/01/2020	N	3.8	U	3.8	U	3.8	U

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection.
2. Gray shaded value indicates the detected concentration is greater than or equal to the Office of the Secretary of Defense (OSD) risk screening level for the residential tapwater exposure scenario (OSD. 2019. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October.). The PFBS risk screening level was updated in April 2021 based on the updated toxicity assessment for PFBS published by the United States Environmental Protection Agency.

Acronyms:
AOPI - area of potential interest
DEB - Dedicated Equipment Background
FD - field duplicate sample
ID - identification
N - primary sample
ng/L - nanograms per liter (parts per trillion)
PFBS - perfluorobutane sulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonic acid
Qual - qualifier

Qualifiers:
J - The analyte was positively identified; however the associated numerical value is an estimated concentration only.
J- - The result is an estimated quantity; the result may be biased low.
U - The analyte was analyzed for but the result was not detected above the limit of quantitation.
UJ - The analyte was analyzed for but was not detected. The limit of quantitation is approximate and may be inaccurate or imprecise.

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

AOPI	Sample/Parent ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
			OSD Risk Screening Levels	0.13 (R) 1.6 (I/C)		0.13 (R) 1.6 (I/C)		1.9 (R) 25 (I/C)	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Building 25 Soil Laydown Yard	RIA-25-1-SO-033120	03/31/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-25-2-SO-033120	03/31/2020	N	**0.00055**	J	0.0011	U	0.0011	U
	RIA-25-3-SO-033120	03/31/2020	N	0.0012	U	0.0012	U	0.0012	U
	RIA-25-4-SO-033120	03/31/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-25-5-SO-033120	03/31/2020	N	0.00097	U	0.00097	U	0.00097	U
Buildings 64 and 65	RIA-64/65-1-SO-040320	04/03/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-64/65-2-SO-040320	04/03/2020	N	0.0011	U	0.0011	U	0.0011	U
Buildings 66 and 69	RIA-66/69-1-SO-040320	04/03/2020	N	0.00091	U	0.00091	U	0.00091	U
	RIA-66/69-2-SO-040320	04/03/2020	N	0.0011	U	0.0011	U	0.0011	U
Buildings 90	RIA-90-1-SO-040620	04/06/2020	N	0.001	U	0.001	U	0.001	U
	RIA-90-2-SO-040620	04/06/2020	N	0.001	U	0.001	U	0.001	U
	RIA-90-3-SO-040620	04/06/2020	N	**0.0032**		0.0013	U	0.0013	U
	RIA-DUP-02-SO-040620 / RIA-90-3-SO-040620	04/06/2020	FD	**0.0024**		0.0012	U	0.0012	U
	RIA-90-4-SO-040220	04/02/2020	N	0.001	U	0.001	U	0.001	U
Building 107	RIA-107-1-SO-040120	04/01/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-107-2-SO-040220	04/02/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 144	RIA-144-1-SO-040120	04/01/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 159	RIA-159-1-SO-040120	03/31/2020	N	0.0012	U	0.0012	U	0.0012	U
	RIA-159-2-SO-040120	04/01/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-159-3-SO-040120	04/01/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 225	RIA-225-1-SO-040220	04/02/2020	N	**0.05**		**0.00069**	J	0.001	U
	RIA-225-2-SO-040220	04/02/2020	N	**0.0039**		**0.00073**	J	0.0011	U
	RIA-225-3-SO-040220	04/02/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 341	RIA-341-1-SO-040120	04/01/2020	N	**0.014**		0.0012	U	0.0012	U
	DUP-01-040120/ RIA-341-1-SO-040120	04/01/2020	FD	**0.012**		0.0011	U	0.0011	U
	RIA-341-2-SO-040120	04/01/2020	N	0.0012	U	0.0012	U	0.0012	U
Current Fire Training Area/Former XYZ Fire Training Area	RIA-FTA-1-SO-040220	04/02/2020	N	**0.0081**		**0.00083**	J	0.00097	U
	RIA-FTA-2-SO-040220	04/02/2020	N	**0.0059**		0.0011	U	0.0011	U
	RIA-FTA-3-SO-040220	04/02/2020	N	0.0011	U	0.0011	U	0.0011	U
	RIA-FTA-4-SO-040220	04/02/2020	N	**0.00064**	J	0.0011	U	0.0011	U

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Rock Island Arsenal, Illinois

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection
industrial/commercial scenarios (OSD. 2019. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October.). The PFBS risk screening level was updated in April 2021 based on the updated toxicity assessment for PFBS published by the United States Environmental Protection Agency. No exceedances were obsereved for the residential or industrial/commercial receptor scenarios.
3. All laboratory reported results in nanograms per gram (ng/g) were converted to milligrams per kilogram (mg/kg).

Acronyms:

(R) = residential receptor scenario
(IC) = industrial/commercial receptor scenario
AOPI - area of potential interest
FD - field duplicate sample
ID - identification
mg/kg - milligrams per kilogram (parts per million)
N - primary sample
PFBS - perfluorobutane sulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonic acid
Qual - qualifier

Qualifiers:
J - The analyte was positively identified; however the associated numerical value is an estimated concentration only.
U - The analyte was analyzed for but the result was not detected above the limit of quantitation.

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection Rock Island Arsenal, IL

ARCADIS

Figure 2-1
Site Location

Legend

Installation Boundary

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS Preliminary Assessment / Site Inspection Rock Island Arsenal, IL

ARCADIS

Figure 2-2
Site Layout

Legend

- Installation Boundary
- Shallow (Unconsolidated) Monitoring Well
- Drinking Water Intake
- Industrial Stormwater Discharge Point
- Stream (Perennial)
- Surface Runoff / Groundwater Flow Direction

Data Sources:
Rock Island Arsenal, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS
Preliminary Assessment /
Site Inspection
Rock Island Arsenal, IL

ARCADIS

Figure 2-3
Topographic Map

Legend

- Installation Boundary
- Elevation Contour (feet)

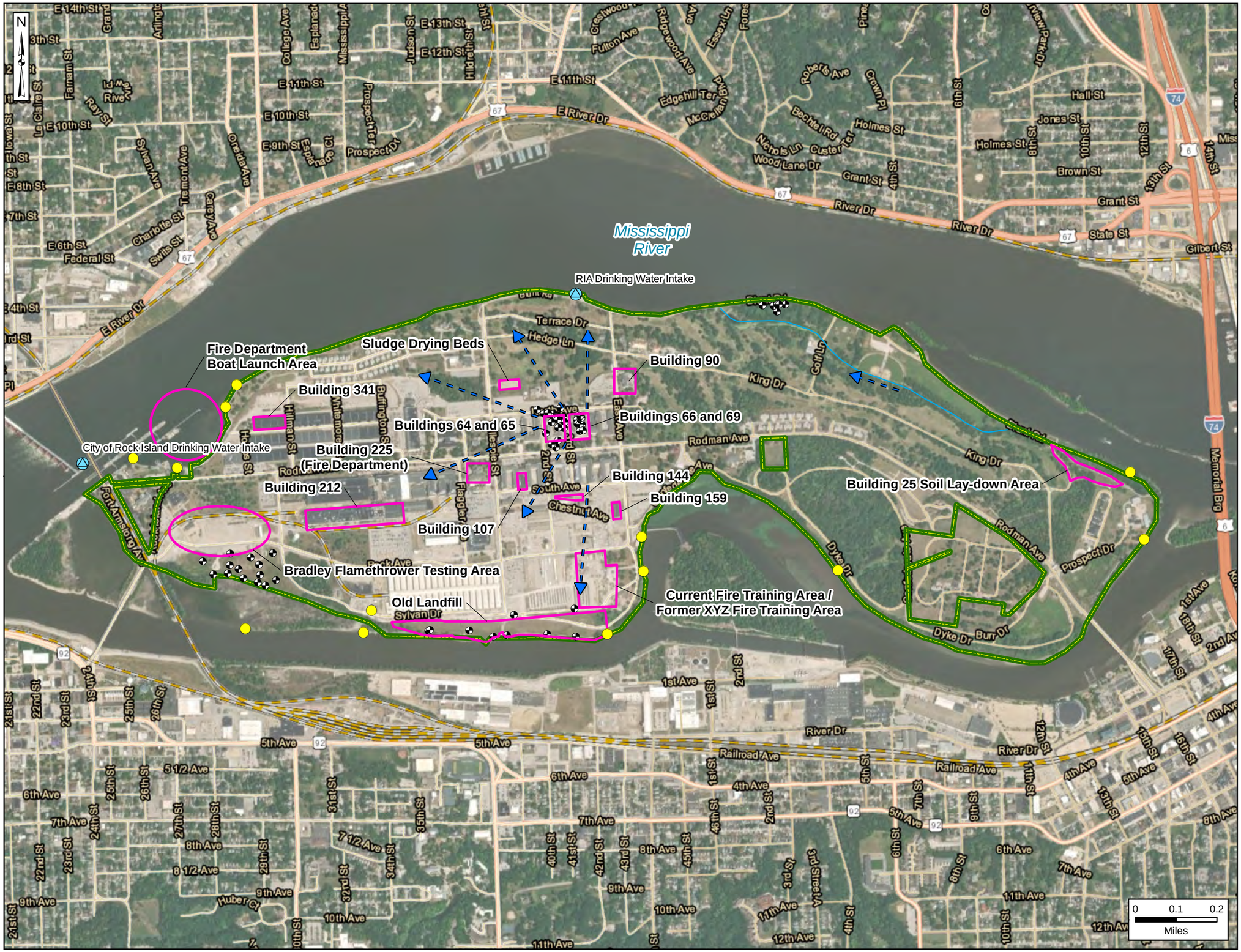
Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, USGS Topo

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS Preliminary Assessment / Site Inspection Rock Island Arsenal, IL

ARCADIS

Figure 5-2
AOPI Locations



Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Drinking Water Intake
- Industrial Stormwater Discharge Point
- Stream (Perennial)
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Rock Island Arsenal, IL

