



WURTSMITH AFB MICHIGAN

ADMINISTRATIVE RECORD COVER SHEET

AR File Number 637479

FINAL
INTERIM RECORD OF DECISION
for the
ALERT AIRCRAFT AREA AT SWISE ROAD
INTERIM REMEDIAL ACTION

Former Wurtsmith Air Force Base
Oscoda, Michigan

United States Air Force
Air Force Civil Engineer Center
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July 2024

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ACRONYMS

AFFF	aqueous film-forming foam
amsl	above mean sea level
AR	administrative record
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
CPA	critical process analysis
CSM	conceptual site model
CTS	Central Treatment System
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EQ	equalization
ESTCP	Environmental Security Technology Certification Program
ESI	expanded site inspection
F°	Fahrenheit
FS	feasibility study
ft	feet/foot
ft ³	cubic feet
ft/day	feet per day
GAC	granular activated carbon
gpm	gallons per minute
GSI	Groundwater-Surface Water Interface
HA	Health Advisory
HNVs	Human Non-Cancer Values
IRA	interim remedial action
MDEQ	Michigan Department of Environmental Quality
NA	not applicable
µg/kg	micrograms per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/L	nanograms per liter
NTCRA	non-time critical removal action
NPDES	National Pollutant Discharge Elimination System
OMB	Office of Management and Budget
O&M	operation and maintenance
OUSD	Office of the Under Secretary of Defense
OWAA	Oscoda-Wurtsmith Airport Authority
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonic acid
PFHxS	perfluorohexane sulfonate
PFHxA	perfluorohexanoic acid
PFNA	perfluorononanoic acid

PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PP	proposed plan
ppt	parts per trillion
RAB	Restoration Advisory Board
RAO	remedial action objective
RI	remedial investigation
ROD	record of decision
RSLs	regional screening levels
SAFF	Surface-Active Foam Fractionation
SCWO	Super critical water oxidation
SI	site inspection
TCRA	time-critical removal action
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
WAFB	Wurtsmith Air Force Base

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1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Facility Name: Former Wurtsmith Air Force Base

Site Location: Oscoda, Iosco County, Michigan

Site: Alert Aircraft Area at Swise Road

1.2 STATEMENT OF BASIS AND PURPOSE

The U.S. Air Force (USAF) is the lead agency and has selected the interim remedy to prevent the highest concentrations of per- and polyfluoroalkyl substances (PFAS) in the Alert Aircraft Area groundwater plume from migrating towards Van Etten Lake. The Alert Aircraft Area site, which is also known as Aqueous Film-Forming Foam (AFFF) Area 4, is on the former Wurtsmith Air Force Base (WAFB), Oscoda, Michigan (Figure 1). The selected remedy was chosen in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, as amended by Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record (AR) file for this site. The USAF maintains a copy of the AR at <https://ar.afcec-cloud.af.mil>. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) [formerly the Michigan Department of Environmental Quality (MDEQ)], the supporting agency, concurs with the selected remedy.

1.3 ASSESSMENT OF THE SITE

The response action selected in this interim record of decision (ROD) is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances from this site into the environment, and from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The USAF is conducting a remedial investigation (RI) to evaluate the nature and extent of perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), perfluorohexanoic acid (PFHxA), and perfluorobutane sulfonic acid (PFBS) across the former WAFB, including groundwater migrating towards Van Etten Lake from the Alert Aircraft Area. After the RI, the USAF will conduct a feasibility study (FS) to develop and evaluate final remedial alternatives for the Alert Aircraft Area. Because the USAF has not reached that stage of the CERCLA process in which it can develop and evaluate final remedial alternatives, the selected remedy for the interim remedial action (IRA) is focused on preventing the highest concentrations of per- and polyfluoroalkyl substances (PFAS) in the Alert Aircraft Area groundwater plume from migrating towards Van Etten Lake. The selected IRA is consistent with other response actions undertaken at the former WAFB to control the migration of PFAS. While source materials are not addressed explicitly by the selected IRA, the goal is to reduce contaminant toxicity, mobility, and volume of such to the maximum extent practicable.

The selected IRA for the Alert Aircraft Area is hydraulic control using pump and treat with granular activated carbon (GAC). The expected timeframe for IRA implementation is the summer of 2024.

The main components of the IRA are:

- Installing 5 groundwater extraction wells to provide hydraulic control of the plume,
- Constructing a treatment system building,
- Installing three GAC treatment vessels in the treatment system building,
- Installing equalization (EQ), backwash, and settling tanks, and
- Installing 5 infiltration galleries.

The target extraction well field flow rate will be approximately 235 gallons per minute (gpm). Groundwater pumped from the extraction well field will be treated and discharged to a series of infiltration galleries. The new GAC pump and treat system will treat the extracted groundwater to levels below the more stringent of EGLE Rule 299.44's generic groundwater cleanup criteria for residential and non-residential drinking water or EGLE 299.44's groundwater-surface water interface (GSI) criteria. For all PFAS except PFOS, the generic groundwater cleanup criteria for residential and non-residential drinking water are more stringent than the GSI criteria. There is no GSI criterion for PFHxA. The applicable levels are 12 nanograms per liter (ng/L) for PFOS, 8 ng/L for PFOA, 6 ng/L for PFNA, 51 ng/L for PFHxS, and 400,000 ng/L for PFHxA. PFBS will be below the EGLE-identified "to be considered" discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44's criteria for PFBS.

Treatment system efficacy will be measured through the routine sampling of the GAC treatment system to determine how effective the GAC is at removing PFAS from the extracted groundwater. Groundwater monitoring will be conducted upgradient and downgradient of the extraction well field and infiltration galleries to monitor how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake. Both new and existing monitoring wells will be used to measure performance. A detailed performance monitoring plan will be developed and included in the IRA work plan.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed; complies with those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective. Although this interim remedy is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim remedy utilizes treatment and supports that statutory mandate. Because this interim remedy does not constitute the final remedy for the Alert Aircraft Area, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final remedy. Subsequent actions will be planned to address fully the threats posed by conditions at the site.

Because this interim remedy will result in hazardous substances, pollutants or contaminants remaining on-site above health-based levels, a review will be conducted to ensure that the interim remedy continues to provide adequate protection of human health and the environment within five years after commencement of the IRA. Because this is an interim ROD, review of this site and remedy will be ongoing as the USAF continues to develop remedial alternatives for the site.

1.6 DATA CERTIFICATION CHECKLIST

- Contaminants of potential concern (COPCs) and their respective concentrations (Section 2.2.2),
- Baseline risk presented by the COPCs (Section 2.7),
- Cleanup levels established for COPCs and the basis for these levels (Section 2.8.1),
- How source materials constituting principal threats are addressed (Section 2.11),
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 2.6),
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Sections 2.6 and 2.11),
- Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.10.1), and
- Key factors that led to selecting the remedy (Section 2.10).

1.7 AUTHORIZING SIGNATURE

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26-July-24

TAMMY R. O'NEILL
Acting Director, Installations Directorate
Air Force Civil Engineer Center

Date

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2.0 DECISION SUMMARY

This decision summary provides an overview of the general characteristics of the Alert Aircraft Area. In addition, the decision summary describes the remedial alternatives evaluated and a comparative analysis of those alternatives. The decision summary concludes with identifying the selected remedy and the statutory determinations supporting the selected remedy.

2.1 SITE NAME, LOCATION, AND DESCRIPTION

The USAF is the lead agency for the Alert Aircraft Area at Swise Road IRA. EGLE is the supporting agency. Funding for the IRA is provided by the USAF.

2.1.1 Installation

The former WAFB is located in Oscoda, Michigan, in Iosco County in the northern part of Michigan's Lower Peninsula (Figure 1). The installation was in operation from 1923 through 1993. WAFB was recommended for closure by the Base Closure and Realignment Commission of 1991 and officially closed on 30 June 1993. The USAF transferred the majority of former WAFB to the Charter Township of Oscoda after base closure and is currently home to more than 40 businesses and government agencies, including a public library, community college, and the Oscoda-Wurtsmith Airport.

The former WAFB is a 5,220-acre site in Iosco County, Michigan, located within the Charter Township of Oscoda, about 170 miles north of Detroit, Michigan. County Route F-41 runs along the east and northeast boundary of the former WAFB. Van Etten Lake lies east and northeast; Clark's Marsh and the Huron-Manistee National Forests lie to the south; the Au Sable State Forest lies north and west. The Charter Township of Oscoda and Lake Huron are approximately 1 mile to the east (Figure 1).

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Site History

The Alert Aircraft Area, shown on Figure 1, is in the northeast portion of the former WAFB. An alert apron was constructed at the Alert Aircraft Area between 1959 and 1960 and occupies approximately 50 acres. The primary function of the alert apron was to stage aircraft in a state of readiness. Aircraft generally underwent maintenance and fueling at other WAFB aprons and were then taxied to the alert apron. Weapons (such as bombs) were loaded onto aircraft while staged at the alert apron. Minor maintenance and fueling activities may have been performed at the alert apron (Versar, 1998). While there are no documented uses of AFFF at the Alert Aircraft Area, groundwater was likely impacted from AFFF used on numerous fuel spills to minimize the fire danger, or from an estimated 500-gallon AFFF release at Building 5306, Integrated Maintenance.

2.2.2 Per- and Polyfluoroalkyl Substances (PFAS) Investigations and Responses

2.2.2.1 2012-2013 Site Investigation

The USAF conducted a PFAS site investigation between October 2012 and February 2013, during which groundwater, sediment, soil, and seep samples were collected at various sites (MWH, 2013). The sampling activities included collecting soil and groundwater from multiple Installation Restoration Program sites. Sampling results confirmed the presence of PFOS and PFOA in groundwater across the base. Sampling

results confirmed the presence of PFOS and PFOA in groundwater at concentrations that exceeded the 2009 United States Environmental Protection Agency (USEPA) provisional health advisory (HA) level of 200 ng/L or parts per trillion (ppt) for PFOS and 400 ng/L for PFOA (USEPA, 2009), which were in effect at the time of the investigation.

2.2.2.2 2015 Preliminary Assessment

A preliminary assessment (PA) was conducted in 2015 by the USAF to identify areas where AFFF was potentially stored, handled, used, or released at the former WAFB. The PA identified potential AFFF release areas, including the Alert Aircraft Area (AMEC, 2016).

2.2.2.3 2016 Site Inspection for Aqueous Fire Fighting Foam Areas

The USAF conducted a base-wide site inspection (SI) in 2016 to further characterize PFOS and PFOA at 23 AFFF areas, including the Alert Aircraft Area (Wood, 2018). Groundwater results were compared to the screening level of 70 ng/L. Groundwater exceeded 70 ng/L for PFOS, PFOA, or the combined PFOS and PFOA in multiple areas. The SI report concluded that PFOS and PFOA releases(s) had occurred within the Alert Aircraft Area (Wood, 2018). PFOS and PFOA were present along Perimeter Road near Swise Road at concentrations up to 2,370 and 23.7 ng/L, respectively.

2.2.2.4 2017 and 2019 Expanded Site Inspection

Between 2017 and 2019, the USAF conducted an expanded site inspection (ESI) that included further evaluation of groundwater (Wood, 2020). The ESI indicated that the Alert Aircraft Area appeared to be outside the capture zones of the existing pump and treat systems and that VAS and groundwater analytical results suggest that a narrow PFOS and PFOA plume is discharging into Van Etten Lake with concentrations exceeding the screening level, which was 70 ng/L at that time. The ESI recommended a remedial investigation to fully understand the extent of groundwater impacts above the screening levels and potential for PFOS and PFOA to discharge into Van Etten Lake.

2.2.3 PFAS Investigations Conducted by Others

2.2.3.1 EGLE August and September 2018 Surface Water and Pore Water Investigation

EGLE conducted a surface water and pore water investigation in August and September 2018 (Figure 2). Surface water and pore water samples were collected along Van Etten Lake, Van Etten Creek, Au Sable River, and Clark's Marsh. Surface and pore water sample results were compared to EGLE's Rule 299.44 Table 1 criteria that were in effect at the time. The generic cleanup criteria for residential and non-residential drinking water for PFOS and PFOA were 70 ng/L each; the generic cleanup criteria for the GSI were 12 ng/L for PFOS and 12,000 ng/L for PFOA (AECOM, 2020). Surface water and pore water samples were analyzed for 24 PFAS. PFOS and PFOA were the only PFAS that had established generic cleanup criteria and GSI criteria at the time of the 2018 surface water and pore water investigation.

EGLE now has established surface water quality values for PFOS, PFOA, PFBS, PFNA, and PFHxS. Under Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards, the EGLE Rule 57 Human Non-Cancer Values (HNVs) for non-drinking water are 12 ng/L for PFOS, 170 ng/L for PFOA, 670,000 ng/L for PFBS, 30 ng/L for PFNA, and 210 ng/L for PFHxS (EGLE, 2023).

One surface water sample (SW VEL 04) and one pore water sample (PW VEL 04) collected from Van Etten Lake during the EGLE 2018 surface water and pore water investigation were collected downgradient of the Alert Aircraft Area at Swise Road groundwater plume. The 2018 surface water sample SW VEL 04

contained PFOS concentrations at 17.5 ng/L, which exceeds the current EGLE Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards, HNV for non-drinking water of 12 ng/L (Figure 2). The 2018 pore water sample PW VEL 04 contained PFOS concentrations at 9.94 ng/L, which is below the EGLE Rule 323.1057 Water Quality Standards HNVs for non-drinking water of 12 ng/L. PFOA, PFBS, PFNA, and PFHxS concentrations did not exceed the EGLE Rule 323.1057 HNVs for non-drinking water of 170 ng/L, 670,000 ng/L, 30 ng/L, and 210 ng/L, respectively, at SW VEL 04 and PW VEL 04.

2.3 COMMUNITY PARTICIPATION

The Alert Aircraft Area at Swise Road IRA Proposed Plan (PP) was made available to the public on 20 September 2023. It can be found at the Robert J. Parks Public Library located at 6010 Skeel Avenue, Oscoda, Michigan, 48750, or the former WAFB online AR at <https://ar.afcec-cloud.af.mil/>. The notice of availability of the document was published in the *Iosco County News-Herald* on 20 September 2023. A supplemental public notice was placed in the newspaper on 4 October 2023 that included a hyperlink to the public meeting for online participation. A public comment period was held from 20 September 2023 to 20 October 2023. A copy of the public notice, as published, is included in Appendix A. The USAF held a public meeting on 11 October 2023 to present a summary of the proposed remedy, the alternatives evaluated, and how the public could submit comments on the PP.