ARCADIS

Figure 5-3
Aerial Photo of
Building 25 Soil Lay-down Area

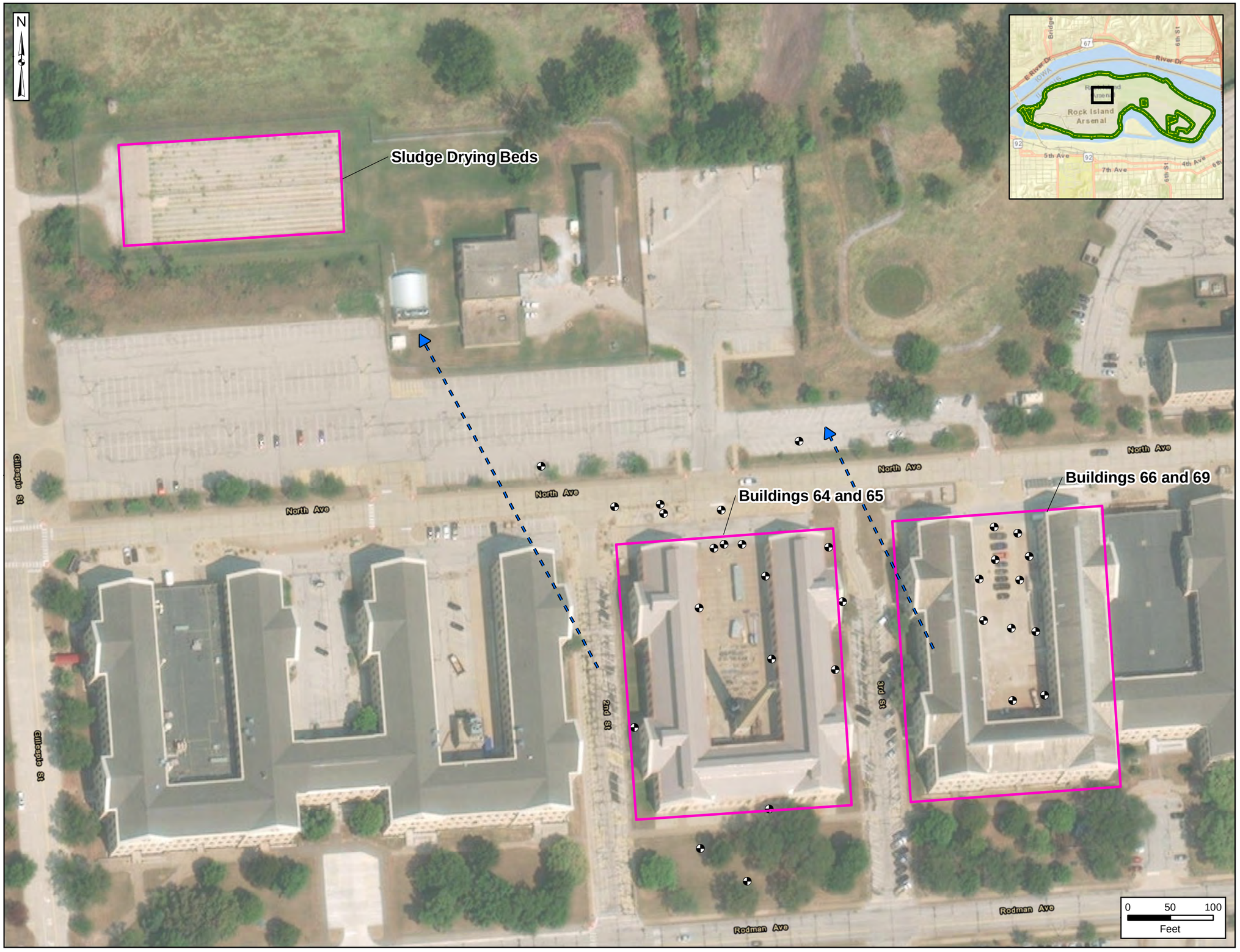
Legend

- Installation Boundary
- AOPI
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North



USAEC PFAS
Preliminary Assessment / Site Inspection
Rock Island Arsenal, IL

ARCADIS

Figure 5-4
Aerial Photo of Sludge Drying Beds, Buildings 64 and 65, and Buildings 66 and 69

Legend

- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS Preliminary Assessment / Site Inspection Rock Island Arsenal, IL

ARCADIS

Figure 5-5
Aerial Photo of
Building 90

Legend

- Installation Boundary
- AOPI
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Rock Island Arsenal, IL

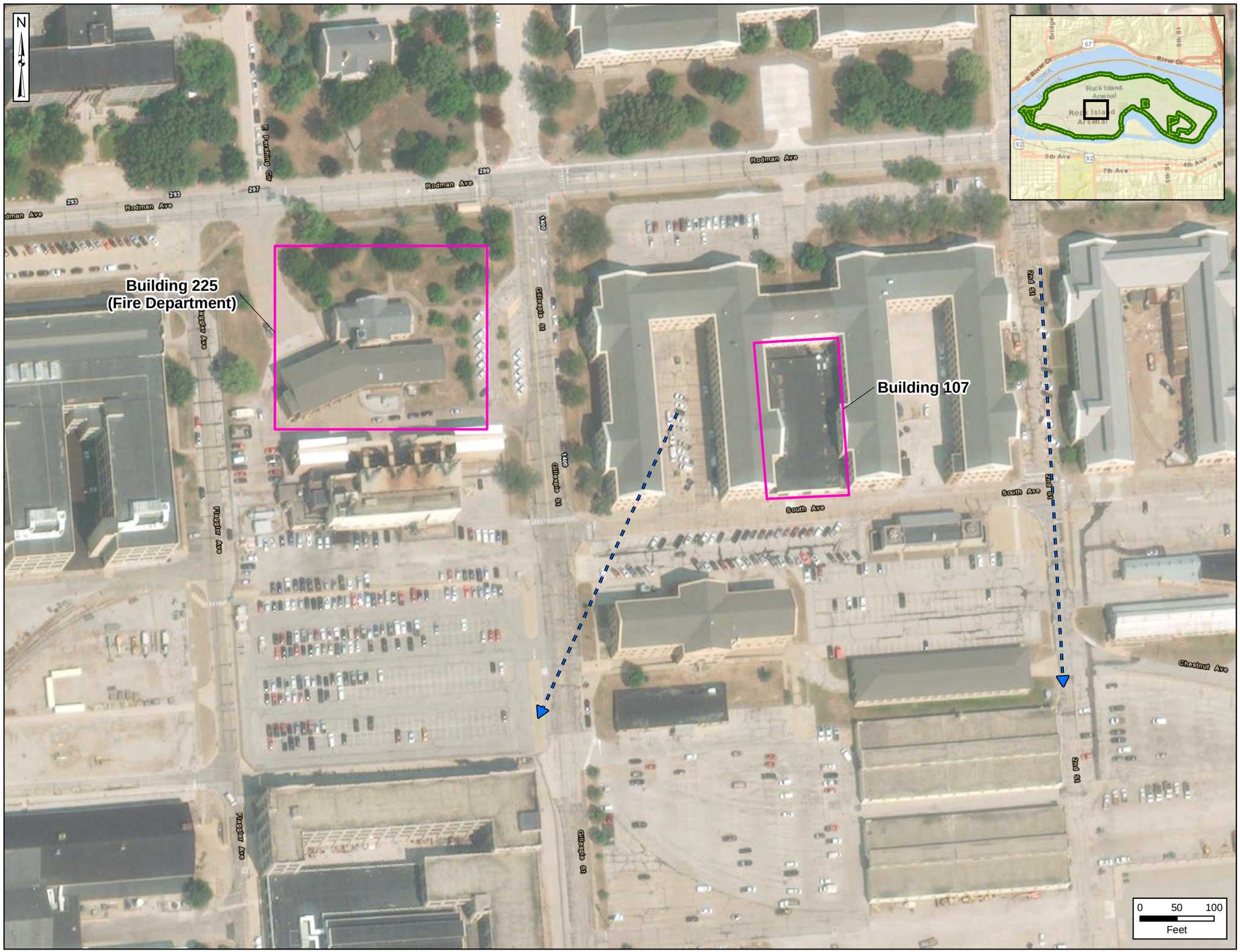


Figure 5-6
Aerial Photo of
Building 225 and Building 107

Legend

- Installation Boundary
- AOPI
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Rock Island Arsenal, IL

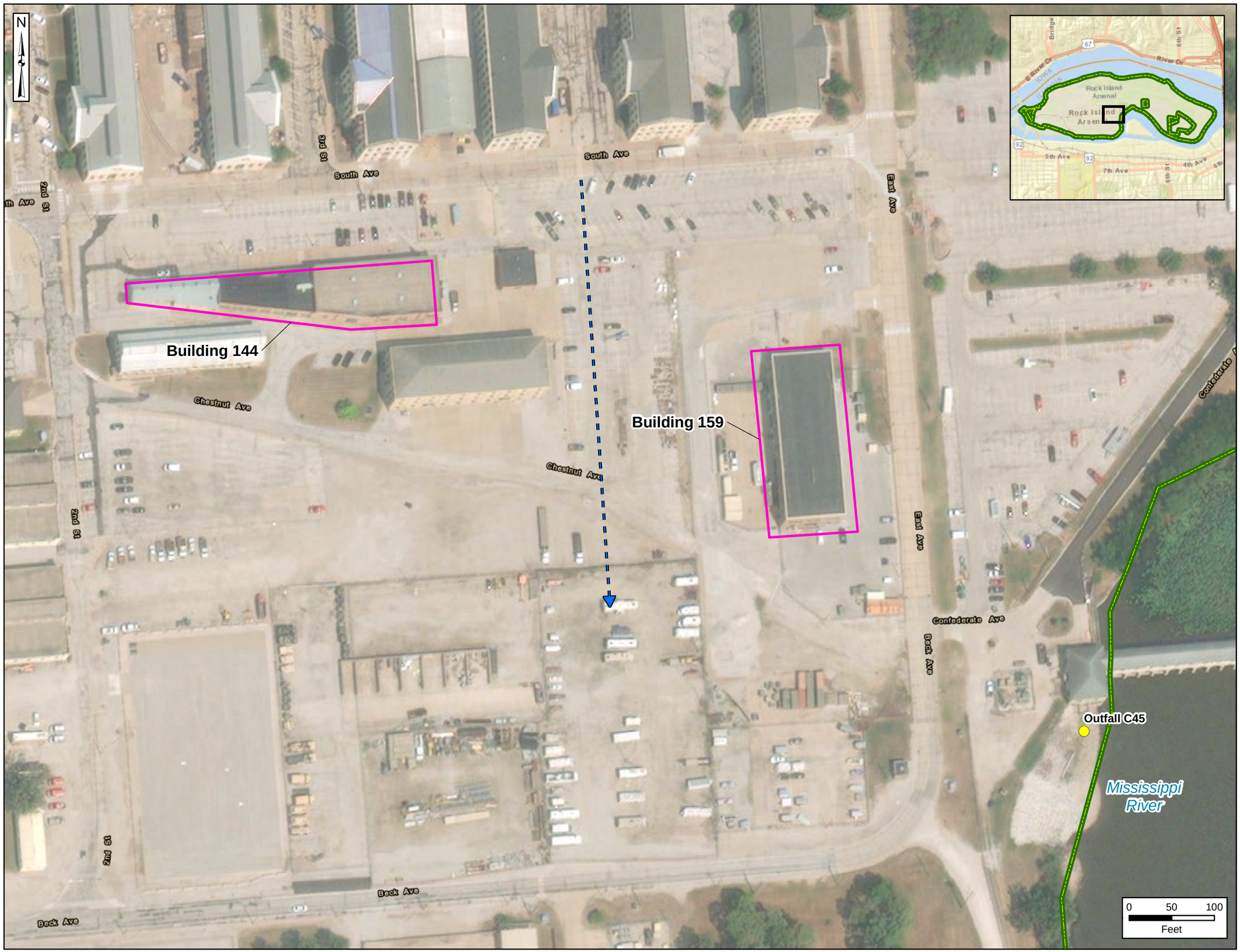


Figure 5-7
Aerial Photo of
Building 144 and Building 159

Legend

- Installation Boundary
- AOPI
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

USAEC PFAS Preliminary Assessment / Site Inspection Rock Island Arsenal, IL

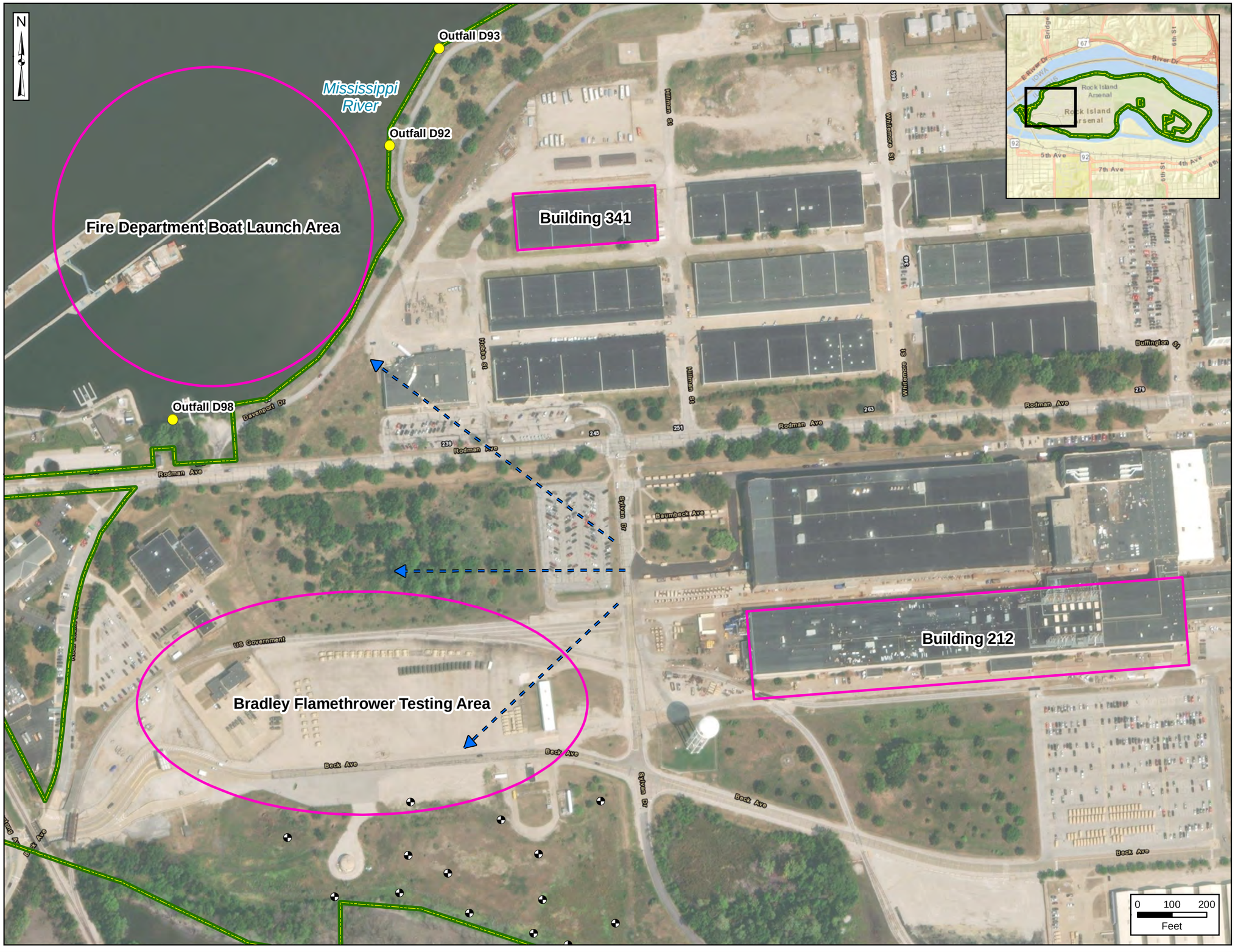


Figure 5-8
Aerial Photo of Building 341, Building 212, Bradley Flamethrower Testing Area, and Fire Department Boat Launch Area

Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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Figure 5-9
Aerial Photo of
Old Landfill and
Current Fire Training Area/
Former XYZ Fire Training Area

Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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Figure 7-1
AOPI Locations and OSD Risk Screening Level Exceedances

Mississippi River

RIA Drinking Water Intake

Fire Department Boat Launch Area

Sludge Drying Beds

Building 90

Building 341

Buildings 64 and 65

Buildings 66 and 69

City of Rock Island Drinking Water Intake

Building 225 (Fire Department)

Building 144

Building 159

Building 212

Building 107

Building 25 Soil Lay-down Area

Bradley Flamethrower Testing Area

Old Landfill

Current Fire Training Area / Former XYZ Fire Training Area

Legend

- Installation Boundary
- AOPI
- AOPI with OSD Risk Screening Level Exceedance
- Shallow (Unconsolidated) Monitoring Well
- Drinking Water Intake
- Industrial Stormwater Discharge Point
- Stream (Perennial)
- Surface Runoff / Groundwater Flow Direction

AOPI = area of potential interest
OSD = Office of the Secretary of Defense

0 0.1 0.2 Miles

Data Sources:
Rock Island Arsenal, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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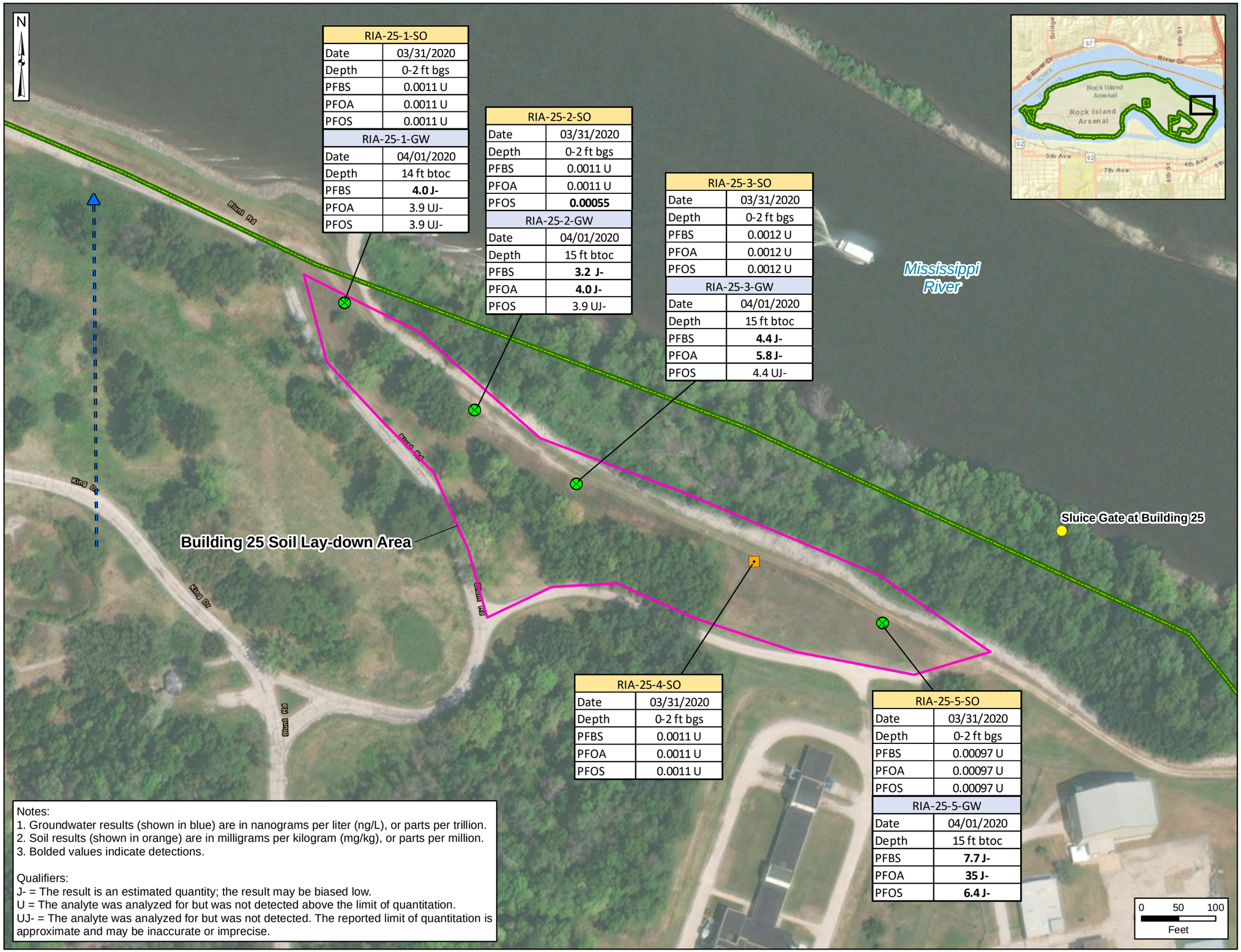
Figure 7-2
Building 25 Soil Lay-down Area AOPI
PFOS, PFOA, and PFBS
Analytical Results