The restoration advisory board (RAB) for the former WAFB was formed in 2017. It consists of eight government and 11 community members tasked with enabling community involvement and providing input into the environmental restoration process for the former WAFB. The RAB meets quarterly to facilitate the exchange of information and concerns between the community, state agencies, the USAF, and other federal agencies.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

This interim ROD presents the IRA to address human health exposures to the highest concentrations of PFAS downgradient of the Alert Aircraft Area at Swise Road that are migrating towards Van Etten Lake. Effective 8 July 2024, PFOS and PFOA (including their structural salts and isomers) became listed CERCLA hazardous substances (40 Code of Federal Regulations [CFR] Section 302.4, Table 302.4). All other PFAS are considered CERCLA pollutants and contaminants per 42 U.S. Code Section 9601.

The IRA described in this plan is intended to prevent the highest PFAS concentrations associated with the Alert Aircraft Area groundwater plume from migrating towards Van Etten Lake. A base-wide RI is currently being conducted to delineate the nature and extent of PFAS contamination at the former WAFB. A final remedy will be selected to address PFAS concentrations at the former WAFB after the RI and FS activities are complete. It is intended that this interim action will not be inconsistent with nor preclude implementation of the expected final remedy.

2.5 SITE CHARACTERISTICS

2.5.1 Conceptual Site Model

A preliminary conceptual site model (CSM) has been developed for the Alert Aircraft Area as part of the base-wide RI. The preliminary CSM summarizes the COPCs, impacted media, human and ecological exposure pathways and describes the site's physical characteristics and potential contaminant migration pathways (including the GSI interaction). The preliminary CSM was developed based on an extensive

review of existing analytical data, hydrologic and lithologic data from the USAF AR, EGLE reports, and peer-reviewed literature. The preliminary CSM will be updated after completing the RI, which includes the baseline human health and ecological risk assessments.

2.5.1.1 Physical Characteristics

The Alert Aircraft Area, shown on Figure 1, is located in the northeast portion of the former WAFB. The Alert Aircraft Area occupies approximately 50 acres. A thick concrete pad extends over most of the site (Versar, 1998). Unpaved areas consist of a mixture of maintained grassed areas and formerly wooded areas that have been clearcut. The ground surface elevation at the site ranges from approximately 613 feet above mean sea level (amsl) to 618 feet amsl.

2.5.1.2 Climate

The climate in Iosco County, Michigan, is characterized by harsh winters and short, mild summers. Mean monthly temperatures range from 21 degrees Fahrenheit (F°) in winter to 66 degrees F° in summer. However, temperatures as low as -40 degrees F° and as high as 100 degrees F° have been recorded. Precipitation in the area averages about 30 inches of rainfall and 51 inches of snow annually (World Wide Media Group, 2023). Thunderstorms occur on about 32 days each year, and most occur in June, July, and August. The heaviest snows typically occur from November through March. On average, 112 days per year have at least 1 inch of snow on the ground (NRCS, 2020).

2.5.1.3 Topography

Ground surface topography at the WAFB defines a subtle mound, with the flight line located approximately along the crest. The topography is relatively flat with gentle slopes eastward from 0.5 miles from the foot of the bluffs toward Van Etten Lake and Lake Huron, southward toward the Au Sable River Valley and associated wetlands, and northward toward the Mikado Till Plain. At the eastern margin of former WAFB near Van Etten Lake, slopes locally increase to 10 degrees or more, dropping 10 feet (ft) downward to the lake's shoreline. On the southern margin, slopes also steepen locally at the northern edge of the Au Sable River Valley.

2.5.1.4 Surface Water

Surface water bodies near the Alert Aircraft Area include Van Etten Lake. Van Etten Lake is a 4-mile-long and ½ mile wide, man-made lake fed by the Pine River to the north that discharges into Van Etten Creek to the south. Van Etten Creek then discharges into the Au Sable River. A small dam on Van Etten Creek controls the Van Etten Lake levels seasonally (USDA, 2019). Lake Huron, located approximately 1 mile directly east of the former WAFB, is the ultimate regional discharge zone for groundwater and surface water. The primary industry of the Charter Township of Oscoda is tourism, including fishing.

2.5.1.5 Geology

The principal geologic units underlying the Alert Aircraft Area are unconsolidated glacial deposits of Pleistocene age; these units unconformably overlie Paleozoic sandstone and shale bedrock. Bedrock units consist of Mississippian sandstones, siltstones, and shales of the Marshall Formation and Coldwater Shale. Relatively coarse-grained sandy deposits of the east-trending ancestral Au Sable meltwater channel overlie lake deposits and glacial till, consisting primarily of silty clay, which grades to a silty to clayey sand or gravel at its base. The granitic rocks of the Precambrian Canadian Shield are the source rocks of glacial deposits present at the former WAFB (ECC, 2016). Locally, soils consist of fine to coarse sand with silt

and trace gravel to 60–65 ft below the ground surface (bgs). An extensive silty-clay layer exists beneath the sand layer. Depth to bedrock varies from 100 to 250 ft across the base.

2.5.1.6 Hydrogeology and Hydrology

The water table at the former WAFB fluctuates 1–3 ft annually and has an average aquifer recharge rate of 15 inches per year (Wood, 2018). The unconfined and unconsolidated sand aquifer located across the former base has an approximate thickness of between 43 and 53 ft (USAF, 2002). Groundwater flows northeast, east, or southeast toward either Van Etten Lake or the Au Sable River.

Groundwater near the proposed extraction well field at the Alert Aircraft Area is typically encountered between 19 and 20 ft bgs. Groundwater flow in the vicinity of the Alert Aircraft Area is generally toward the northeast with a velocity ranging from 0.89–4.6 feet per day (Versar, 1998).

2.5.1.7 Nature and Extent of Contamination

A groundwater plume exhibiting elevated PFOS, PFOA, PFNA, and PFHxS concentrations emanates from the Alert Aircraft Area and extends northeast towards Van Etten Lake (Figures 3, 4, 5, and 6). The vertical and horizontal extent of PFOS, PFOA, PFNA, and PFHxS in the surficial aquifer has not been delineated; the extent will be fully delineated during the RI. The highest concentrations of PFOS, PFOA, PFNA, and PFHxS in this area’s groundwater occur along Swise Road (Exhibit 1).

Exhibit 1. Alert Aircraft Area - Maximum Concentrations of PFOS, PFOA, PFNA, and PFHxS

Alert Aircraft Area Plume	Sample Location	Maximum Concentrations of PFOS, PFOA, PFNA, and PFHxS				
		Date Collected	PFOS Concentration (ng/L)	PFOA Concentration (ng/L)	PFNA Concentration (ng/L)	PFHxS Concentration (ng/L)
Swise Road	WURVS017	05/07/22	7,010	54.3	12.6	307
	WURVS019	11/30/21	4,320	30.7	7.0 J	157
Alert Apron	WURMW018M	01/27/24	6,900	26.8	2.5 J	290
Installation Boundary	WURVS020	11/30/21	119	43.2	ND	376
	WURVS021	11/29/21	182	7.4 J	ND	34.3
	WURVS162	08/13/23	742	8.3	2.9 J	36.2

Notes:

- The screening criteria for plume delineation are the lower of each of EGLE Rule 299.44 generic groundwater cleanup criteria for residential and non-residential drinking water (EGLE, 2023) and the United States Environmental Agency (USEPA) regional screening levels (RSLs) for residential tap water (USEPA, 2023). The DoD incorporates USEPA’s RSLs for environmental cleanup investigations when they are derived from final, peer reviewed toxicity values (OUSD, 2024).
- The screening criteria are 4 nanograms per liter (ng/L) for PFOS, 6 ng/L for PFOA, 5.9 ng/L for PFNA, and 39 ng/L for PFHxS.

DoD = Department of Defense J = estimated value ng/L = nanograms per liter ND = not detected
OUSD = Office of the Under Secretary of Defense

The potential receptors (human or ecological) that may be exposed to PFAS in groundwater at the Alert Aircraft Area at Swise Road are summarized in the preliminary exposure CSM. The preliminary exposure CSM for human health is presented in Exhibit 2. Preliminary exposure CSMs are presented in Exhibit 3 for aquatic food web receptors and Exhibit 4 for terrestrial food web receptors. Each diagram conveys the

pathways of chemical transport to potential exposure media, including soil, groundwater, surface water, sediment, and diet (biota).

Soil investigations conducted at the Alert Aircraft Area indicate that PFOS, PFOA, PFBS, PFNA, PFHxS, PFHxA, and PFBA are not present in surface and subsurface soil at concentrations above the USEPA regional screening levels (RSLs) (USEPA, 2023). The DoD incorporates USEPA's RSLs for environmental cleanup investigations when they are derived from final, peer reviewed toxicity values (OUSD, 2024). The USEPA RSLs for soil are 13 micrograms per kilogram ($\mu\text{g}/\text{kg}$) for PFOS, 19 $\mu\text{g}/\text{kg}$ for PFOA, 1,900 $\mu\text{g}/\text{kg}$ for PFBS, 19 $\mu\text{g}/\text{kg}$ for PFNA, 130 $\mu\text{g}/\text{kg}$ for PFHxS, 3,200 $\mu\text{g}/\text{kg}$ for PFHxA, and 7,800 $\mu\text{g}/\text{kg}$ for PFBA (USEPA, 2023).

2.6 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCES USES

The Alert Aircraft Area is located on property owned by the Oscoda-Wurtsmith Airport Authority (OWAA). The area lies northeast of the main airport runway. Based on information contained in the latest Airport Master Plan (OWAA, n.d.), the land use at the Alert Aircraft Area is zoned within the aviation support and industrial districts.

Groundwater at the Alert Aircraft Area is not used as a drinking water source, and no drinking water wells exist in this area. Municipal water supply to surrounding populations is provided by the Charter Township of Oscoda.

2.7 SUMMARY OF SITE RISKS

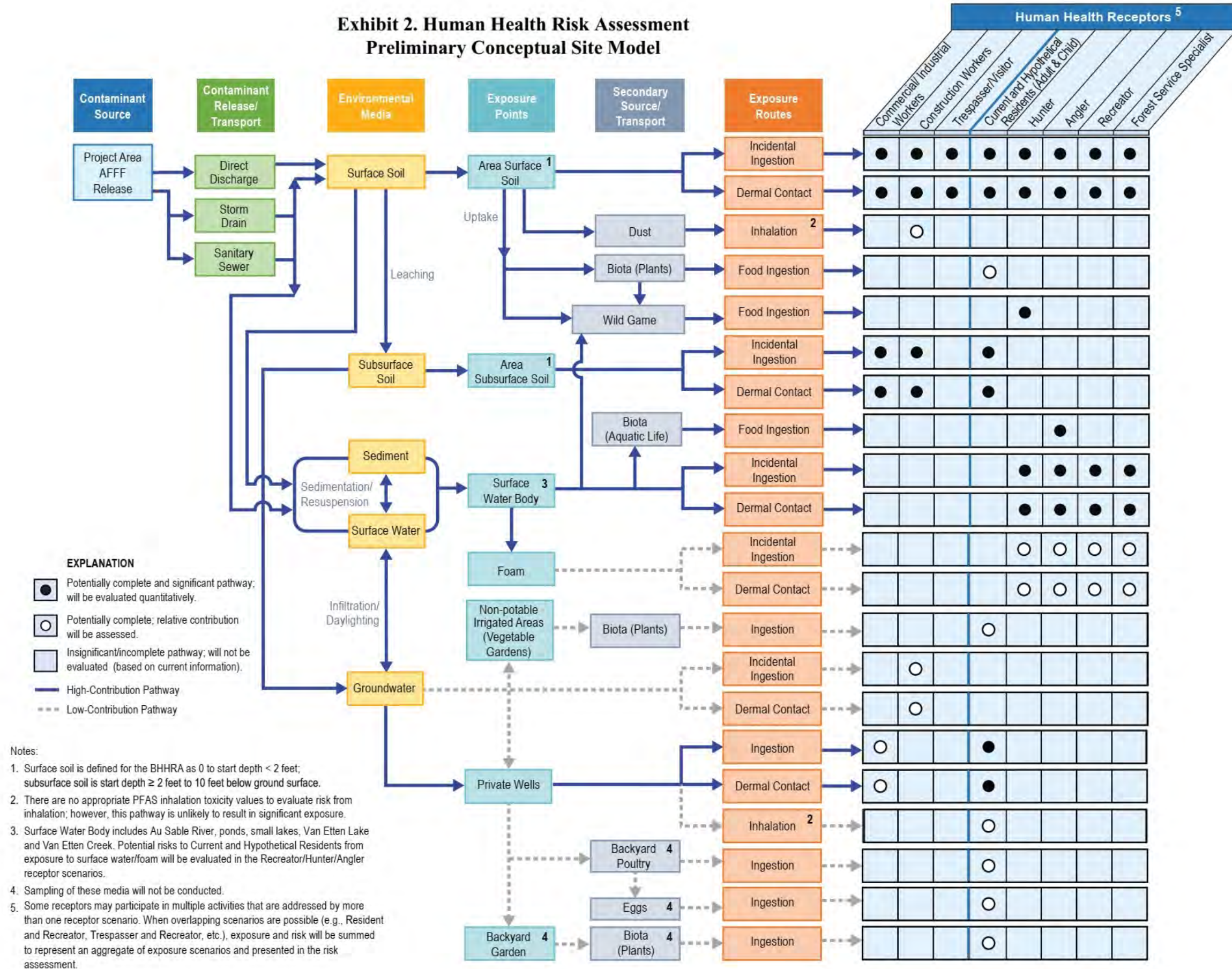
PFAS are a class of emerging contaminants, which means they are contaminants that: (1) present a potential unacceptable risk to human health and the environment; and (2) either do not have regulatory standards based on peer-reviewed science or the existing regulatory standards are evolving due to new science, detection capabilities, or pathways. As emerging contaminants, the human health and ecological effects from exposure to PFAS are not yet fully understood and continue to be studied.