RIA-25-1-SO	
Date	03/31/2020
Depth	0-2 ft bgs
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U
RIA-25-1-GW	
Date	04/01/2020
Depth	14 ft btoc
PFBS	**4.0 J-**
PFOA	3.9 UJ-
PFOS	3.9 UJ-

RIA-25-2-SO	
Date	03/31/2020
Depth	0-2 ft bgs
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.00055**
RIA-25-2-GW	
Date	04/01/2020
Depth	15 ft btoc
PFBS	**3.2 J-**
PFOA	**4.0 J-**
PFOS	3.9 UJ-

RIA-25-3-SO	
Date	03/31/2020
Depth	0-2 ft bgs
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	0.0012 U
RIA-25-3-GW	
Date	04/01/2020
Depth	15 ft btoc
PFBS	**4.4 J-**
PFOA	**5.8 J-**
PFOS	4.4 UJ-

RIA-25-4-SO	
Date	03/31/2020
Depth	0-2 ft bgs
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

RIA-25-5-SO	
Date	03/31/2020
Depth	0-2 ft bgs
PFBS	0.00097 U
PFOA	0.00097 U
PFOS	0.00097 U
RIA-25-5-GW	
Date	04/01/2020
Depth	15 ft btoc
PFBS	**7.7 J-**
PFOA	**35 J-**
PFOS	**6.4 J-**

Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but was not detected above the limit of quantitation.
UJ- = The analyte was analyzed for but was not detected. The reported limit of quantitation is approximate and may be inaccurate or imprecise.

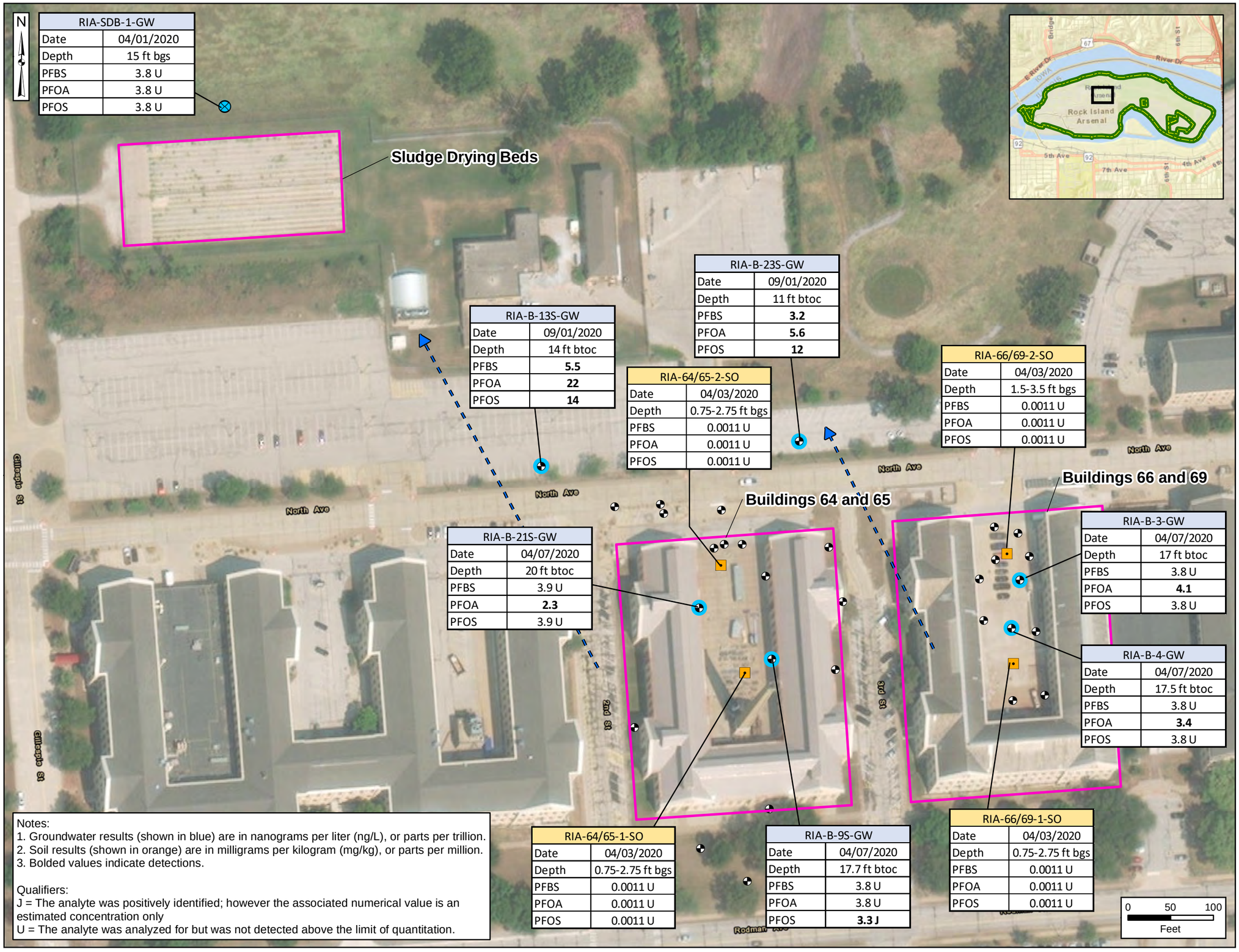
Legend

- Installation Boundary
- AOPI
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction
- Soil Sampling Location
- Soil and Groundwater Sampling Location (Boring)

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North



Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
U = The analyte was analyzed for but was not detected above the limit of quantitation.

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Figure 7-3
Sludge Drying Beds, Buildings 64 and 65, and Buildings 66 and 69 AOPIs PFOS, PFOA, and PFBS Analytical Results

Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Surface Runoff / Groundwater Flow Direction
- Groundwater Sampling Location (Boring)
- Soil Sampling Location
- Groundwater Sampling Location (Monitoring Well)

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

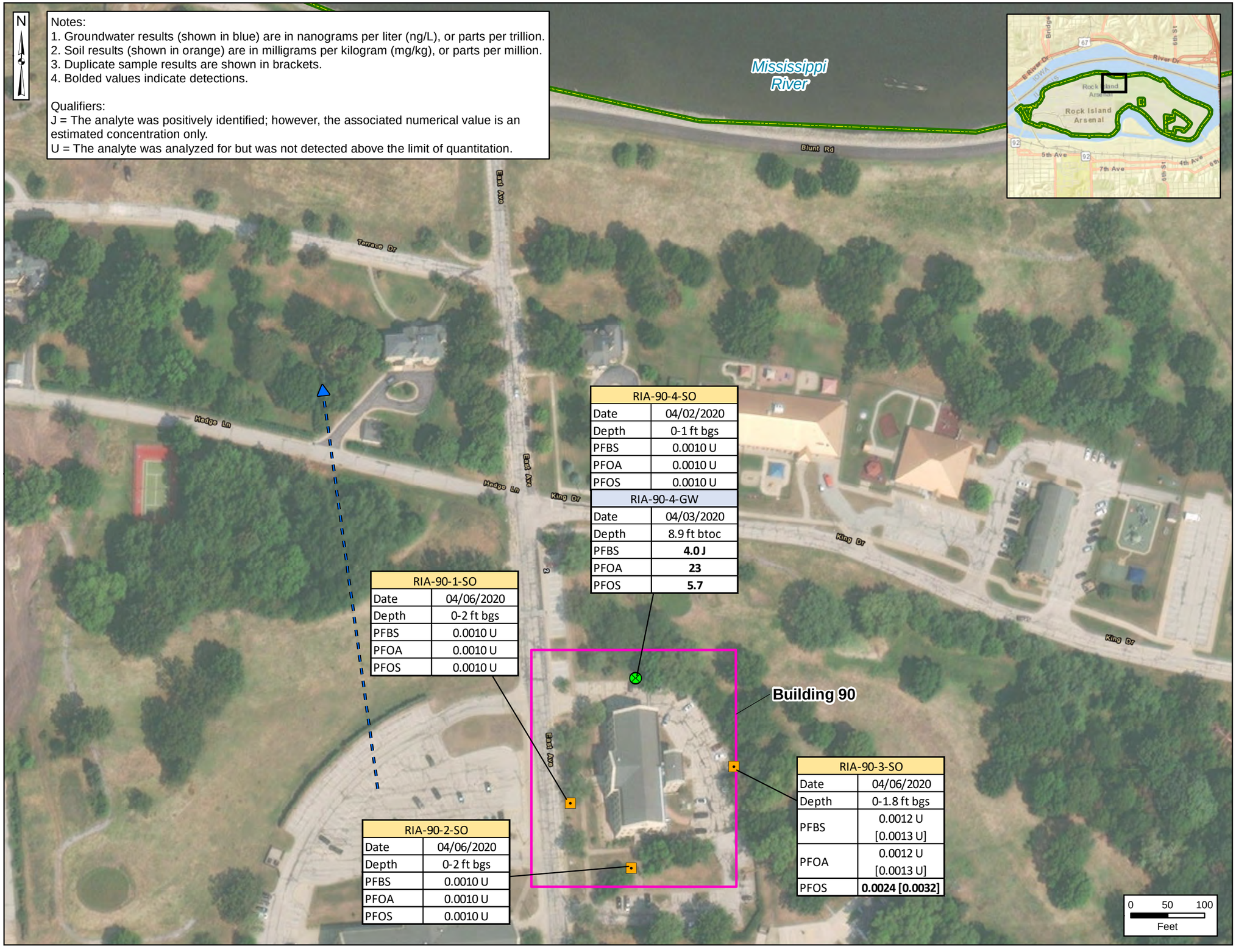

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Figure 7-4
Building 90 AOPI
PFOS, PFOA, and PFBS Analytical Results

Legend

- Installation Boundary
- AOPI
- Surface Runoff / Groundwater Flow Direction
- Soil and Groundwater Sampling Location (Boring)
- Soil Sampling Location

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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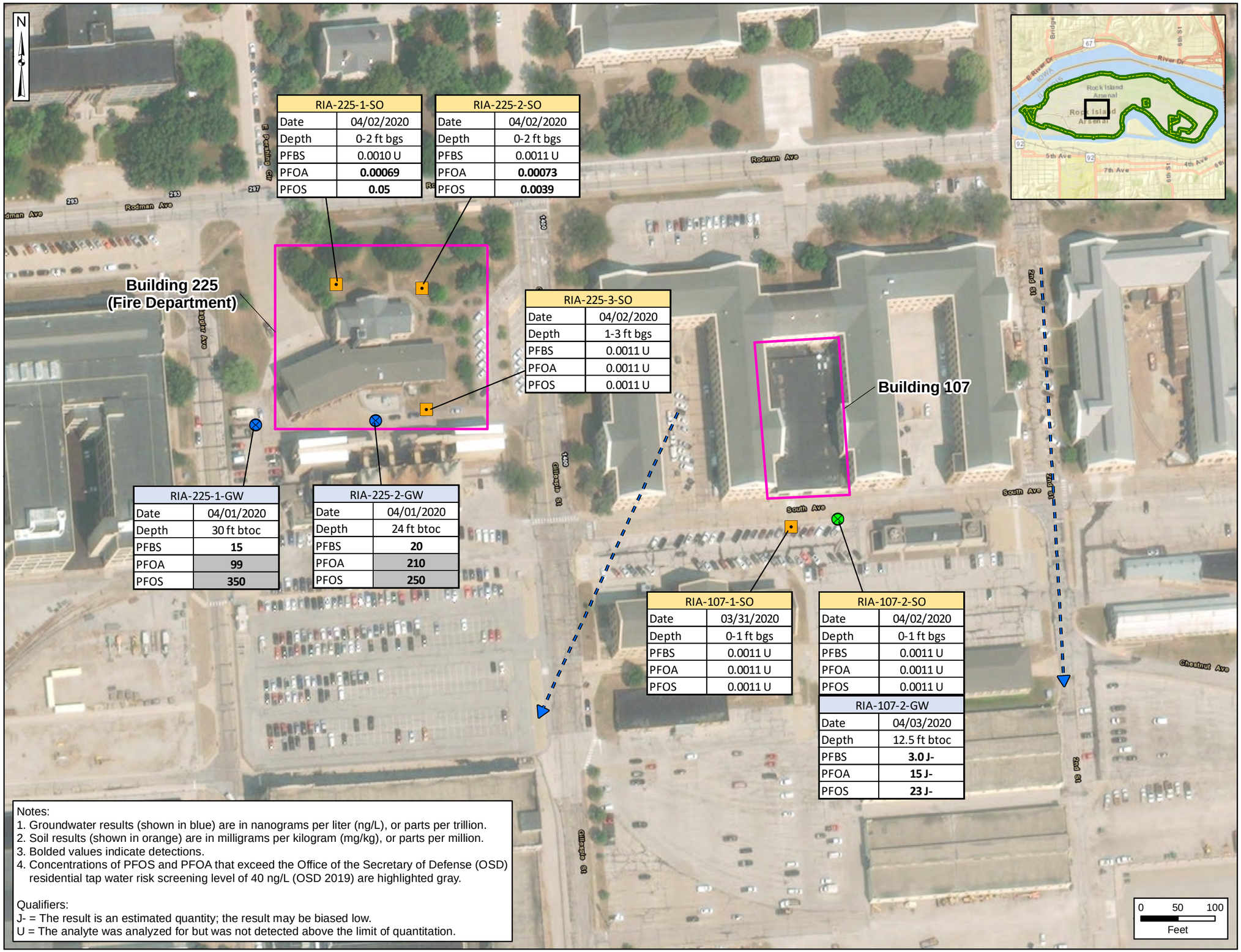

Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2019) are highlighted gray.

Qualifiers:
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but was not detected above the limit of quantitation.

Figure 7-5
Building 225 and Building 107 AOPIs PFOS, PFOA, and PFBS Analytical Results

Legend
- Installation Boundary
- AOPI
- Surface Runoff / Groundwater Flow Direction
- Soil Sampling Location
- Soil and Groundwater Sampling Location (Boring)
- Sonic Boring to Groundwater Sampling Location

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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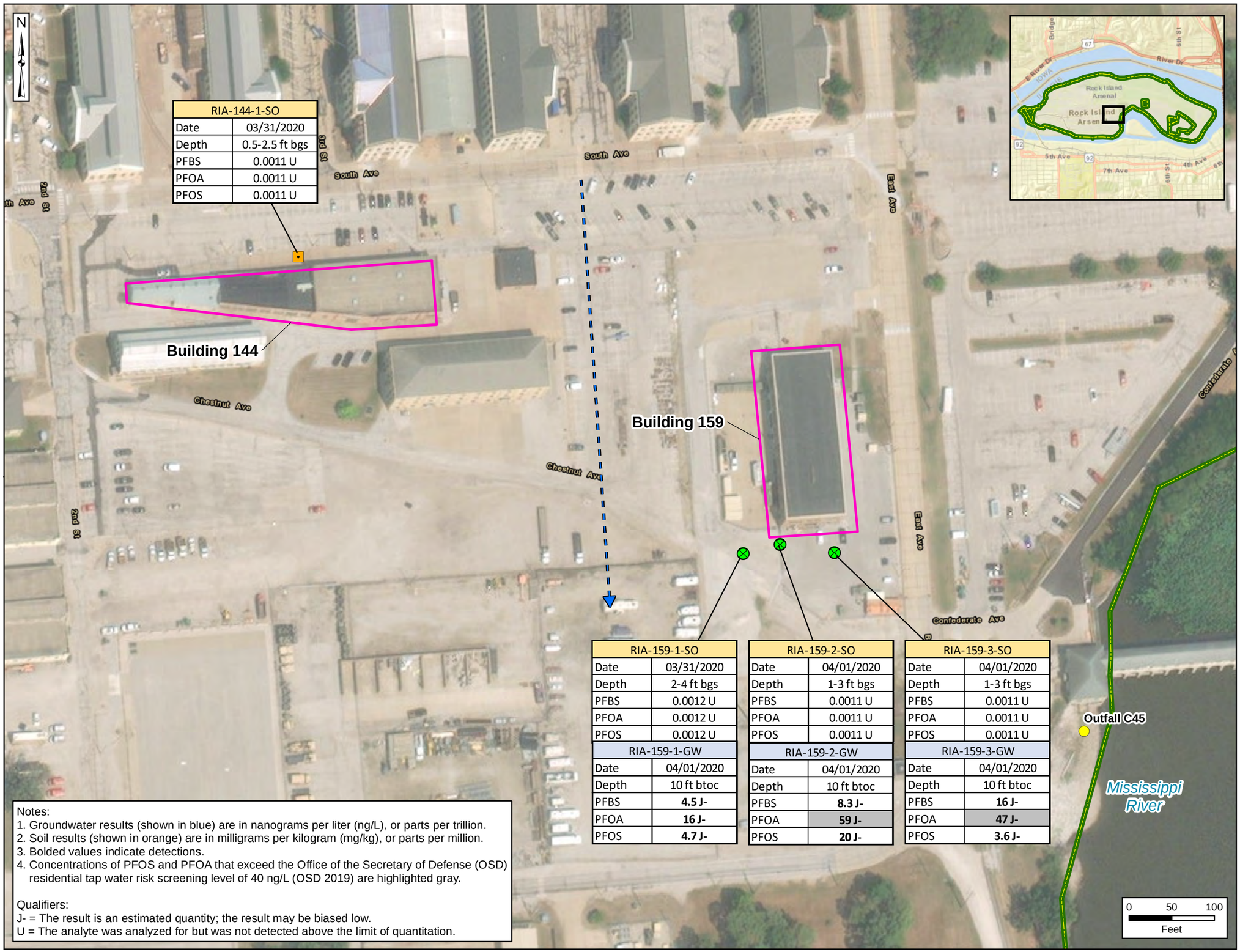

Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2019) are highlighted gray.

Qualifiers:
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but was not detected above the limit of quantitation.