As required by CERCLA, the PFAS RI at the former WAFB will include human health and ecological risk assessments related to potential PFAS exposures. The ongoing RI is evaluating exposure pathways and potential PFAS receptors.

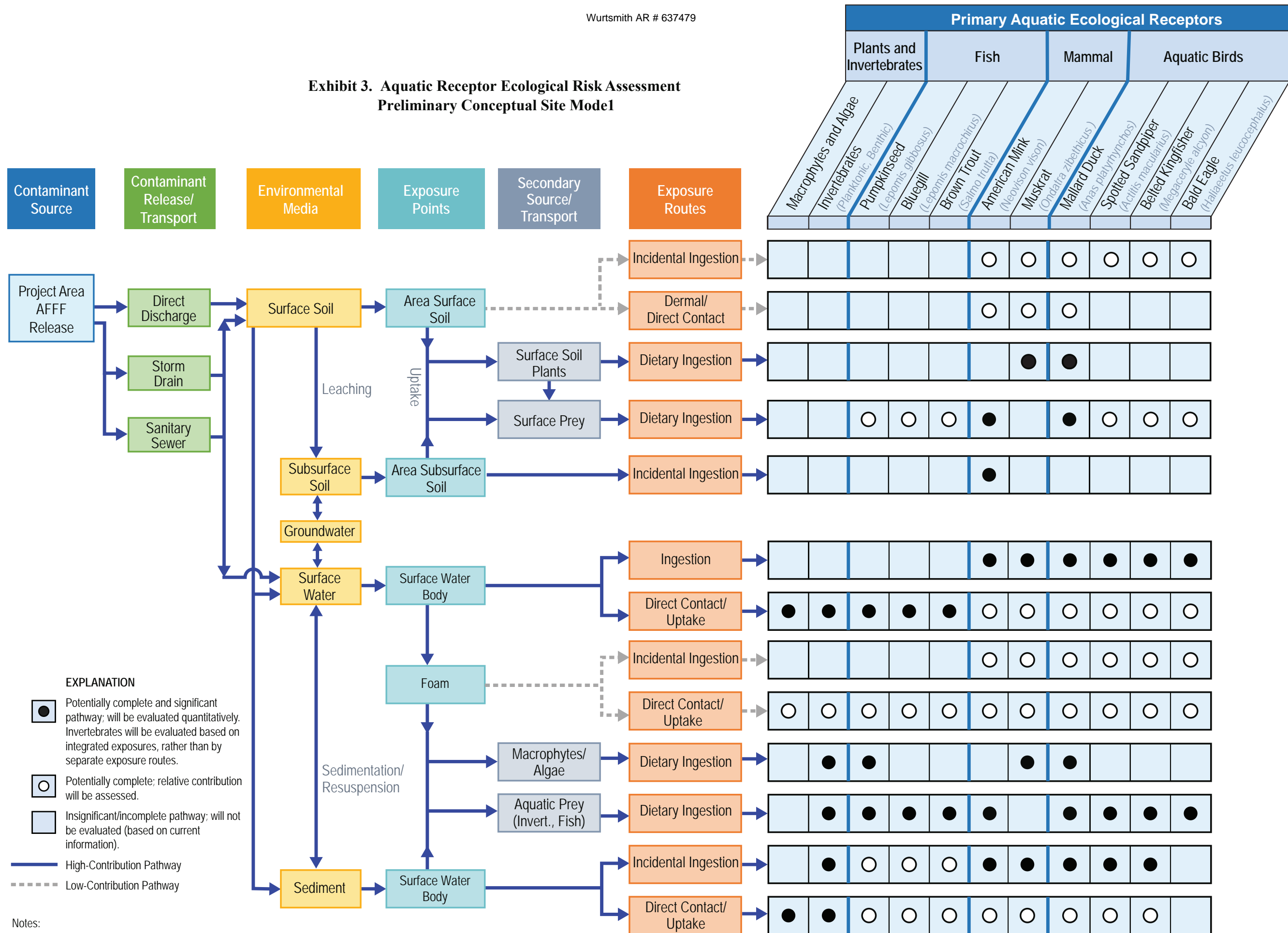
2.7.1 Basis for Action

The USAF is conducting an RI at the former base to further evaluate exposure pathways and potential PFAS receptors. PFAS associated with the Alert Aircraft Area continue to migrate towards Van Etten Lake. Therefore, the interim remedy selected in this interim ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances from this site to the environment, and from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

Exhibit 2. Human Health Risk Assessment Preliminary Conceptual Site Model



**Exhibit 3. Aquatic Receptor Ecological Risk Assessment
Preliminary Conceptual Site Model**



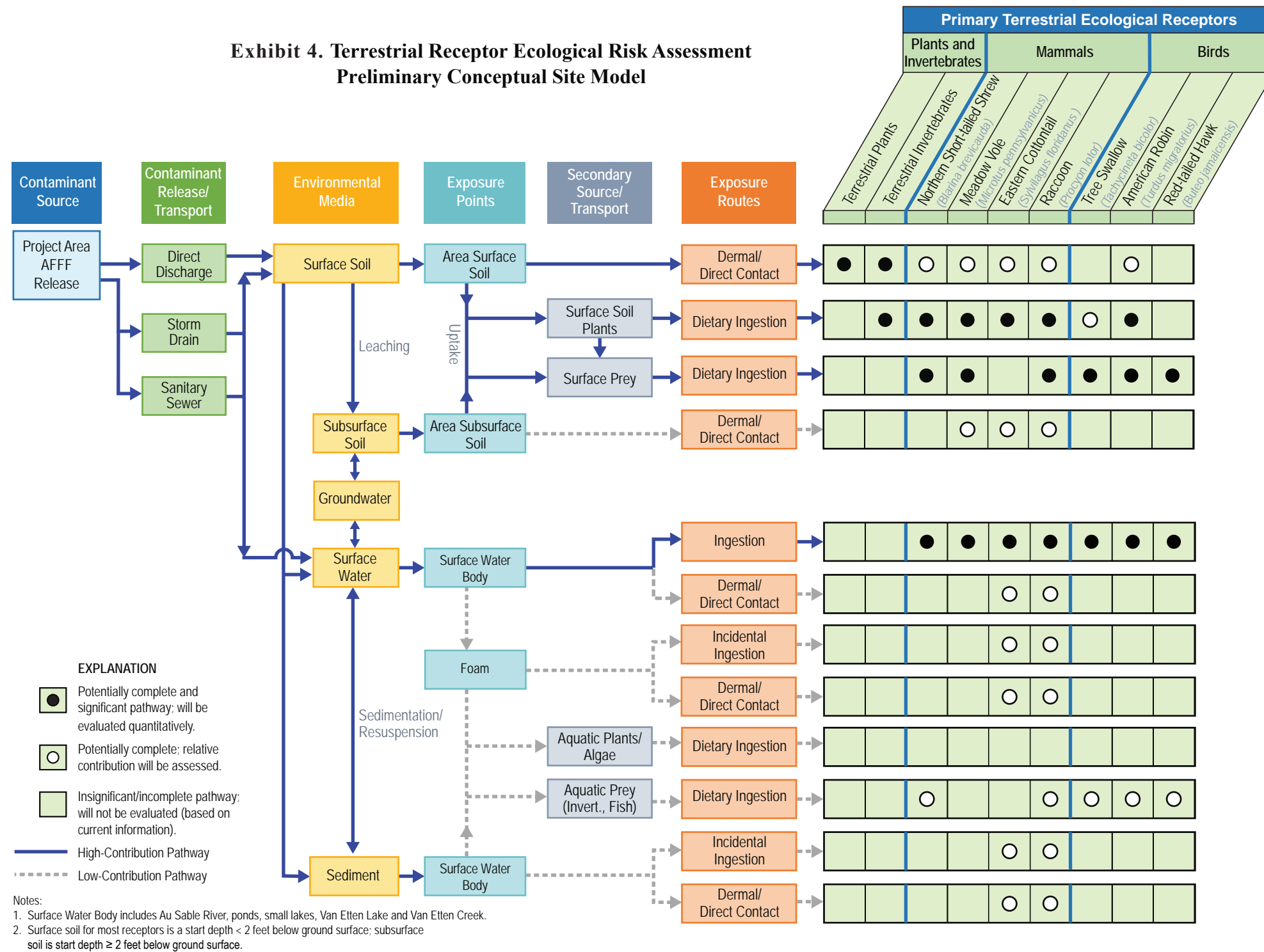
EXPLANATION

- Potentially complete and significant pathway; will be evaluated quantitatively. Invertebrates will be evaluated based on integrated exposures, rather than by separate exposure routes.
- Potentially complete; relative contribution will be assessed.
- Insignificant/incomplete pathway; will not be evaluated (based on current information).

— High-Contribution Pathway
- - - Low-Contribution Pathway

Notes:
 1. Surface Water Body includes Au Sable River, ponds, small lakes, Van Etten Lake and Van Etten Creek.
 2. Surface soil for most receptors is a start depth < 2 feet below ground surface; subsurface soil is start depth ≥ 2 feet below ground surface.

Exhibit 4. Terrestrial Receptor Ecological Risk Assessment Preliminary Conceptual Site Model



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2.8 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAO) are site-specific cleanup objectives established based on the nature and extent of contamination, the potential for human and environmental exposure, and applicable or relevant and appropriate requirements (ARARs). This IRA's only RAO is to hydraulically control the migration of the highest concentrations of PFAS-contaminated groundwater towards Van Etten Lake by pumping contaminated groundwater from the Alert Aircraft Area at Swise Road and treating it at the new groundwater treatment system.

2.8.1 Contaminants of Potential Concern

The primary COPCs in groundwater at the Alert Aircraft Area are PFOS, PFOA, PFNA, and PFHxS as these were the only PFAS detected in groundwater at concentrations exceeding the RI screening criteria for plume delineation. The screening criteria for plume delineation are the more stringent of the EGLE Rule 299.44 generic groundwater cleanup criteria for residential and non-residential drinking water (EGLE, 2023) and the USEPA RSLs (USEPA, 2023). The DoD incorporates USEPA's RSLs into environmental cleanup investigations when they are derived from final, peer reviewed toxicity values (OUSD, 2024). PFBS and PFHxA were not detected in groundwater at the Alert Aircraft Area at concentrations above the screening criteria. The screening criteria for plume delineation are 4 ng/L for PFOS, 6 ng/L for PFOA, 5.9 for PFNA, 39 ng/L for PFHxS, 420 ng/L for PFBS, and 990 ng/L for PFHxA.

The new GAC treatment system will reduce PFOS, PFOA, PFNA, and PFHxS concentrations in the effluent (treated groundwater) to levels below the more stringent of EGLE Rule 299.44's generic groundwater cleanup criteria for residential and non-residential drinking water or Rule 299.44's GSI criteria. There is no GSI criterion for PFHxA. The applicable levels are 12 ng/L for PFOS, 8 ng/L for PFOA, 6 ng/L for PFNA, 51 ng/L for PFHxS, and 400,000 ng/L for PFHxA. PFBS will be below the EGLE-identified "to be considered" discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44's criteria for PFBS.

2.9 DESCRIPTION OF ALTERNATIVES

The USAF has not yet prepared an FS to develop and evaluate comprehensive alternatives for contaminated groundwater at the former WAFB. Therefore, the remedial alternatives focus on hydraulic control of groundwater migrating towards Van Etten Lake from the Swise Road portion of the plume. These alternatives are designed to satisfy the RAO and include the following:

1. Alternative 1: No Action,
2. Alternative 2: Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries,
3. Alternative 3: Hydraulic Control Using Pump and Treat with GAC – Discharge to Van Etten Lake, and
4. Hydraulic Control Using Pump and Treat with GAC – Discharge to Storm Sewer System.

2.9.1 Description of Remedy Components

This section provides a list of each alternative's major components and features as they occur in the remediation process. Each list includes the treatment technology, major components, operation and

maintenance (O&M) requirements to maintain the integrity of the remedy, and a description of the performance monitoring approach.

2.9.1.1 *Alternative 1: No Action*

The NCP requires that a No Action alternative be evaluated to provide a baseline for comparison to other alternatives. In a CERCLA evaluation, a No Action alternative results in no remediation or controls and does not consider any existing controls. No actions would be taken under this alternative to protect human health or the environment. Alternative 1 would result in no reduction of PFAS entering Van Etten Lake and would provide no monitoring or land use controls.

2.9.1.2 *Alternative 2: Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries*

Alternative 2 would control PFAS migration towards Van Etten Lake by installing a hydraulic control system east of the Alert Aircraft Area near the intersection of Swise and Perimeter Roads. The new groundwater treatment system would use GAC as the treatment media.

- Groundwater Extraction Method - The hydraulic control system would consist of five extraction wells to capture the vertical and horizontal extent of the target plume area. The extraction well field would be situated east of the Alert Aircraft Area near the intersection of Swise Road and Perimeter Road (Figure 5). Extracted groundwater from each well would be routed via underground piping to a new treatment system building where it would be combined at a common header inside the building.

Extraction wells would be approximately 69 to 71 feet deep with 45- to 47-foot screens. The location and screened intervals were determined through preliminary groundwater modeling. The extraction wells would pump from approximately 45 to 50 gpm for a total target pumping rate of approximately 235 gpm. The estimated groundwater capture zone for the groundwater extraction well field is illustrated on Figure 7.

- Technology for Treating Extracted Groundwater – A groundwater treatment system would be installed inside a new treatment system building. The groundwater treatment system would use GAC as the treatment media. GAC is a proven technology for treating PFAS. The GAC treatment train would be sized to accommodate a total input/output flow rate of up to 500 gpm.

Extracted groundwater from each well would be routed via underground piping into a header manifold (individual pipes plumbed into a larger single pipe), combining groundwater into one stream for GAC treatment. Once the groundwater from the extraction well field reaches the new treatment system building, it would be conveyed to an equalization tank to control the flow of water to the GAC treatment system vessels. This alternative would include installing blank lines on the header manifold and spare underground pipes for possible future treatment system expansion.

The GAC treatment train would consist of three vessels configured in series (pretreatment/lead/lag) configuration. The pretreatment GAC vessel would be used to capture competing organic material and have the capacity to be backwashed to remove accumulated biomass and solids. Each vessel would be filled with approximately 700 cubic feet (ft³) of GAC. A settling tank would also be installed to receive backwash solids for processing and disposal.