Figure 7-6
Building 144 and Building 159 AOPIs PFOS, PFOA, and PFBS Analytical Results

Legend
- Installation Boundary
- AOPI
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction
- Soil Sampling Location
- Soil and Groundwater Sampling Location (Boring)

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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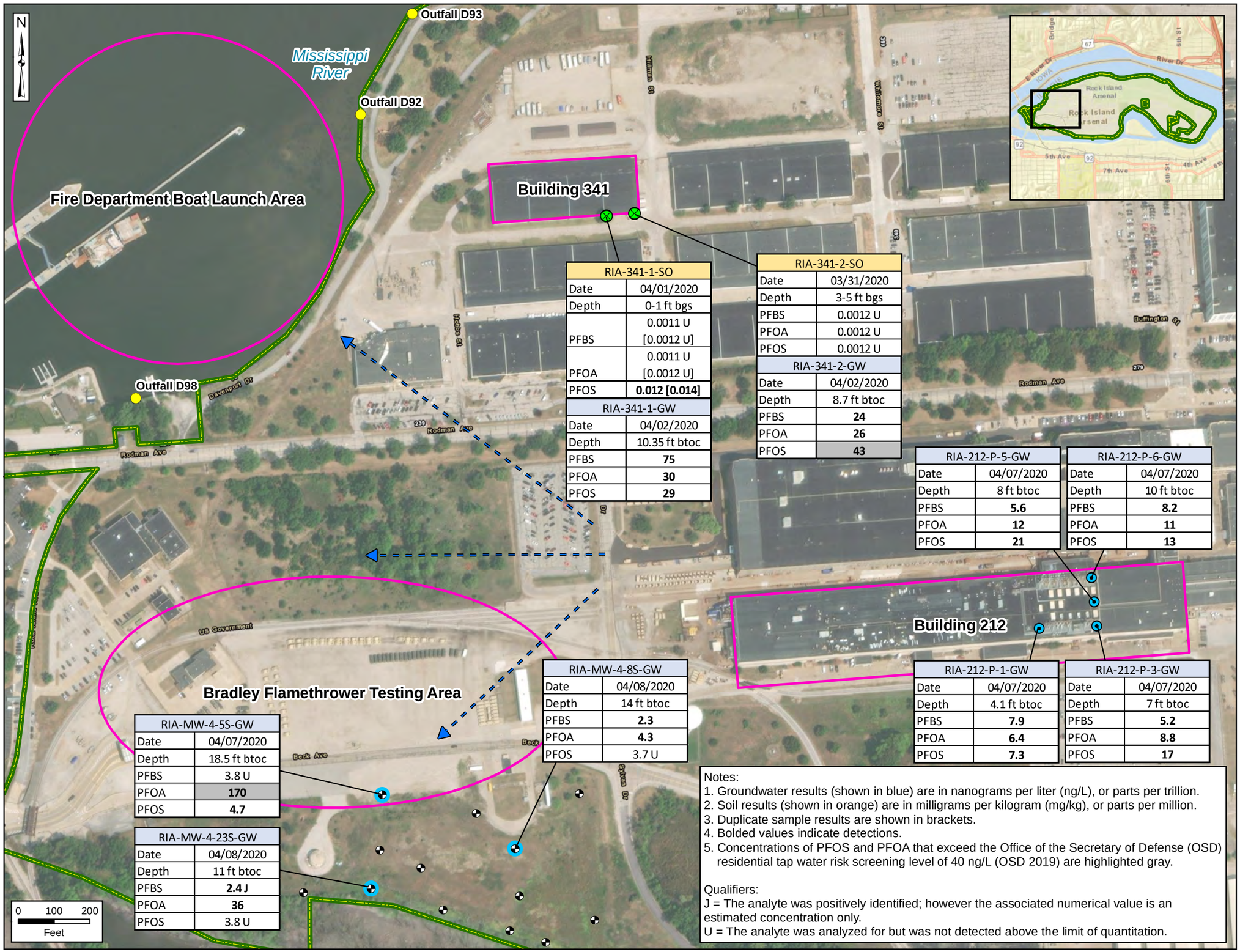
Figure 7-7
Building 341, Building 212, and Bradley Flamethrower Testing Area AOPIs PFOS, PFOA, and PFBS Analytical Results



RIA-341-1-SO	
Date	04/01/2020
Depth	0-1 ft bgs
PFBS	0.0011 U [0.0012 U]
PFOA	0.0011 U [0.0012 U]
PFOS	**0.012 [0.014]**

RIA-341-1-GW	
Date	04/02/2020
Depth	10.35 ft btoc
PFBS	**75**
PFOA	**30**
PFOS	**29**

RIA-341-2-SO	
Date	03/31/2020
Depth	3-5 ft bgs
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	0.0012 U

RIA-341-2-GW	
Date	04/02/2020
Depth	8.7 ft btoc
PFBS	**24**
PFOA	**26**
PFOS	**43**

RIA-212-P-5-GW	
Date	04/07/2020
Depth	8 ft btoc
PFBS	**5.6**
PFOA	**12**
PFOS	**21**

RIA-212-P-6-GW	
Date	04/07/2020
Depth	10 ft btoc
PFBS	**8.2**
PFOA	**11**
PFOS	**13**

RIA-212-P-1-GW	
Date	04/07/2020
Depth	4.1 ft btoc
PFBS	**7.9**
PFOA	**6.4**
PFOS	**7.3**

RIA-212-P-3-GW	
Date	04/07/2020
Depth	7 ft btoc
PFBS	**5.2**
PFOA	**8.8**
PFOS	**17**

RIA-MW-4-8S-GW	
Date	04/08/2020
Depth	14 ft btoc
PFBS	**2.3**
PFOA	**4.3**
PFOS	3.7 U

RIA-MW-4-5S-GW	
Date	04/07/2020
Depth	18.5 ft btoc
PFBS	3.8 U
PFOA	**170**
PFOS	**4.7**

RIA-MW-4-23S-GW	
Date	04/08/2020
Depth	11 ft btoc
PFBS	**2.4 J**
PFOA	**36**
PFOS	3.8 U

Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction
- Soil and Groundwater Sampling Location (Boring)
- Groundwater Sampling Location (Sump)
- Groundwater Sampling Location (Monitoring Well)

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2019) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for but was not detected above the limit of quantitation.

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North

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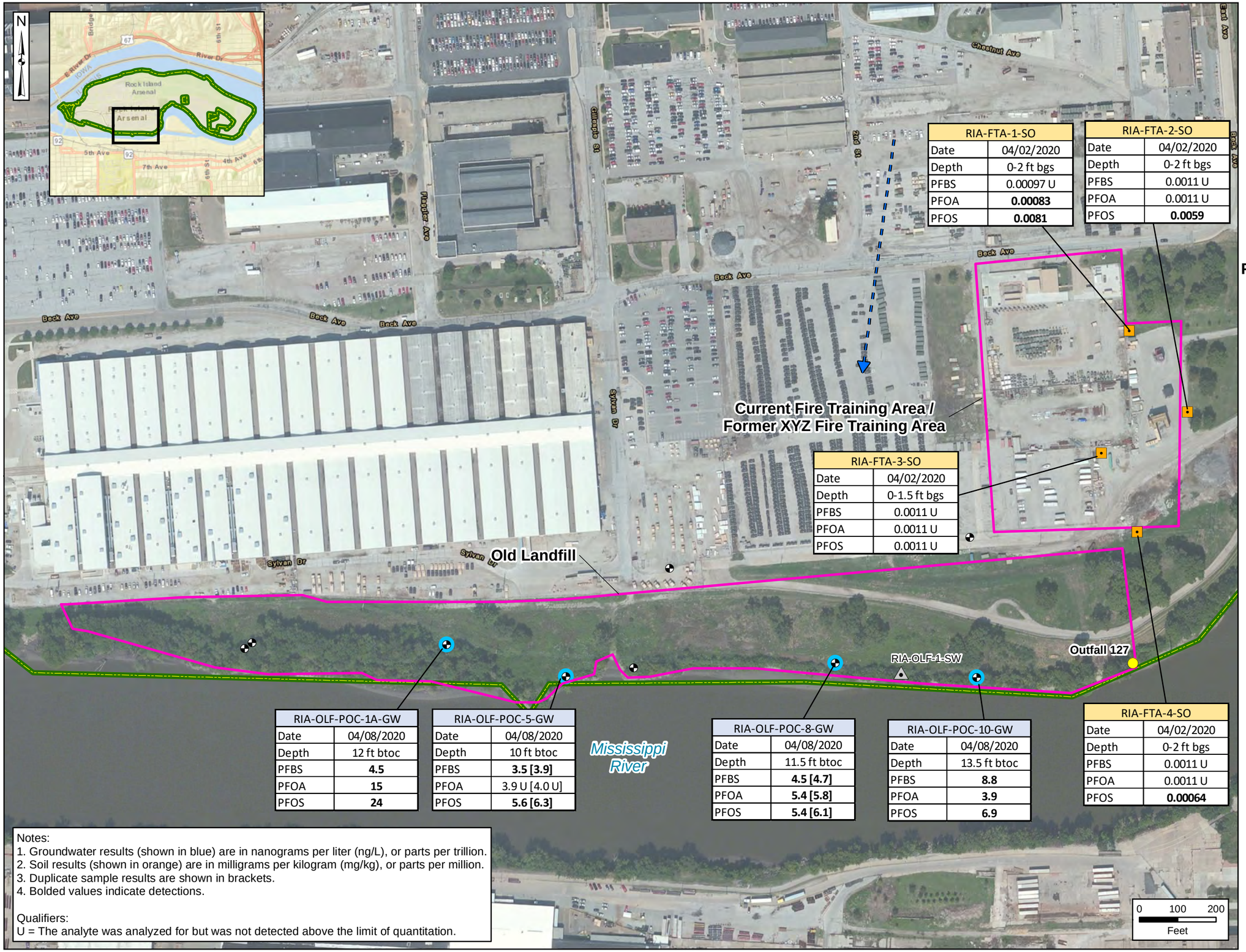
Figure 7-8
Old Landfill and Current Fire Training Area/ Former XYZ Fire Training Area AOPIs PFOS, PFOA, and PFBS Analytical Results



Legend

- Installation Boundary
- AOPI
- Shallow (Unconsolidated) Monitoring Well
- Industrial Stormwater Discharge Point
- Surface Runoff / Groundwater Flow Direction
- Soil Sampling Location
- Groundwater Sampling Location (Monitoring Well)
- Surface Water Sampling Location (Seep)*

AOPI = area of potential interest
ft bgs = feet below ground surface
ft btoc = feet below top of casing
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

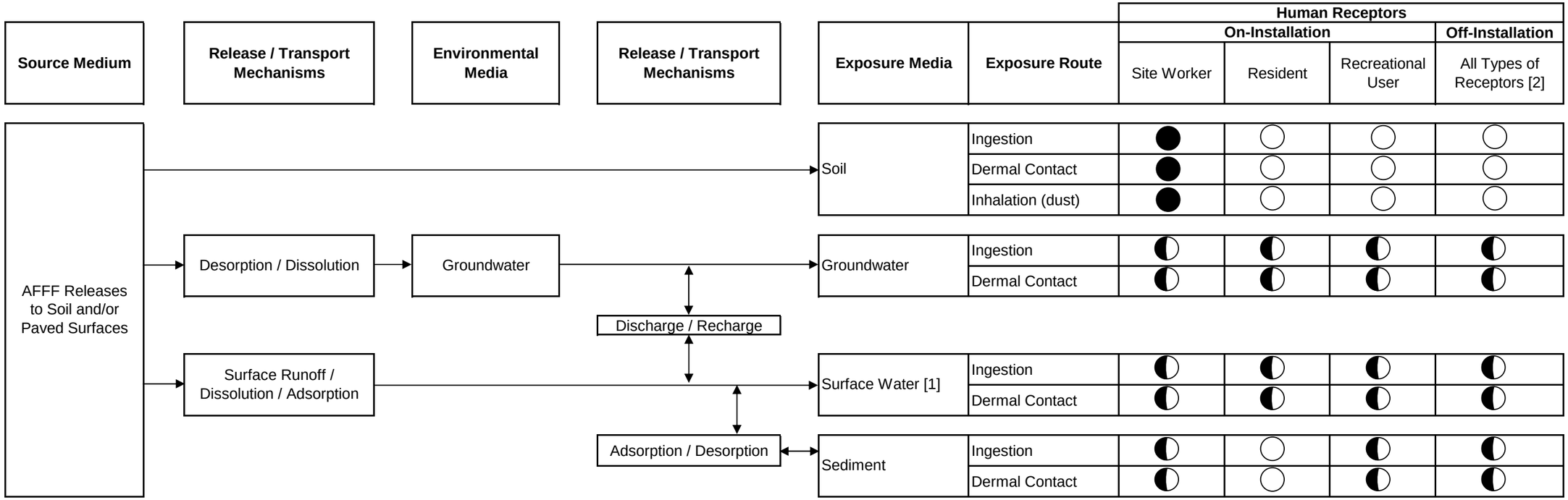
* Surface water sample was not collected due to unfavorable hydrologic conditions.

Notes:
1. Groundwater results (shown in blue) are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results (shown in orange) are in milligrams per kilogram (mg/kg), or parts per million.
3. Duplicate sample results are shown in brackets.
4. Bolded values indicate detections.

Qualifiers:
U = The analyte was analyzed for but was not detected above the limit of quantitation.

Data Sources:
Rock Island Arsenal, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 15 North



Legend:

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

● = Complete Exposure Pathway

Notes:

[1] Surface water exposure pathway for Site Workers describes a drinking water scenario and incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.

[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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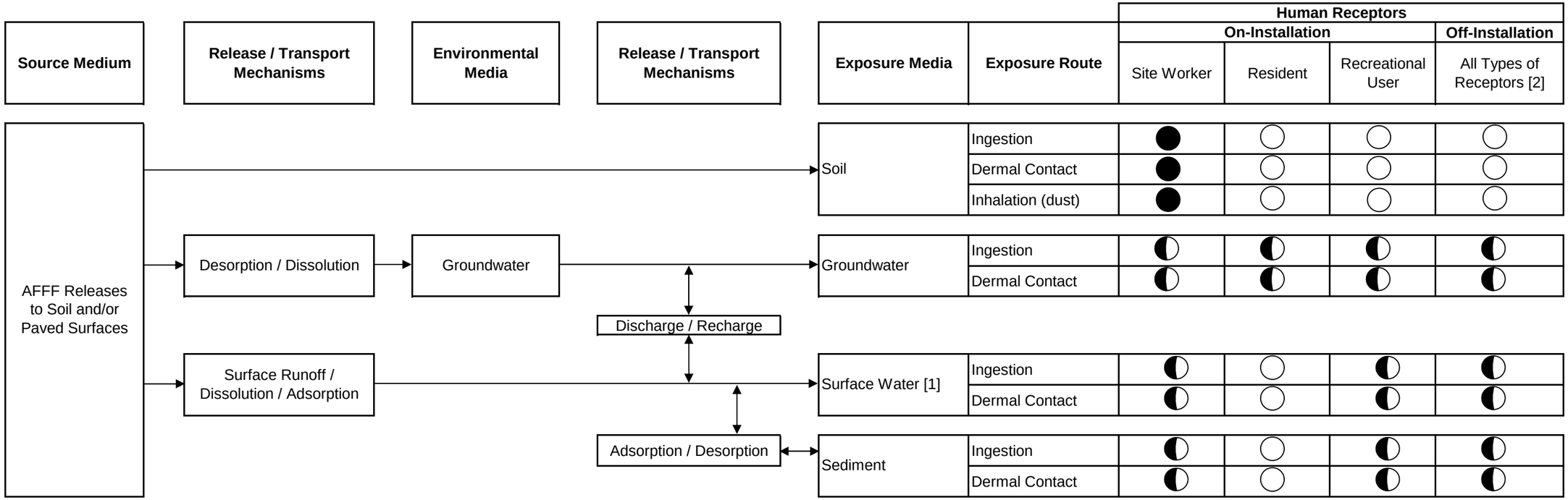
Conceptual Site Model for Building 25 Soil Lay-down Area and Building 90
USAEC PFAS Preliminary Assessment / Site Inspection
Rock Island Arsenal, Illinois

Figure 7-9



Legend:

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

● = Complete Exposure Pathway

Notes:

[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.

[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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Conceptual Site Model for Building 225, Building 341, and Current Fire Training Area/Former XYZ Fire Training Area

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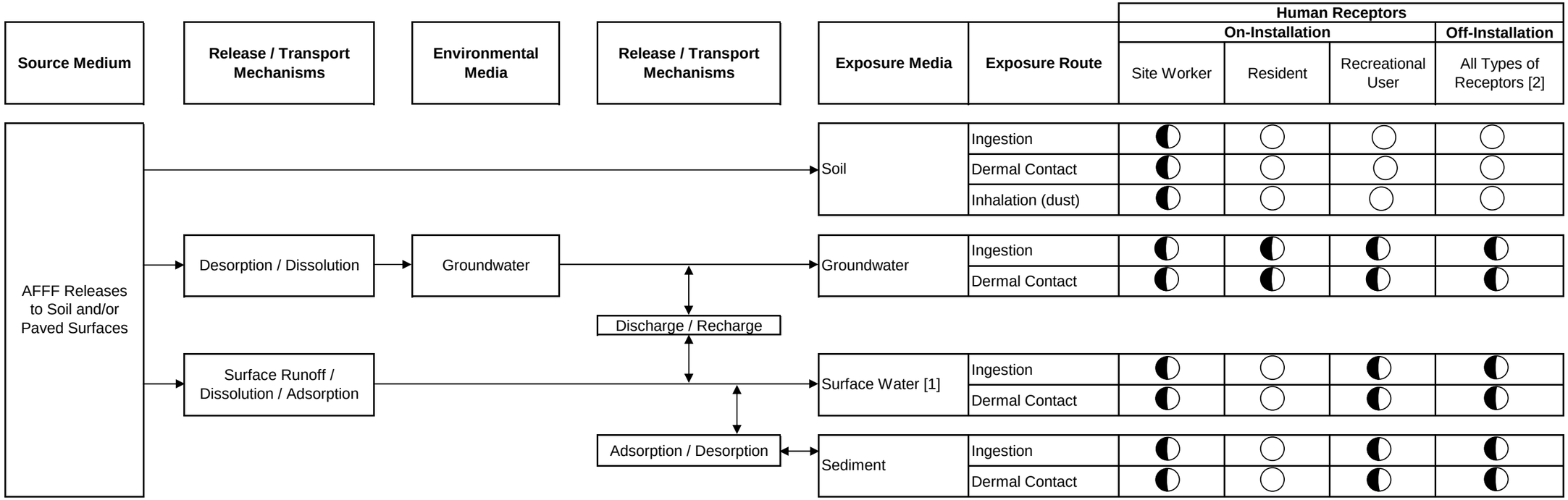
Rock Island Arsenal, Illinois