- Location for Discharging Treated Groundwater - Treated groundwater would be returned to the affected aquifer via a series of infiltration galleries installed approximately 200 ft east and

hydraulically downgradient of the extraction well field (Figure 7). The location of the proposed infiltration galleries is within the known footprint of the existing PFAS groundwater plume. Infiltration galleries are a network of perforated pipes in trenches that return treated water below the ground surface but above the groundwater table. It is estimated that there is between 19 and 20 ft of unsaturated soil between the land surface and the water table in the vicinity of the Alert Aircraft Area. The placement of the infiltration galleries downgradient of the extraction wells is a key component of Alternative 2. Returning treated water to the affected aquifer via infiltration galleries decreases the slope of the groundwater table between the infiltration galleries and extraction wells. This decreases the extraction well pumping rates required to maintain hydraulic control of the plume.

Under section 300.400(e)(1) of the NCP, federal, state, or local permits are not required for on-site response actions conducted pursuant to CERCLA sections 104, 106, 120, 121, or 122. “On-site” is defined as “the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of response action” 40 CFR Section 300.5. Alternative 2 would require compliance with ARARs at the point of discharge to the infiltration galleries.

- Operation and Maintenance - The GAC beds would be replaced when PFAS are detected in treated water leaving the lead tank and entering the lag tank. The pretreatment GAC vessel would be backwashed on a routine basis to remove solids. Maintenance of extraction well pumps and treatment system feed pump components would occur routinely to ensure target extraction rates are being achieved and the pump and treat system is operating optimally. Feed pumps are pumps that push the groundwater through the GAC treatment system.
- Performance Monitoring – Performance monitoring of the treatment system would be conducted to assess 1) how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake, and 2) how effective the GAC is at removing PFAS from the extracted groundwater. Groundwater monitoring would be conducted upgradient and downgradient of the extraction well field and infiltration galleries to monitor how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake and the reduction in PFAS concentrations in downgradient monitoring wells over time. Treatment system monitoring would be conducted to determine how effective the GAC is at removing PFAS from the extracted groundwater. The criteria for determining effective PFAS removal by the GAC would be reducing PFOS, PFOA, PFNA, PFHxS, PFBS, and PFHxA concentrations in the treatment system discharge (treated groundwater) to levels below the more stringent of EGLE Rule 299.44’s generic groundwater cleanup criteria for residential and non-residential drinking water or Rule 299.44’s GSI criteria. There is no GSI criterion for PFHxA. The applicable levels are 12 ng/L for PFOS, 8 ng/L for PFOA, 6 ng/L for PFNA, 51 ng/L for PFHxS and 400,000 ng/L for PFHxA. PFBS will be below the EGLE-identified “to be considered” discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44’s criteria for PFBS.
- Management of Treatment Residuals – Treatment residuals would include spent GAC media from changeouts and settled solids from backwash operations. Waste characterization sampling would be conducted on each waste stream. Settled solids from the settling tank would be processed by a filter press to reduce volume and transported off site for disposal at an approved off-site hazardous waste disposal facility. Spent GAC would be transported off-site for carbon regeneration.

2.9.1.3 *Alternative 3: Hydraulic Control Using Pump and Treat with GAC – Discharge to Van Etten Lake*

Alternative 3 would control PFAS migration towards Van Etten Lake by installing a hydraulic control system, as detailed in Alternative 2. Treated groundwater from the new treatment system would be conveyed underground to a new outfall location on Van Etten Lake.

- Groundwater Extraction Method – The hydraulic control system for Alternative 3 would include the same components described under Alternative 2. The hydraulic control system would consist of five extraction wells to capture the vertical and horizontal extent of the target plume area. Extracted groundwater from each well would be routed via underground piping to a new treatment building where it would be combined at a common header inside the building.

The extraction wells would be approximately 69 to 71 feet deep with 45- to 47-foot screens. Each extraction well would pump approximately 55 gpm for a total target pumping rate of approximately 275 gpm. The estimated groundwater capture zone for the groundwater extraction well field is illustrated on Figure 8.

- Technology for Treating Extracted Groundwater - The new GAC groundwater treatment system for Alternative 3 would be identical to Alternative 2.
- Location for Discharging Treated Groundwater – Treated groundwater from the new treatment system would be conveyed underground to a new outfall location on Van Etten Lake (Figure 8). Alternative 3 would require the installation of new infrastructure to convey treated groundwater to a new outfall location on Van Etten Lake. Treated groundwater would exit the groundwater treatment facility via underground piping. The underground piping would extend southeast approximately 2,500 feet, connect to a new manhole, and cross beneath County Route F-41 (east) to the new outfall location. A new headwall would be constructed to support the outfall piping and to prevent shoreline erosion. This alternative would include installing a spare underground pipe for possible future treatment system expansion. A transfer pump would be installed in the new treatment system building to pump treated groundwater to the new manhole. Flow from the new manhole to the outfall on Van Etten Lake would be by gravity flow. The USAF would obtain a National Pollutant Discharge Elimination System (NPDES) permit from EGLE for Alternative 3's point source discharge.
- Operation and Maintenance – Operation and maintenance of the GAC treatment system for Alternative 3 would be identical to Alternative 2. The GAC beds would be replaced when PFAS are detected in treated water leaving the lead tank and entering the lag tank. The pretreatment GAC vessel would be backwashed on a routine basis to remove solids. Maintenance of extraction well pumps and treatment system feed pump components would occur routinely to ensure target extraction rates are being achieved and the pump and treat system is operating optimally. Feed pumps are pumps that push the groundwater through the GAC treatment system.
- Performance Monitoring - Performance monitoring of the treatment system would be conducted to assess 1) how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake; and 2) how effective the GAC is at removing PFAS from the extracted groundwater. Groundwater monitoring would be conducted upgradient and downgradient of the extraction well field to monitor how effective the extraction wells are at

preventing the highest concentrations of PFAS from migrating towards Van Etten Lake and the reduction in PFAS concentrations in downgradient monitoring wells over time.

The criteria for determining the PFAS removal efficiency of the GAC beds would be (1) reducing PFOS, PFOA, PFNA, PFHxS, and PFBS concentrations in the GAC treatment system discharge (treated groundwater) to levels below the EGLE Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards, HNVs for non-drinking water of 12 ng/L for PFOS, 170 ng/L for PFOA, 30 ng/L for PFNA, 210 ng/L for PFHxS, and 670,000 ng/L for PFBS, and (2) meeting permit discharge requirements for the new outfall on Van Etten Lake.

- Management of Treatment Residuals – Management of treatment residuals would be the same as Alternative 2.

2.9.1.4 *Alternative 4: Hydraulic Control Using Pump and Treat with GAC – Discharge to the Storm Sewer System*

Alternative 4 would control PFAS migration towards Van Etten Lake by installing a hydraulic control system, as detailed in Alternative 2. Treated groundwater from the new treatment system would be conveyed underground to the existing storm sewer system on the former WAFB.

- Groundwater Extraction Method – The hydraulic control system for Alternative 4 would include the same components described under Alternatives 2 and 3. The hydraulic control system would consist of five extraction wells to capture the vertical and horizontal extent of the target plume area. Extracted groundwater from each well would be routed via underground piping to the GAC treatment building where it would be combined at a common header inside the building.

The extraction wells would be approximately 69 to 71 feet deep with 45- to 47-foot screens. Each extraction well would pump approximately 55 gpm for a total target pumping rate of approximately 275 gpm. The estimated groundwater capture zone for the groundwater extraction well field is illustrated on Figure 9.

- Technology for Treating Extracted Groundwater - The new GAC groundwater treatment system would be identical to Alternatives 2 and 3.
- Location for Discharging Treated Groundwater – Treated groundwater would exit the groundwater treatment facility via underground piping and extend southwest approximately 2,500 ft to connect to the existing storm sewer system near the Integrated Maintenance Building 5306 and the runway (Figure 9). It is anticipated that a new storm sewer manhole would be installed to facilitate the connection of the new discharge piping. This alternative would include installing a spare underground pipe for possible future treatment system expansion. A transfer pump would be installed in the new treatment system building to pump treated groundwater to the new manhole. Connection to the existing storm sewer system would require coordination with OWAA and the Charter Township of Oscoda.

A video inspection would be necessary to determine the condition of the existing storm sewer piping that would convey the additional flow from the new treatment system. A flow analysis would also be performed to determine if the existing storm sewer system could accommodate the additional flow volume discharged from the new treatment system. If this video inspection determined that this portion of the existing storm sewer piping is in disrepair and subjected to groundwater infiltration, this portion of the storm sewer would need to be repaired.

As part of the PFAS remedial investigation, and subsequent to public comment on the PP, a video inspection of a portion of the storm sewer was completed. This inspection revealed that the storm sewer was subject to groundwater infiltration. Repair of sections of the storm sewer would be needed if Alternative 4 were selected. The time frame for the repair of the storm sewer is unknown but would undoubtedly cause significant delays in the implementation of Alternative 4.

The storm sewer system collects stormwater from the flightline area and discharges it to OWAA Outfall No. 3, located at the head of Three Pipes Ditch. Three Pipes Ditch discharges to the Au Sable River.

Under section 300.400(e)(1) of the NCP, federal, state, or local permits are not required for on-site response actions conducted pursuant to CERCLA sections 104, 106, 120, 121, or 122. “On-site” is defined as “the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of response action.” 40 CFR section 300.5. Although Alternative 4 would entail an on-site discharge and thus be exempt from permitting requirements, Alternative 4 would have to comply with substantive discharge requirements that qualified as ARARs.

- Operation and Maintenance – The GAC beds would be replaced when PFAS are detected in treated water leaving the lead tank and entering the lag tank. The pretreatment GAC vessel would be backwashed on a routine basis to remove solids. Maintenance of extraction well pumps and treatment system feed pump components would occur routinely to ensure target extraction rates are being achieved and the pump and treat system is operating optimally. Feed pumps are pumps that push the groundwater through the GAC treatment system.
- Performance Monitoring – Performance monitoring of the treatment system would be conducted to assess 1) how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake; and 2) how effective the GAC is at removing PFAS from the extracted groundwater. Groundwater monitoring would be conducted upgradient and downgradient of the extraction well field to monitor how effective the extraction wells are at preventing the highest concentrations of PFAS from migrating towards Van Etten Lake and the reduction in PFAS concentrations in downgradient monitoring wells over time.

The criteria for determining the PFAS removal efficiency of the GAC beds would be (1) reducing PFOS, PFOA, PFNA, PFHxS, and PFBS concentrations in the GAC treatment system discharge to levels below EGLE Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards, HNVs for non-drinking water of 12 ng/L for PFOS, 170 ng/L for PFOA, 30 ng/L for PFNA, 210 ng/L for PFHxS, and 670,000 ng/L for PFBS, and (2) meeting the water quality limitations established for the new storm sewer connection.

- Management of Treatment Residuals – Management of treatment residuals would be the same as Alternatives 2 and 3.

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Exhibit 5 provides a summary of the elements common to each alternative and features that distinguish one alternative from another.

Exhibit 5. Common Elements and Distinguishing Features of Each Alternative

Elements	Alternative 1 No Action	Alternative 2 Pump and Treat with GAC - Discharge to Infiltration Galleries	Alternative 3 Pump and Treat with GAC - Discharge to Van Etten Lake	Alternative 4 Pump and Treat with GAC - Discharge to Storm Sewer System
Key ARARs associated with alternative	Not Applicable (NA)	Complies with ARARs	Complies with ARARs	Complies with ARARs
Long-Term Reliability of Remedy	Does not meet criteria	Demonstrated long-term reliability.	Demonstrated long-term reliability.	Demonstrated long-term reliability.
Quantity of Untreated Waste and Treatment Residuals to be Disposed Off-Site or Managed On-Site in a Containment System and Degree of Hazard Remaining in Such Material	None	Will generate spent GAC media and will produce settled solids from backwash operations. Spent GAC will be regenerated off-site. Settled solids will be transported off-site for disposal at an approved off-site hazardous waste disposal facility.	Will generate spent GAC media and will produce settled solids from backwash operations. Spent GAC will be regenerated off-site. Settled solids will be transported off-site for disposal at an approved off-site hazardous waste disposal facility.	Will generate spent GAC media and will produce settled solids from backwash operations. Spent GAC will be regenerated off-site. Settled solids will be transported off-site for disposal at an approved off-site hazardous waste disposal facility.
Estimated Time for Design and Construction	NA	9 Months	10 Months	Unknown as the magnitude of repairs to the storm sewer has not been fully determined.
Estimated Time to Reach Remediation Goals	0 Years	3 Months (Upon completion of system startup and optimization)	3 Months (Upon completion of system startup and optimization)	3 Months (Upon completion of system startup and optimization)
Estimated Capital Cost	\$0	\$6,467,115	\$6,917,153	\$6,876,928 ¹
Estimated Annual O&M Cost	\$0	\$833,904	\$854,779	\$870,513
Estimated Total Present Worth Cost	\$0	\$23,690,494	\$24,571,686	\$24,856,436
Number of Years Over Which Cost is Projected	0 Years	30 Years	30 Years	30 Years
Use of Presumptive Remedies and/or Innovative Technologies	None	Yes, Carbon Adsorption	Yes, Carbon Adsorption	Yes, Carbon Adsorption

Notes:

1. Capital cost does not include repairs to the storm sewer.

ARARs = Applicable or Relevant and Appropriate Requirements

GAC = granular activated carbon

NA = not applicable

O&M = operation & maintenance

2.9.3 Expected Outcomes of Each Alternative

The expected outcome of Alternative 2: Pump and Treat with GAC – Discharge to Infiltration Galleries, Alternative 3: Pump and Treat with GAC – Discharge to Van Etten Lake, and Alternative 4: Pump and Treat with GAC – Discharge to Storm Sewer System is hydraulic control of the groundwater plume. The expected outcome of Alternative 1: No Action is continued migration of the groundwater plume towards Van Etten Lake.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a detailed analysis of the alternatives for hydraulic control of PFAS-impacted groundwater from Alert Aircraft Area at Swise Road. The analysis is based on the nine evaluation criteria found in 40 CFR Section 300.430(e)(9)(iii).