Figure 7-10



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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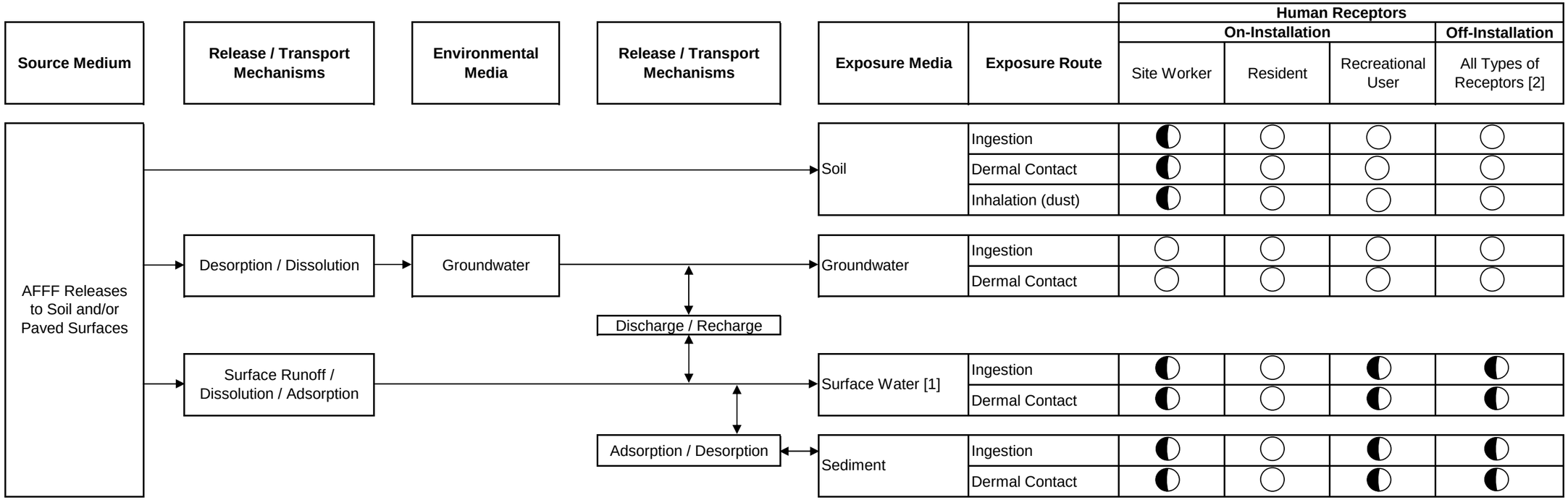
Conceptual Site Model for Bradley Flamethrower Testing Area, and Building 212
USAEC PFAS Preliminary Assessment / Site Inspection
Rock Island Arsenal, Illinois

Figure 7-11



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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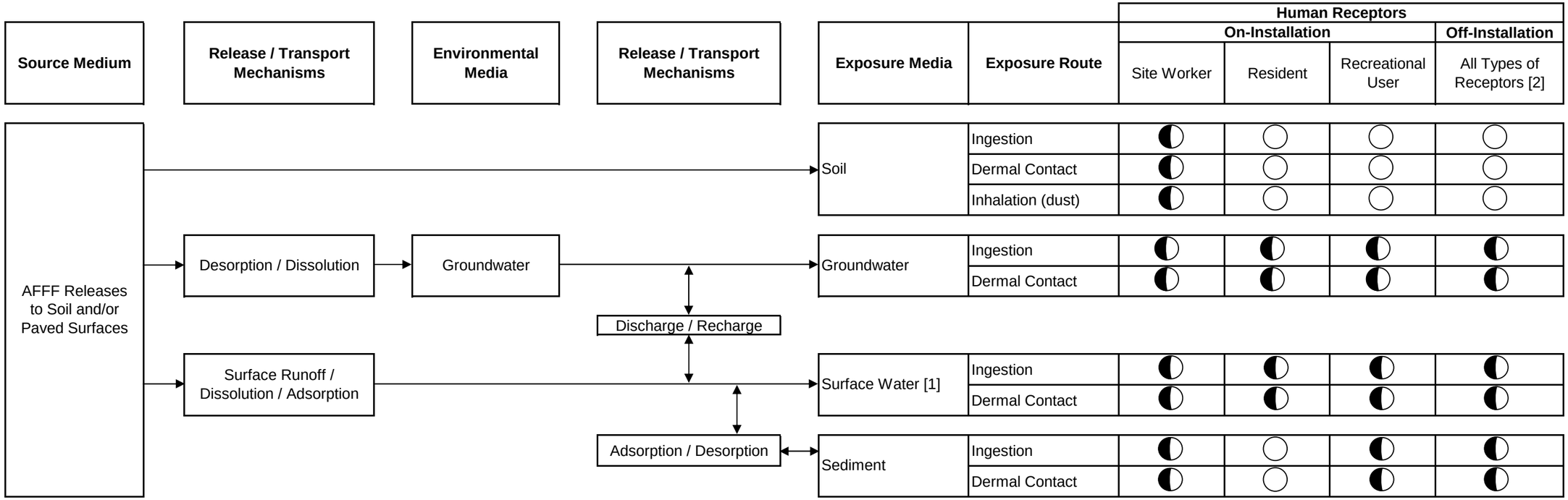
Conceptual Site Model for Sludge Drying Beds
USAEC PFAS Preliminary Assessment / Site Inspection
Rock Island Arsenal, Illinois

Figure 7-12



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers describes a drinking water scenario and incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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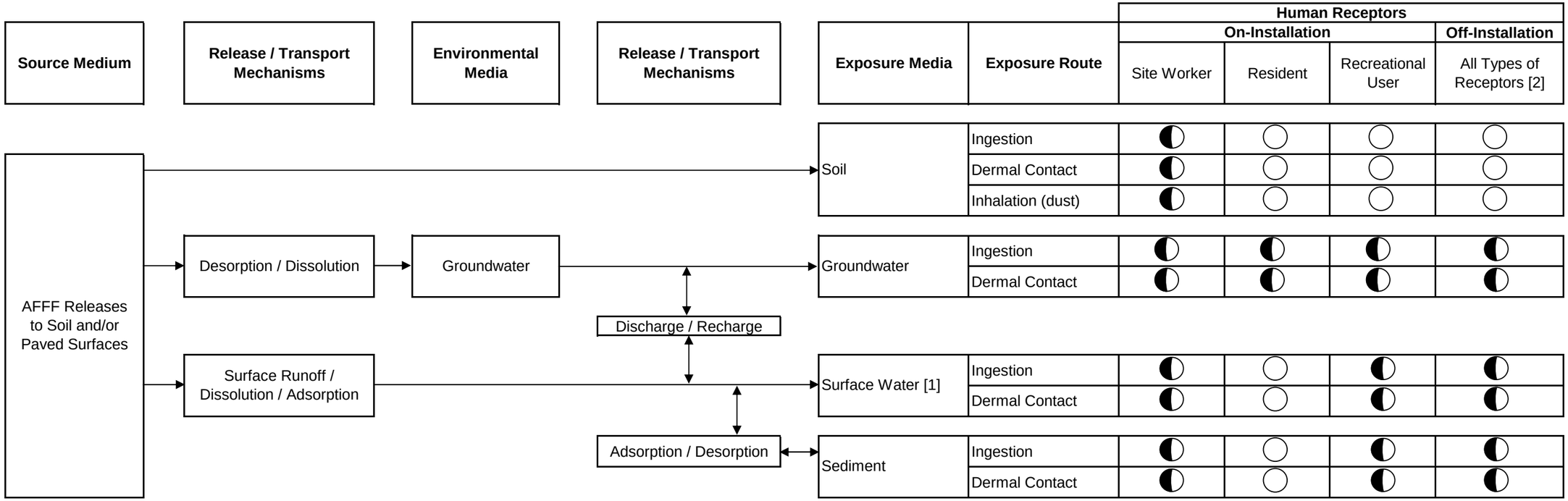
Conceptual Site Model for Buildings 66 and 69 and Buildings 64 and 65
USAEC PFAS Preliminary Assessment / Site Inspection
Rock Island Arsenal, Illinois

Figure 7-13



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:

[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.

[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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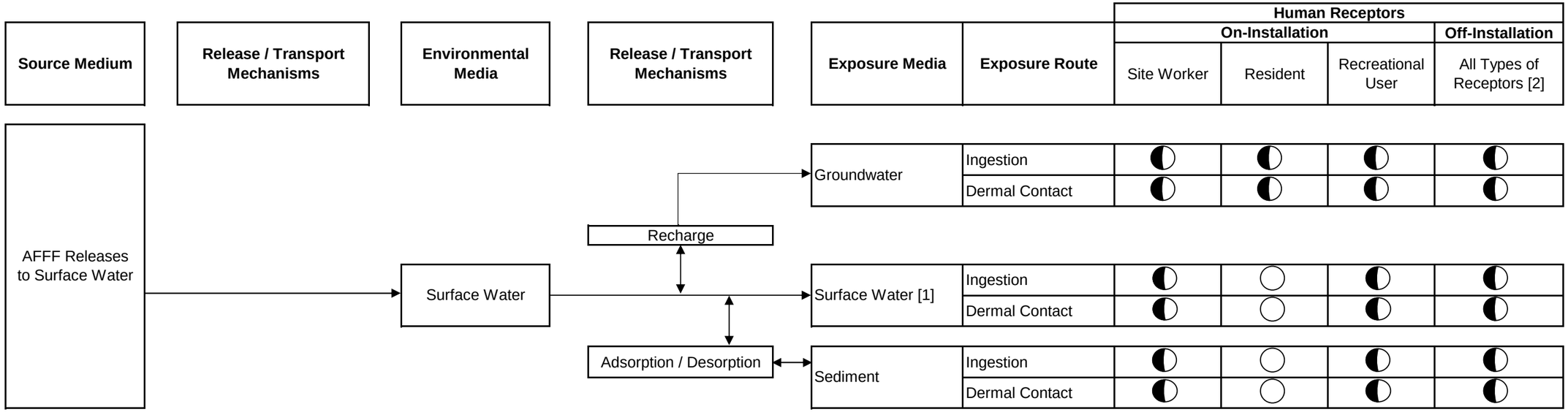
Conceptual Site Model for Building 107, Building 159, Building 144, and Old Landfill
USAEC PFAS Preliminary Assessment / Site Inspection
Rock Island Arsenal, Illinois

Figure 7-14



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:

[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during an outdoor work scenario, for Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.

[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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Conceptual Site Model for Fire Department Boat Launch Area
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Figure 7-15