2.10.1 Analysis of Alternatives

2.10.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1: No Action would not reduce the migration of PFAS towards Van Etten Lake and would not be protective of human health and the environment.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries, Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake, and Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System would provide equal protection of human health and the environment by controlling the migration of PFAS towards Van Etten Lake. Alternative 3 would comply with the NPDES requirements for the new outfall on Van Etten Lake. Alternative 4 would comply with the discharge requirements established for the new storm sewer connection.

2.10.1.2 Compliance with ARARs

Section 300.5 of the NCP defines *applicable* requirements as cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site.

Section 300.5 of the NCP defines *relevant and appropriate requirements* as cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that, although not “applicable” to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

This IRA is solely focused on capturing and treating the highest concentrations of PFAS near the Alert Aircraft Area at Swise Road while the CERCLA process continues toward the step of choosing a final, comprehensive remedy. The more stringent of EGLE Rule 299.44’s generic groundwater cleanup criteria

for residential and non-residential drinking water or EGLE Rule 299.44's GSI criteria would be the ARARs for Alternative 2. The applicable levels would be 12 ng/L for PFOS, 8 ng/L for PFOA, 6 ng/L for PFNA, 51 ng/L for PFHxS, and 400,000 for PFHxA. PFBS will be below the EGLE-identified "to be considered" discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44's criteria for PFBS.

The EGLE Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards, HNVs for PFOS (12 ng/L), PFOA (170 ng/L), PFNA (30 ng/L), PFHxS (210 ng/L), and PFBS (670,000 ng/L) would be ARARs for Alternatives 3 and 4. Other ARARs that are applicable for this IRA include the specific Michigan statutes and regulations listed in the ARARs table regarding characterizing and handling hazardous wastes. See Table 3 for details.

Alternative 1: No Action would not produce treated discharge or solid wastes; therefore, compliance with federal and state requirements is not applicable.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries would comply with the ARARs since the GAC adsorption technology would achieve the discharge of treated groundwater to levels below the more stringent of the EGLE Rule 299.44 generic groundwater cleanup criteria for residential and non-residential drinking water or the EGLE Rule 299.44 GSI.

Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake and Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System would comply with the ARARs since the GAC adsorption technology would achieve the discharge of treated groundwater to levels below the EGLE Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards.

2.10.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refer to the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup levels have been met. This criterion includes considering the residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternative 1: No Action would not be effective in the long term because no actions are taken to control PFAS migration towards Van Etten Lake.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries, Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake, and Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System would effectively establish hydraulic control and plume capture in the long-term. Hydraulic control systems using pump and treat are well-established, proven technologies for controlling groundwater migration with current demonstrated success at the former WAFB.

GAC is a porous material made from coal, wood, peat, or coconut shell that removes organic compounds from liquids and gases by a process known as adsorption. GAC is an effective adsorbent because it is highly porous and provides a large surface area for contaminants to adsorb. It is widely used to remove synthetic organic chemicals, natural organic compounds, and other compounds affecting taste and odor in drinking water treatment.

Removal efficiencies using GAC vary but can exceed 90 percent, resulting in non-detectable PFAS levels in treated water. For example, PFOS and PFOA removal efficiencies at the Wurtsmith Central Treatment

System (CTS) are greater than 90 percent for up to 233 days of treatment system operation. Long-term reliability of this alternative is dependent on routine performance monitoring and O&M of the treatment system, which would include periodic servicing of the system units (media change-out).

2.10.1.4 *Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment*

Reduction of toxicity, mobility, or volume of contaminants through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1: No Action does not provide any treatment to reduce toxicity, mobility, or volume; therefore, if implemented, there would be no reduction in PFAS concentrations in groundwater migrating towards Van Etten Lake from the Swise Road plume. As a result, Alternative 1 does not meet this criterion.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries, Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake, and Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System would not reduce the toxicity of PFAS because destruction or chemical transformation of the compounds does not occur. Alternatives 2, 3, and 4 would reduce PFAS mobility in treated water through GAC adsorption. Furthermore, the mobility of PFAS in groundwater migrating towards Van Etten Lake would be reduced due to hydraulic control of the plume provided by the new extraction wells.

The volume of PFAS in groundwater migrating towards Van Etten Lake from the Swise Road plume would be reduced under Alternatives 2, 3, and 4 due to hydraulic control of the plume provided by the new extraction wells.

2.10.1.5 *Short-Term Effectiveness*

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1: No Action would not be effective in the short term since no actions would be taken.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries, Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake, and Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System would be effective in the short-term based on the recent successful construction and implementation of hydraulic control systems such as the CTS and FT002 at the former WAFB within short timeframes.

2.10.1.6 *Implementability*

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative 1: No Action does not involve any activities; therefore, this alternative would be technically and administratively feasible.

Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries is technically and administratively implementable. GAC is proven and reliable, and GAC treatment media is commercially available. Building materials, extraction wells, and distribution piping and components (i.e., piping, valves, flow meters, pressure gauges, and pumps) are commercially available. The materials to

construct infiltration galleries are also commercially available. The labor necessary to implement Alternative 2 is conventional and readily available.

Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake is technically and administratively implementable. The new GAC groundwater treatment system would be identical to Alternative 2, except that a transfer pump would be installed in the new treatment system building to pump treated groundwater to the new manhole. Additional mechanical and electrical components would also be installed in the new treatment system building to operate the transfer pump. The materials for the new infrastructure (i.e., piping, manhole, and outfall) necessary to convey treated groundwater to the new outfall on Van Etten Lake are commercially available. The labor necessary to implement Alternative 3 is conventional and readily available.

Alternative 3 would also require right-of-way approval from the Iosco County Road Commission for installing underground piping beneath County Route F-41 and access approval from the Charter Township of Oscoda for installing the new outfall/headwall on Van Etten Lake.

Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to the Storm Sewer System is technically and administratively implementable. The new GAC groundwater treatment and transfer pump system would be identical to Alternative 3, except that treated groundwater would be pumped to a new manhole connecting the discharge piping to the sanitary sewer system. The materials needed to connect to the sanitary sewer system (i.e., piping and manhole) are commercially available. Alternative 4 would require coordination with the OWAA and the Charter Township of Oscoda for connection to the existing storm sewer system.

For Alternative 4, a video inspection and flow analysis would be performed to determine the condition of the storm sewer piping and if the storm sewer system could accommodate the additional flow volume that would be discharged from the new treatment system. As part of the PFAS remedial investigation, and subsequent to public comment on the PP, this inspection revealed that the storm sewer was subject to groundwater infiltration. Repair of sections of the storm sewer would be needed if Alternative 4 were selected. The time frame for the repair of the storm sewer is unknown but would likely cause significant delays in the implementation of Alternative 4.

Alternative 2 would be more technically and administratively implementable than Alternatives 3 and 4 because Alternatives 3 and 4 would require coordination with the Charter Township of Oscoda, OWAA, and Iosco County Road Commission (Alternative 3) before construction. Alternative 4 would be the least implementable because repair of sections of the storm sewer would be needed if Alternative 4 were selected. The time frame for the repair of the storm sewer is unknown but would undoubtedly cause significant delays in the implementation of Alternative 4.

2.10.1.7 *Cost*

Present worth costs over a 30-year period, assuming a 2.6% discount rate per the 2022 Office of Management & Budget, are summarized in Exhibit 6.

Exhibit 6. Cost Comparison IRA Alternatives

Alternative	Description	Estimated Capital Costs	Estimated Annual O&M Costs ¹	Estimated Present Worth Cost ²
Alternative 1:	No Action	\$0	\$0	\$0
Alternative 2:	Hydraulic Control using Pump and Treat with GAC – Discharge to Infiltration Galleries	\$6,467,115	\$833,904	\$23,690,494
Alternative 3:	Hydraulic Control using Pump and Treat with GAC – Discharge to Van Etten Lake	\$6,917,153	\$854,779	\$24,571,686
Alternative 4:	Hydraulic Control using Pump and Treat with GAC – Discharge to Storm Sewer System	\$6,876,928 ³	\$870,513	\$24,856,436

Notes:

¹ Average O&M costs over 30 years.² Discount Rate of 2.6% for 30-Year per Office of Management and Budget (OMB) Circular No. A-94, valid for calendar year 2022.³ Capital cost does not include repairs to the storm sewer.

GAC = granular activated carbon

O&M = operation & maintenance

The detailed capital cost estimates and net present worth costs of O&M and monitoring for each alternative are provided in the tables tab at the end of this report.

2.10.1.8 State/Support Agency Acceptance

On 11 September 2023, EGLE concurred with the preferred alternative. However, EGLE has not concurred on the ARARs or on the ROD itself.

2.10.1.9 Community Acceptance

During the public comment period, the community generally expressed support for Alternative 2; however, they did not consider Alternative 2 to be adequately protective. The responsiveness summary in Section 3.0 presents the public comments on the proposed plan for the Alert Aircraft Area at Swise Road IRA and the Air Force's responses to those comments.

2.11 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable [40 CFR Section 300.430(a)(1)(iii)(A)]. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is generally not considered to be a source material (USEPA, 1991). The PFAS impacted groundwater migrating from Alert Aircraft Area towards Van Etten Lake does not constitute a principal threat waste as defined by the NCP.

2.12 SELECTED INTERIM REMEDY**2.12.1 Summary of the Rationale for the Selected Remedy**

Alternative 2 – Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries is the selected interim remedy for groundwater at the Alert Aircraft Area at Swise Road. The selected interim remedy includes a new treatment system building, a new GAC treatment train, and the installation of five groundwater extraction wells. This interim remedy also includes the return of treated groundwater to the

affected aquifer via a series of infiltration galleries located within the known footprint of the existing PFAS groundwater plume.

Alternative 2 – Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries is protective of human health and meets the interim RAO by preventing the highest concentrations of PFAS from migrating towards Van Etten Lake, complies with ARARs, and is effective in both the short and long-term.

Alternative 2 - Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries was selected over other alternatives because it is more cost-effective than Alternative 3 - Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake and Alternative 4 - Hydraulic Control Using Pump and Treat with GAC – Discharge to Storm Sewer System. Additionally, Alternative 2 will be more technically and administratively implementable than Alternatives 3 and 4 because those alternatives would require coordination with the Charter Township of Oscoda and OWAA, as well as the Iosco County Road Commission for Alternative 3 before construction; in addition, Alternative 4 would require repair of sections of the storm sewer. The time frame for the repair of the storm sewer is unknown but would undoubtedly cause significant delays in the implementation of Alternative 4.

The USAF believes the preferred remedial alternative of Hydraulic Control using Pump and Treat with GAC – Discharge to Infiltration Galleries will meet the threshold criteria and provide the best balance of trade-offs among the other alternatives with respect to the balancing and modifying criteria. The USAF expects the preferred alternative to satisfy the CERCLA requirements by (1) being protective of human health, (2) complying with ARARs, and (3) being cost-effective.

2.12.2 Description of the Selected Remedy

The key elements of the Alert Aircraft Apron at Swise Road IRA will include:

- Installing 5 new groundwater extraction wells to provide hydraulic control of the plume,
- Installing a new treatment system building,
- Installing three GAC treatment vessels in the new treatment system building, and
- Installing EQ, effluent, and settling tanks, and
- Installing 5 infiltration galleries.

2.12.2.1 Extraction Wells

The general location of the extraction well field is provided on Figure 7. Preliminary groundwater modeling results indicate that 5 extraction wells spaced approximately 150 ft apart will be required to capture the vertical and horizontal extent of the plume.

2.12.2.2 Treatment System Building

The treatment system building will consist of a metal, prefabricated structure installed on a new concrete slab. The building will be designed with a curbed floor that serves as secondary containment for the treatment system equipment. The location of the treatment building is provided on Figure 7.

2.12.2.3 Infiltration Galleries

Treated groundwater from the new GAC treatment system will be returned to the affected aquifer via a series of infiltration galleries located within the known footprint of the existing PFAS groundwater plume. The location of the infiltration galleries is provided on Figure 7.

2.12.2.4 Performance Monitoring Wells

Performance monitoring will be accomplished with existing and newly installed monitoring wells. Performance monitoring will include upgradient and downgradient monitoring wells that are screened such that the vertical and horizontal plume extents can be monitored. Performance monitoring data will be collected to measure the effectiveness of the extraction well system. A performance monitoring plan will be developed and presented in the IRA work plan.

2.12.3 Summary of Estimated Remedy Costs

The information in this cost estimate summary table (Exhibit 7) is based on the best available information regarding the anticipated scope of the selected interim remedy. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the selected interim remedy. Minor changes will be documented in the form of a memorandum in the AR file. Significant changes will be documented in an explanation of significant differences, and fundamental changes will be documented in an interim ROD amendment.

Exhibit 7. Cost Estimate Summary

Selected Interim Remedy Description	Estimated Capital Cost	Estimated Annual O&M Costs ¹	Estimated Present Worth Cost ²
Alternative 2: Hydraulic Control using Pump and Treat with GAC – Discharge to Infiltration Galleries	\$6,467,115	\$833,904	\$23,690,494

Notes:

¹ Average O&M costs over 30 years.

² Discount Rate of 2.6% for 30-Year per OMB Circular No. A-94, valid for calendar year 2022.

O&M = operation & maintenance

2.12.4 Expected Outcomes of Selected Remedy

The selected interim remedy described in this interim ROD is intended to hydraulically control the migration of the highest concentrations of PFAS impacted groundwater towards Van Etten Lake from the Alert Aircraft Area at Swise Road by pumping contaminated groundwater and treating it at the new treatment system building. A base-wide RI is being conducted at the former WAFB to delineate the nature and extent of PFAS contamination in soil, groundwater (including the GSI), sediment, and surface water. A final remedy will be selected to address the overall PFAS concentrations at the former base after the RI and FS are complete. It is intended that this interim remedy will not be inconsistent with nor preclude implementation of the expected final remedy.

2.13 STATUTORY DETERMINATIONS

The USAF expects the selected interim remedy to satisfy the following statutory requirements of CERCLA section 121, 42 U.S.C section 9621:

- Be protective of human health and the environment.
- Comply with ARARs.
- Be cost-effective.

- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.
- Satisfy the preference for treatment that permanently and significantly reduces volume, toxicity, or mobility of contaminants as a principal element and the bias against off-site disposal of untreated wastes.

The following sections discuss how the selected interim remedy meets these statutory requirements.

2.13.1 Protection of Human Health and the Environment

The selected interim remedy will protect human health and the environment through containment and treatment. The hydraulic control system will prevent the highest concentrations of PFAS from migrating towards Van Etten Lake from the Alert Aircraft Area at Swise Road plume and is protective of human health. The selected interim remedy does not pose short-term risks or cross-media impacts. CERCLA human health and ecological risk assessments have not been completed at the former WAFB related to potential PFAS exposures. The RI is evaluating exposure pathways and potential PFAS receptors.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The ARARs for this IRA will incorporate the more stringent of the EGLE Rule 299.44 generic groundwater cleanup criteria or EGLE 299.44 GSI criteria for the discharge of treated groundwater to infiltration galleries. The remedy developed during the FS for the final remedial action will comply with all state criteria that qualify as ARARs under CERCLA section 121(d)(2), 42 U.S.C. section 9621(d)(2).

2.13.3 Cost-Effectiveness

The selected interim remedy is cost-effective and represents a reasonable value for the expense. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of the alternatives that satisfied the threshold criteria (i.e., protective of human health and the environment and compliance with ARARs). The overall effectiveness of the selected interim remedy was evaluated by assessing cost in light of three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to cost to determine cost-effectiveness. The relationship of the overall effectiveness of the selected interim remedy was determined to be proportional to its costs. Hence, the selected interim remedy represents a reasonable value for the money to be spent.

The present worth cost of the selected interim remedy is \$23,690,494, which provides an overall level of protection comparable or superior to alternative remedies and therefore represents the best value.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected interim remedy will provide hydraulic control of the PFAS plume and prevent contaminant migration towards Van Etten Lake from the Alert Aircraft Area at Swise Road while the CERCLA process continues toward the step of choosing a final, comprehensive remedy. A final remedy will be selected to address the overall PFAS concentrations in groundwater at the former WAFB after the RI and FS activities are complete. Although it is possible that the selected interim remedy and the final remedy will overlap objectives and remedial elements, the selected interim remedy is not designed or expected to be the final

remedy. The selected interim remedy is the best alternative given the limited scope of this action. While the USAF cannot predict the details of the final remedy, the USAF intends that this selected interim remedy will not be inconsistent with nor preclude implementation of a final remedy.

2.13.5 Preferences for Treatment as a Principal Element

The selected interim remedy addresses potential risks posed by PFAS. It will protect human health and the environment through extraction and treatment. The hydraulic control system will provide effective hydraulic control of the highest PFAS concentrations within the plume and reduce PFAS migration towards Van Etten Lake from the Alert Aircraft Area at Swise Road, thereby reducing potential exposure to recreational users and wildlife.

The selected interim remedy would reduce contaminant mobility because PFAS would be removed from extracted groundwater through adsorption. Furthermore, the mobility of PFAS in the groundwater at the Alert Aircraft Area at Swise Road would be reduced from hydraulic control of the plume. The toxicity and volume of PFAS would be reduced because the compounds would be permanently destroyed by off-site reactivation.

2.13.6 Five-Year Review Requirements

Because this interim remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, the USAF will review the remedy within five years after the initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The PP for the Alert Aircraft Area at Swise Road IRA was released for public comment on 20 September 2023. Alternative 2 – Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries was identified as the preferred alternative for the IRA. A total of 39 written comments were submitted during the public comment period. The USAF reviewed all written comments submitted during the public comment period. No significant changes from the preferred alternative of the PP were made.

3.0 RESPONSIVENESS SUMMARY

This section summarizes the public comments regarding the PP developed for the Alert Aircraft Area at Swise Road. At the time of the public review period, the USAF had identified Alternative 2 – Hydraulic Control Using Pump and Treat with GAC – Discharge to Infiltration Galleries as the preferred alternative.

The 30-day public comment period on the PP was held from 20 September 2023 to 20 October 2023. The public was notified of the availability of the PP via notice in the Iosco County News-Herald on 20 September 2023. A total of 39 comments were received from multiple stakeholders, including the RAB, community members, and a congressional member representing Michigan’s first district. Comments were received via email. In general, the primary comments related to the remedy selection revolved around the scope of the IRA.

Where appropriate, comments of similar nature have been combined and summarized in the responsiveness summary. Others are included as received due to the technical nature of the comment.

3.1 STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES

While, in general, stakeholders support Alternative 2 as the selected interim remedy, there were concerns expressed related to the rationale and scope of the IRA. IRAs are limited in scope. As explained in Department of Defense Manual 4715.20, a military service may use an IRA as “a partial solution to a complex (e.g., multi-media) contaminant problem or as a remedial action at one site included within a group of sites.” After the remedial investigation has evaluated whether there are any unacceptable risks and the feasibility study has analyzed alternatives that can address those risks, the record of decision will choose a remedy or remedies that protects human health and the environment from any identified unacceptable risks. This IRA is intended to hydraulically control the migration of the highest concentrations of PFAS-contaminated groundwater towards Van Etten Lake from the Alert Aircraft Area at Swise Road. The groundwater plume at Swise Road is the most downgradient source of the highest concentrations migrating towards Van Etten Lake. The USAF understands that the community is primarily concerned with the focus of the proposed IRA as it does not address all of the PFAS plumes located northeast, north, and west of the Alert Aircraft Area but rather only the highest PFAS concentrations of the plume at Swise Road. The data required to develop a final, comprehensive remedy is not yet available. While the base-wide RI is underway to determine the full extent of impacts to Van Etten Lake, the IRA will, in the meantime, reduce PFAS migration towards the lake.

3.2 GENERAL COMMENTS

Comment 1 (Summary Comment): Multiple commenters stated that a comprehensive remedial plan for the full extent of impacts across the base has not been developed. One commenter stated that “*Oscoda and Au Sable communities have seen an economic decline with respect to residential property values, rental properties and tourism due to PFAS contamination in and around the WAFB area*” and that “*Residents on Van Ettan Lake have to deal with having their drinking water tested yearly to insure their water is below regulated health levels as well as dealing with PFAS foam on our shorelines and beaches daily that we all know is coming from WAFB.*” Another commenter stated that “*The AF needs to treat ALL the PFAS plumes indicated on their maps to prevent off-base migration of PFAS above GSI criteria, by one means or another, to achieve groundwater cleanup at levels below the GSI criteria along the 8.5 miles of GSI influenced by the AF’s PFAS releases to VanEtten Lake, VanEtten Creek, Clark’s Marsh, and Lake Huron.*” Another

commenter stated that “... *the USAF should use this as a pilot effort to learn what the obstacles are in achieving complete hydraulic capture and treatment that can be applied to the several miles of base perimeter across which PFAS is currently migrating away from WAFB and into the local community and waterways.*”

Response: The USAF priority has been to protect drinking water sources. In 2015, as part of the base-wide PFOS/PFOA site inspection, a drinking water well inventory was completed, and drinking water wells located downgradient of the former Wurtsmith Air Force Base (WAFB) were sampled. One residential drinking water well exceeded 70 parts per trillion (ppt) for PFOS, PFOA or the sum of the two and the Air Force conducted an emergency removal action in 2016 to provide the resident with bottled water and then connect the residence to a municipal water supply. An additional water well inventory is being completed as part of the ongoing PFAS remedial investigation (RI) to ensure that no one is drinking groundwater that contains PFOS/PFOA attributable to WAFB in excess of 70 ppt.

Since 2015 the USAF has completed Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) response actions consisting of one emergency removal action, three time-critical removal actions (TCRAs), one non-time critical removal action (NTCRAs), and two IRAs. These response actions all addressed PFAS contamination. The Alert Aircraft Area IRA will be the third IRA, and there are four additional PFAS IRAs in various stages of planning. The intent of the Alert Aircraft Area IRA is to address the highest concentrations of PFAS in groundwater migrating towards Van Etten Lake. No other USAF Base Realignment and Closure (BRAC) installation has completed more non-drinking water CERCLA PFAS-related response actions.

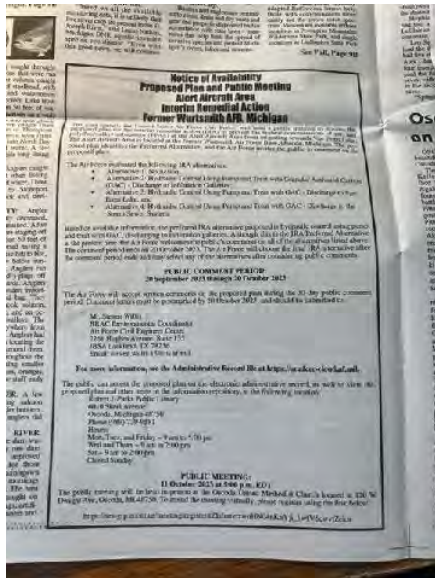
Concurrent with the response actions being taken, the USAF is continuing the base-wide RI to understand the nature and extent of contamination and the risks to human health and the environment; the USAF needs those answers before it can analyze alternatives for a final remedy or remedies. There is currently insufficient data to design a comprehensive remedy or remedies to address all PFAS contamination migrating towards Van Etten Lake, Van Etten Creek, and Clark’s Marsh. CSMs developed by the United States Geological Survey (1983), EGLE (2020), and USAF (2022) do not indicate that PFAS is migrating into Lake Huron.

After the RI and FS are completed, the USAF will propose a final remedy or remedies for public comment and then select a final remedy or remedies to address the overall PFAS plume(s) at the former WAFB. The final remedial action will comply with all state criteria that qualify as applicable or relevant and appropriate requirements (ARARs) under CERCLA section 121(d)(2) (42 U.S.C. § 9621(d)(2)). The ARARs identified for this IRA were developed in consultation with EGLE and incorporate changes requested by EGLE.

Comment 2: *“In terms of community engagement for this IRA, the USAF fell short of full engagement. The public notices about public comments and the public meeting for comments were published in the local paper. However, the virtual participation login stated (see Attachment 3), “Those who want to join remotely, can register online at https://ses-grp.zoom.us/meeting/register/tZIsfuuvrzwuHN04nKuYji_IwfV6cwvtZekn.” As you can see, this is a ridiculously long website address and publishing this in a hard copy paper would essentially eliminate people from accessing this option. The notice should have included an easily created “QR” code for the registration site. Small, but obvious, details like these should be addressed in all future meetings hosted by the USAF. In addition, the public meeting presentation provided by the USAF was not made available to the RAB members during the public comment period. This eliminated the option to share this presentation with community members that were not able to be in*

attendance for the meeting. Also, public comments and the responses from the USAF should be provided as soon as possible, not in the final Record of Decision. In October 2023 there is a CPA team on the base property evaluating other IRA's being considered at the former WAFB. I ask that that team be directed to look at the current AAA IRA and provide input. This would allow what the DOD considered their "best team" an opportunity to provide input into this plan."

Attachment 3:



Response: The USAF will continue to evaluate ways to simplify the ability of the public to participate in public meetings.

With regards to when the USAF responds to comments received during the public comment period on the proposed plan, CERCLA §117 (42 U.S.C. §9617(b)) and 40 C.F.R. §300.430(f)(3)(F) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires the USAF to respond to all significant comments in the ROD, and include a discussion of any significant changes and reasons for such changes in response to the public comments. From a practical standpoint, the USAF cannot provide responses to the public comments ahead of a decision on whether significant changes are being made to the remedy, and that decision is made in the ROD.

While the Alert Aircraft Area IRA was not reviewed by the full critical process analysis (CPA) team, USAF subject matter experts that are part of the CPA team did participate in a review of conceptual designs of the IRA during the early stages of IRA planning. There are no plans to involve the full CPA team at this phase of the CERCLA process. Optimization reviews of interim or final remedial actions are always conducted to ensure that remedial systems are attaining remedial action goals.

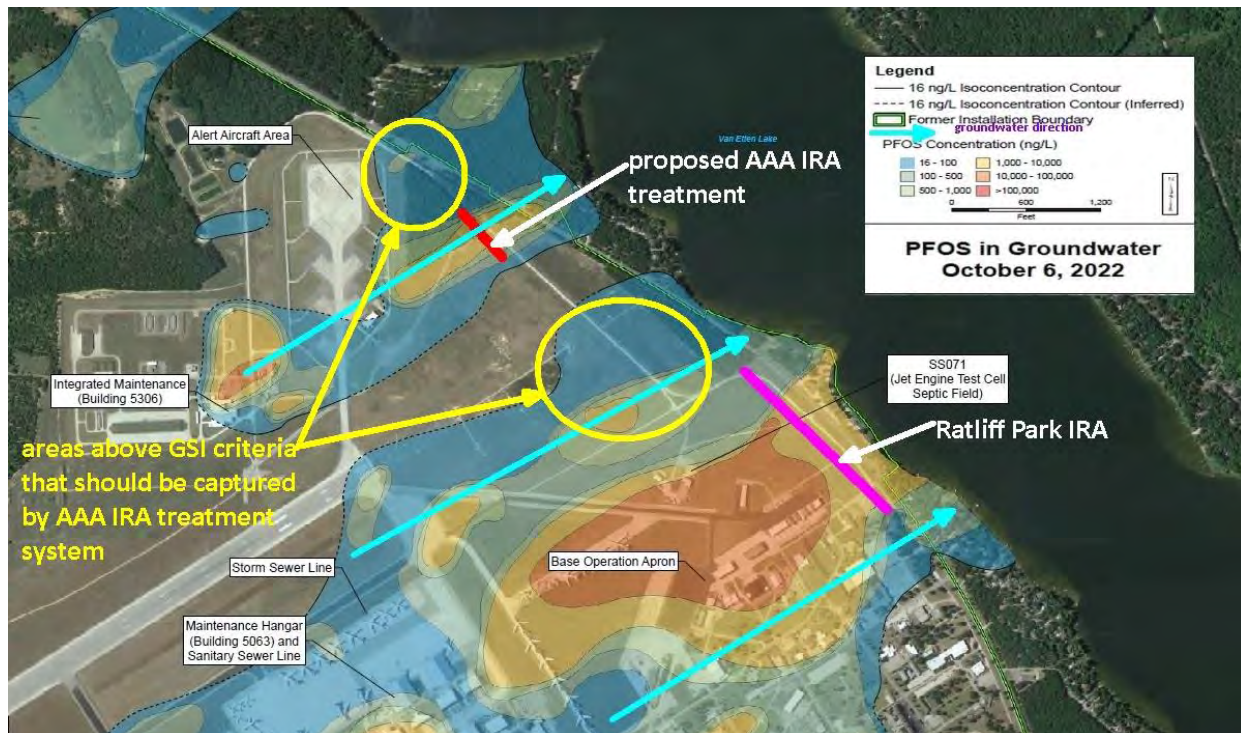
3.3 TECHNICAL AND LEGAL ISSUES

Both technical and legal comments were received during the public comment period. Multiple commenters stated that the scope of the IRA was inadequate and that the extraction well field did not expand adequately to the northeast, north, and south of the Alert Aircraft Area and does not prevent PFAS from migrating into Van Etten Lake. Several commenters felt that the IRA was not following CERCLA and the 11 July 2023

memorandum from the Assistant Secretary of Defense Energy, Installations, and Environment Brendan Owens titled *Taking Interim Actions to Address Per-and Polyfluoroalkyl Substances Migration from DoD Installations and National Guard Facilities*.

Comment 3 (Summary Comment): Multiple commenters stated that the IRA does not address the full extent of PFAS migrating towards Van Etten Lake from the Alert Aircraft Area and that the IRA is not protective of human health and the environment. One commenter noted that “... *my opinion is that the proposed IRA plan does provide some remediation efforts to the Alert Aircraft Area as an interim action specifically at the identified higher PFAS concentration areas moving toward Van Ettan Lake but in my view does not provide adequate PFAS remediation for all the additional nearby plumes along Van Ettan Lake that continue to contaminate local residents properties on the west side of Van Ettan Lake along F41 roadway as well as property owners on the east side of Van Ettan Lake which presents a risk to human health and the environment*” and that “*the proposed plan may prevent or slow down the highest PFAS concentrations associated with the Alert Aircraft Area groundwater plume from migrating towards Van Ettan Lake but the current plan does not address the PFAS plumes northeast and southeast of that particular highly contaminated plume that is being addressed which is releasing PFOS contamination towards Van Ettan Lake that are above the GSI protection criteria action levels of 12 ng/L for PFOS (Exhibit 11-4 and 11-5).*” Another commentator stated that “*The USAF should recognize the entire plume areas (see Attachment 2) and stop those plumes from flowing from the base property, which they are legally obligated to do*” and “*Also, the AAA IRA treatment area does not protect the Van Etten Lake State Forest Campground.*” A third commenter stated that “*The areas of groundwater PFAS contamination discharging from the base indicated in Figure 1 certainly qualify to be included in an IRA under the current DoD guidance.*”

Attachment 2/Figure 1:



Note: Attachment 2/Figure 1 was provided with the comments and was not generated by the USAF.

Response: The USAF is complying with federal law (CERCLA), federal regulations (NCP), and DoD guidance while implementing interim response actions and conducting the RI. The USAF understands that the community is concerned that the proposed IRA does not address all of the PFAS plumes located northeast, north, and west of the Alert Aircraft Area but rather focuses on the highest PFAS concentrations of the plume at Swise Road. As explained in Section 1.5 above, an IRA is limited in scope. After the remedial investigation has evaluated whether there are any unacceptable risks and the FS has analyzed alternatives that can address those risks, the USAF will choose a remedy or remedies that protect human health and the environment from any identified unacceptable risks. The Alert Aircraft Area IRA is designed to hydraulically control the migration of the highest concentrations of PFAS-contaminated groundwater towards Van Etten Lake from the Alert Aircraft Area at Swise Road. The groundwater plume at Swise Road is the most downgradient source of the highest concentrations migrating towards Van Etten Lake.

The USAF has expanded the RI to include investigating the groundwater-surface water interface on the east side of Van Etten Lake and on the southeast side of Van Etten Creek based on recommendations received from the RAB and the public. The expanded RI includes installing and sampling new multi-screened monitoring wells/piezometers, sampling existing EGLE wells, and performing a hydraulic study to obtain continuous real-time groundwater head data for evaluating groundwater-surface water interactions. Further, the USAF plans to collect surface soil samples in areas where foam was reportedly deposited on the land surface on the east side of Van Etten Lake if permission for property access can be obtained. In addition, as part of the RI, the USAF is investigating the groundwater-surface water interface on the west side of Van Etten Lake including the groundwater-surface water interface at the Van Etten Lake State Forest Campground. The RI investigation at Van Lake State Forest Campground included installing and sampling

new multi-screened monitoring wells, sampling existing monitoring wells, and collecting near-shore surface water and sediment samples.

The data required to develop a final, comprehensive remedy or remedies is not yet available. To date, the understanding of the horizontal and vertical distribution of PFAS impacts in groundwater has primarily come through vertical aquifer sampling (VAS) and the sampling of existing monitoring wells previously installed to delineate non-PFAS chemicals of concern. While VAS is an important tool for understanding the distribution of PFAS in groundwater, these grab-type samples only provide screening-level data and a one-time concentration and VAS sampling points cannot be resampled. In addition, at a number of locations where high concentrations of PFAS have been identified by VAS data, samples collected from permanent monitoring wells installed to verify these results were more than an order of magnitude lower than the VAS data. This difference between VAS and monitoring well data appears to be related to the inclusion of solids/particulates (e.g., turbidity) inherent in VAS. This observation of elevated PFAS results associated with turbidity is not unique to sampling conducted at WAFB. The USAF and EGLE have agreed that the final delineation of PFAS groundwater impacts required for the RI, and which will be used at the FS-phase of the CERCLA process to evaluate remedial alternatives, must be based upon the sampling of permanent monitoring wells. The installation of these wells is ongoing. The proposed treatment system design includes the installation of “spare” extraction well pipelines and the installation of “spare” pipeline connections on the inside of the treatment system building as a contingency. In addition, the treatment system building is designed to accommodate an additional GAC treatment system. If upon completion of the RI, the data indicates the need for additional extraction well(s) and treatment capacity, the additional well(s) and additional treatment capacity can be added in a subsequent decision document.

Comment 4 (Summary Comment): Multiple commenters stated that the USAF is not following the 11 July 2023 memorandum from the Assistant Secretary of Defense Energy, Installations, and Environment Brendan Owens’ titled *Taking Interim Actions to Address Per-and Polyfluoroalkyl Substances Migration from DoD Installations and National Guard Facilities* stating that “*The DoD Components are further directed to prioritize implementation of interim actions as expeditiously as possible to address PFAS under CERCLA, such as removal of soil or sediment “hot spots” and installation of groundwater extraction systems, where supported by site-specific information.*” One commenter stated that “*In Mr. Owens 6/11/2023 memo (General Comment C), he stated that plumes should be captured to prevent harm to humans or the environment.*” Another commenter stated that “*The Owens Memo requires implementation of interim remedial actions that mitigate harm to human health and the environment.*”

Attachment 1




OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
1615 LINDSEY DRIVE
WASHINGTON, DC 20301-75400

7/11/23

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS,
ENERGY AND ENVIRONMENT),
ASSISTANT SECRETARY OF THE NAVY (ENERGY,
INSTALLATIONS AND ENVIRONMENT),
ASSISTANT SECRETARY OF THE AIR FORCE
(INSTALLATIONS, ENVIRONMENT AND ENERGY),
DIRECTOR, NATIONAL GUARD BUREAU (OINT STAFF, IE),
DIRECTOR, DEFENSE LOGISTICS AGENCY (INSTALLATION
MANAGEMENT)

SUBJECT: Memorandum for Taking Interim Actions to Address Per- and Polyfluoroalkyl
Substances Migration from DoD Installations and National Guard Facilities

The Department of Defense (DoD) follows the federal cleanup law, the Comprehensive
Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and long-
standing Environmental Protection Agency regulations to evaluate all our military installations
nationally for potential releases of hazardous substances, pollutants, and contaminants. This
process includes identifying, investigating, and cleaning up releases caused by DoD activities,
and includes federal and state environmental regulator review and public participation. The
CERCLA process has many steps that may take several years, sometimes decades, to complete.

In the interest of protecting human health and the environment, in support of the
Secretary of Defense's commitment to taking care of Service members and their families, and in
recognition of and commitment to the critical role defense communities play in national security,
the Department is committed to addressing its PFAS releases as quickly as possible. In support
of these goals, the DoD Components are directed to evaluate the data gathered during
Preliminary Assessments/Site Inspections and Remedial Investigations and assess where an
interim action can be taken to mitigate further PFAS plume migration or ongoing impacts to
groundwater, surface water, and/or sediment, from an on-base PFAS source area. The DoD
Components are further directed to prioritize implementation of interim actions as expeditiously
as possible to address PFAS under CERCLA, such as removal of soil or sediment "hot spots"
and installation of groundwater extraction systems, where supported by site-specific information.

If a DoD Component is not certain whether the site-specific information supports taking
an interim action, the Office of the Assistant Secretary of Defense for Energy, Installations and
Environment (OASD(EIAE)) will assist in the final evaluation of information.

The point of contact for this matter is Mr. Alexander Long, at 703-571-0061, or
alexander.long@osd.mil.

OVERSIGNED: [Signature]
A.M. 12241284
Brenda M. Owen

Response: The USAF is following the 11 Jul 2023 Office of the Assistant Secretary of Defense (OASD) memorandum. The memorandum directs DoD Components to "...assess where an interim action can be taken to mitigate further PFAS plume migration or ongoing impacts to groundwater, surface water, and/or sediment from an on-base PFAS source area. The DoD Components are further directed to prioritize implementation of interim actions as expeditiously as possible to address PFAS under CERCLA, such as removal of soil or sediment 'hot spots' and installation of groundwater extraction systems, where supported by site-specific information" (emphasis added).

Since 2015 – well before the 11 Jul 2023 memo was issued - the USAF has completed the following CERCLA response actions at former WAFB to address PFAS contamination: one emergency removal action, three TCRA, one NTCRA, and two IRAs. The Alert Aircraft Area IRA will be the third IRA and there are four additional PFAS IRAs in various stages of planning. No other USAF BRAC installation has completed more CERCLA PFAS-related removal or interim actions. The FT002 pump and treat system (PTS) constructed as a TCRA has operated continuously since 2015. The Central Treatment System (CTS), also constructed as a TCRA, has operated continuously since 2018, and the Mission Street PTS was retrofitted with ionizing resin as a NTCRA and has been operational since 2019. Both the CTS and Mission Street PTS removal actions were completed to remove PFOS/PFOA in groundwater prior to discharge to the storm water system. The USAF expanded the existing FT002 PTS as an IRA in 2022 to further address the migration of PFAS into Clark's Marsh. In 2021, USAF completed a TCRA at the former FT002 fire training area and removed 24,780 tons of PFAS-impacted soil to mitigate further groundwater impacts. As part of the Van Etten Lake at Ken Ratliff Memorial Park IRA, the treatment capacity at the CTS was

doubled and 12 groundwater extraction wells were installed to prevent the further migration of high concentrations of PFOS/PFOA into Van Etten Lake. The USAF will continue to follow the CERCLA process while it analyzes potential future remedial actions at WAFB.

Comment 5: *Item#2 of my comments pertain to page #9 of the proposed plan which indicate “Treated groundwater would be discharged to a series of infiltration galleries installed approximately 200 ft. east and hydraulically downgradient of the extraction wells.” My comment/question is what is the anticipated contamination level of the treated groundwater going into the infiltration galleries after being cycled thru the proposed GAC system and will that treated water ultimately end up in Van Ettan Lake? Please advise what you believe the system efficiency/effectiveness level will be of the Alert Aircraft Area IRA assuming the system design is the same or similar to one of the newer GAC system operating today.*

Response: Treated groundwater will be returned to the affected aquifer within the known footprint of the existing PFAS groundwater plume. The treated groundwater will mix with downgradient groundwater and flow towards Van Etten Lake.

The new GAC treatment system design is identical to the existing CTS treatment systems; the 3-carbon vessel configuration provides redundancy and adequate contact time for PFAS adsorption. GAC adsorption is a well-established technology for removing PFAS from extracted groundwater. Sample ports installed after every stage of the GAC treatment train will be sampled during routine monitoring events. PFAS concentrations in the treated groundwater will be below the lower of the applicable EGLE Rule 299.44 generic groundwater cleanup criteria or groundwater surface water interface (GSI) criteria for PFNA, PFOA, PFOS, PFHxS, and PFHxA prior to being discharged to the infiltration galleries. PFBS will be below the EGLE-identified “to be considered” discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44’s criteria for PFBS. Samples collected from the treatment system discharge prior to being returned to the affected aquifer via the infiltration galleries will be used to monitor compliance with those criteria. Based on the PFAS concentrations detected within the plume area where the extraction wells will be installed, which were detected at lower concentrations than the PFAS concentrations being treated at the existing CTS treatment systems, we anticipate a removal efficacy to be greater than 90%.

Comment 6: *Item#3 of my comments/questions pertains to page #10 which indicates that the proposed plan will include only (5) extraction wells placed across the highly contaminated plumes but there is a PFOS contaminated plume indicated on the latest PFOS plume map which is northeast of the proposed plan area right next to Van Ettan Lake water edge that is showing levels (MW#A4-MW1) measured at 941 ng/L PFOS which definitely exceeds the project action levels outlined in item#1 of my comments, and this area is not addressed by the proposed plan. As such , in my opinion, the proposed plan does not provide protection for human health and the environment for surrounding areas. My first comment/question is why is this area not included in the proposed plan? Secondly, please advise as to how the Air Force plans to remediate this area as I am sure it is very likely that particular plume is releasing PFOS into Van Ettan Lake at levels exceeding what Air Force has outlined in the proposed plan contamination guidelines and this ongoing discharge will contribute to continued PFAS foam events on Van Ettan Lake.*

Response: Please see response to Comment No. 1.

Comment 7: *Item #4 of my comments pertain to page #9 which indicates that “ Groundwater monitoring would be conducted upgradient and downgradient of the extraction well field and infiltration galleries to*

monitor how effective the extraction wells are preventing the highest concentrations of PFAS from migrating towards Van Ettan Lake” but page #10 which does not show any proposed plan for new monitoring wells between proposed plan extraction wells and Van Ettan Lake in order to provide data to be used for performance monitoring to validate that the new proposed GAC system for the Alert Aircraft Area is performing as designed. Currently plume maps show (2) monitoring wells (A4-MW2 and SS05-MW1) in a small focused area which will not, in my opinion, support the proposed plan. Please advise as to how many monitoring wells are being planned for, where will they be installed, and if they will be sampled prior to and at GAC system start up?

Response: Please see Figure 7 of the Final Interim ROD. The USAF agrees performance monitoring is a critical component of measuring remedy success. In consultation with EGLE, the performance monitoring plan will be included in the remedial action work plan (RAWP) and will include evaluating both hydraulic control data and analytical data. Hydraulic control performance will be measured through groundwater level monitoring in conjunction with groundwater modeling. New and existing monitoring wells will be used to measure hydraulic control performance and to measure PFAS concentrations. The focus of the IRA is PFAS contamination associated with the Alert Aircraft Area at Swise Road migrating towards Van Edden Lake. Monitoring the hydraulic control system is best suited to areas where the hydraulic control can be measured, such as immediately up or downgradient of the system.

Comment 8: *Item#5 of my comments pertain to page #11 “Estimated Capital Cost and Estimated Average Annual Operating and Maintenance Cost. Preferred alternative #2 shows an estimated capital cost at \$6,467,115.00 and an average annual operating and maintenance cost of \$833,904.00. Comparing it to proposed plan IRA at Ratliff Memorial Park showed an estimated capital cost of \$4,089,542.00 and an average annual operating and maintenance cost of \$424,589.00. My comment/question is why has the annual operating and maintenance cost doubled in (2) years and the Alert Aircraft Area capital cost is \$2.5m more with (7) less extraction wells and a lot less plumbing? I would have to assume the additional capital cost is due to a new facility build versus an expansion to the existing facility. Please advise as to why the operating cost has doubled as I understand that both of the GAC systems for the Alert Aircraft Area and newer GAC systems are very similar in design.*

Response: There was a notable increase in subcontractor and equipment/materials costs between 2021 and 2022 and this increase affected the labor and materials costs for the IRA at the Alert Aircraft Area. This is a nationwide phenomenon. In 2022, the producer price index (PPI) for nonresidential construction increased by 23.1%. This increase was primarily a result of increased price for steel and petroleum products and pandemic-driven shortages. Although the PPI for nonresidential construction has trended downward in 2023, subcontractor pricing has not followed the downward path of materials prices. Labor costs continue to increase, especially for projects executed with union labor. The Construction Labor Research Council reported in July 2023 that local construction union settlements in the first half of 2023 included first-year increases for pay and benefits that averaged 4.4%, up from 3.9% in 2022.

Comment 9: *Item #6 of my comments pertains to the proposed Alert Aircraft Area extraction well capture zones relative to current models/designs as it relates to groundwater elevation being influenced by Van Ettan Lake water levels. My comment/question is has the current Alert Aircraft Area extraction well capture zones/designs taken into consideration the Van Ettan Lake water levels when the lake is at its winter low*

as well as when it is at its summer high? I know this was a concern of EGLE's on previously installed IRA's and I would like to know if the same applies for this IRA? Please advise.

Response: The extraction well spacing and pumping rates input into the groundwater model were conservative; therefore, the system will be capable of handling a higher groundwater flux across the well field than would be caused by the seasonal steepening of hydraulic gradient because of a lowered lake stage.

Comment 10: *My comments are related to wildlife and fish:*

- 1. Will there be any additional testing of white-tailed deer?*
- 2. Has there been any other testing done since the first harvest?*
- 3. Has or will there be any testing of walleye in VanEtten Lake at a time that there is little chance of spawning walleye from Lake Huron to be present in the lake?*

Response:

- The USAF is not sampling white-tailed deer as part of the RI biota sampling effort. The white-tailed deer sample data collected by the Michigan Department of Health and Human Services (MDHHS) will be incorporated into the risk assessment that is being conducted as part of the RI.
- The USAF is not sampling white-tailed deer as part of the RI biota sampling effort.
- The biota sampling effort on Van Etten Lake included targeting several species including walleye, white sucker, largemouth bass, and rainbow trout. The species sampled was dependent on the species and class-size that was captured during the sampling effort. The fish species sampled at Van Etten Lake for the human health risk assessment included yellow perch (10/17/23 and 10/18/23) and rainbow trout (10/18/23).

Comment 11: *A) The US Air Force (AF) chose to not perform vertical aquifer sampling (VAS) transects during their Remedial Investigation (RI) despite suggestions to do so. One consequence of this is that the results the RI did not demonstrate the actual width of the plumes they need to capture before the PFAS reaches the base boundary. This work needs to be done. The AF should perform a transect of VAS locations across the plume at the transverse location where they are installing their extraction wells to better plan the width and the depth that needs to be captured by the IRA.*

Response: See USAF response to Comment No. 1 regarding VAS data. The USAF is delineating the full extent of PFAS-impacted groundwater at the former WAFB, including the Alert Aircraft Area. The RI data are being collected in a stepwise fashion and the plume extents are routinely updated and presented to the RAB members and the public. Further, as part of the pre-design work for the IRA, continuous soil sampling will be conducted down to the top of the confining clay layer at each proposed extraction well location for lithological interpretation and sieve analysis. These data will be used to determine the length of the screened interval, screen slot size, and extraction well depth.

Comment 12: *B) The treatment building that is being built should include additional room for add-on PFAS removal/concentration technologies such as foam flotation equipment which would inexpensively remove most of the high-concentration PFAS waste from the extracted groundwater, and separate it from the low-concentration groundwater requiring expensive granular activated carbon (GAC) treatment.*

Response: The former WAFB has been selected for a demonstration project through DoD's Environmental Security Technology Certification Program (ESTCP). The ESTCP project will be conducted at the Van Etten Lake at Ken Ratliff Park IRA location.

The demonstration project (ER23-7939) entitled "Sustainable On-Site Removal and Destruction of PFAS Using Surface Active Foam Fractionation and Super Critical Water Oxidation" has been awarded with an estimated start date of September 2024. The equipment for the Surface-Active Foam Fractionation (SAFF[®]) will be provided by Allonnia and the super critical water oxidation (SCWO) by Revive Environmental/Battelle. USAF will divert up to 100 gpm of higher concentration PFAS groundwater to the SAFF unit from extraction well(s) for processing. Once the separation process is complete, the effluent water will be routed through an existing GAC treatment system for polishing. The concentrated foam will be treated by SCWO. The equipment for the SAFF and SCWO will be self-contained and brought to the former WAFB to conduct the test. Test duration is expected to be on the order of 2 months and the results and cost-effectiveness of this technology will be evaluated for potential future applications at the site.

Comment 13: D) *The majority of PFAS contamination associated with the Alert Area originated at the Weapons Storage Area (WSA) (IRP sites SS-05/SS-69), but this is not discussed at all. The AF should consider isolating and treating the source area as a separate IRA and prevent migration of the source mass of PFAS that seems to be still emanating from the WSA all the way to the base boundary. I would suggest that a separate IRA be performed at the WSA wherein the groundwater containing high concentration PFAS is extracted downgradient of the WSA and plumbed through an ex-situ foam-fractionization unit which will remove and concentrate the PFAS from the extracted groundwater, removing ~98% of the PFAS mass in a concentrated solution that can be destroyed or modified for disposal. The effluent from this concentration technology, containing ~2% of the original PFAS concentration, can be reinjected upgradient of the WSA source area in a recirculation pattern to flush through the PFAS source area which would ultimately exhaust it, yet not let it migrate from the collection system. As concentrations diminish to much lower source area PFAS levels, granular activated carbon (GAC) removal can be added to the system to completely remove the PFAS from the recirculated flow, thus providing a polishing flush to the system.*

Response: The USAF acknowledges that the Alert Aircraft Area IRA does not specifically address the upgradient plume area at Integrated Maintenance; soil and groundwater delineation is ongoing at that site. The proposed treatment system building for the Alert Aircraft Area IRA is designed to accommodate an additional GAC system, and the USAF will consider incorporating emerging treatment technologies in future remedies.

Comment 14: 1) *Page 2/27, PPI; The AF states that it is only treating the hottest part of the plume. In Mr. Owens 6/11/2023 memo (General Comment C), he stated that plumes should be captured to prevent harm to humans or the environment. This legal threshold for this capture/treatment is the State of Michigan groundwater/surface water interface (GSI) criteria and groundwater migrating from the base should not contain PFAS concentrations in excess of their respective Michigan's Part 201 and Rule 57 criteria. The AF needs to treat ALL the PFAS plumes indicated on their maps to prevent off-base migration of PFAS above GSI criteria, by one means or another, to achieve groundwater cleanup at levels below the GSI criteria along the 8.5 miles of GSI influenced by the AF's PFAS releases to VanEtten Lake, VanEtten Creek, Clark's Marsh, and Lake Huron. State criteria are risk-based and promulgated to be protective of human health and the environment.*

Response: The Alert Aircraft Area Interim ROD incorporates the lower of the EGLE Rule 299.44 generic groundwater cleanup criteria or GSI criteria as the treatment levels for PFNA, PFOA, PFOS, PFHxS, and PFHxA in groundwater that will be returned to the affected aquifer via infiltration galleries. See Table 4. PFBS will be below the EGLE-identified “to be considered” discharge criterion of 250 ppt prior to being discharged to the infiltration galleries; the TBC discharge criterion is more stringent than Rule 299.44’s criteria for PFBS. However, the Rule 299.44 cleanup criteria are not “legal thresholds” or triggers for determining when actions are needed under CERCLA. DoD agencies like USAF are required to conduct human health and ecological risk assessments to determine whether unacceptable risk exists. For risk assessments in remedial investigations, the DoD uses approved Environmental Protection Agency risk screening criteria to determine whether a contaminant presents an unacceptable risk to human health or the environment. These RSLs are being used in the WAFB RI. On the other hand, the process for determining whether immediate action is needed to address PFAS in drinking water sources is different. For several years, the DoD threshold for determining whether PFAS in a drinking water source presents an imminent and substantial danger to human health has been levels of 70 ppt of PFOS, PFOA or PFOS + PFOA combined. See, e.g., “Department of Defense Guidance on Using State Per- and Polyfluoroalkyl Substances Drinking Water Standards in Comprehensive Environmental Response, Compensation, and Liability Act Removal Actions,” 22 Dec 2021.

Comment 15: 2) Page 3/27, last PP; The AF proposes to use infiltration galleries for the disposal of treated groundwater that is extracted during the remedy. Horizontal ‘septic-type’ galleries will move the PFAS contamination that exists downgradient from the infiltration points. A much better choice would be to have vertical injection wells installed downgradient and between the extraction wells to swiftly create a situation downgradient of the extraction transect that is clean, and should remain clean if the AAA IRA’s treatment system is operating properly.

Response: The efficacy of infiltration galleries has been demonstrated at the former WAFB (e.g., FT002 and Landfills 030/031). The permeable sand and gravel in the aquifer have a low horizontal to vertical hydraulic anisotropy ratio (the difference between the horizontal and vertical hydraulic conductivity), allowing the increase in the groundwater level at the point of recharge at the water table from an infiltration gallery to equilibrate horizontally and vertically with relatively little mounding. Model predicted water levels for the potentiometric surface at the infiltration galleries are 20 ft below grade.

Comment 16: PP 5; The AF mentions “protection of public health or welfare” as the justification for the IRA, but never mentions the environment that they have contaminated.

Response: Effective 8 July 2024, PFOS and PFOA (including their structural salts and isomers) became listed CERCLA hazardous substances (40 Code of Federal Regulations [CFR] Section 302.4, Table 302.4). All other PFAS are CERCLA pollutants and contaminants per 42 U.S. Code Section 9601. Pursuant to CERCLA §104(a)(1), response actions for pollutants or contaminants are only allowed when a release or substantial threat of a release “may present an imminent and substantial danger to the public health or welfare.” When PFOS and PFOA became CERCLA hazardous substances under the recently promulgated EPA rule, the requirement for remedial action became the same as it is for all other CERCLA hazardous substances: Is there an unacceptable risk to human health or the environment. The WAFB RI is assessing risks to human health and the environment.

Comment 17: 4) Page 10/27, RH col. PP 3; The AF states that “Treated groundwater would be discharged to a series of infiltration galleries installed approximately 200 ft east and hydraulically downgradient of the extraction wells.” The AF should look at vertical injection wells as mentioned in comment 2.

Response: Please see response to Comment No. 15.

Comment 18: 5) Page 12/27, RH col. PP 1; The AF states that they are pumping more water in Alternative 3 than Alternative 2, and over a narrower expanse of PFAS plume. Since the plume is wider in Alternative 2 (as depicted), why isn't the AF pumping much more water in Alternative 2 than is proposed?

Response: The target capture zone for Alternatives 2 and 3 is the same, and both alternatives will capture the same width of plume as it crosses the extraction well field. Lower pumping rates are required for Alternative 2 because the effect of infiltration galleries located downgradient of the extraction wells is to decrease the hydraulic gradient through the extraction well field. The decrease in hydraulic gradient in turn decreases the groundwater flux, and therefore, decreases extraction well pumping rates needed to maintain hydraulic control.

Comment 19: 6) Page 13/27, Figure 7; The spacing of the extraction wells for Alternative 3 is closer together than the well spacing for Alternative 2. Why? Additionally, the line of extraction wells is not perpendicular to the groundwater flow direction. Why?

Response: Because lower extraction rates are required for Alternative 2 than would be required for Alternatives 3 (no infiltration galleries) and 4 (no infiltration galleries), the extraction wells for Alternative 2 can be spaced further apart. The orientation of the four southernmost extraction wells is perpendicular to the interpreted un-stressed groundwater flow direction. The most northerly extraction well and piping are shown slightly offset from the extraction well array to avoid existing underground utilities.

Comment 20: 7) Page 19/27, LH col. PP 1; The AF highlights their “successful implementation” of hydraulic control of the groundwater at the FT-2 fire training area, but this is not a true statement. The FT-2 pump and treatment (P&T) system does not fully capture the FT-2 PFAS plume – by design, as the AF stated that this IRA was designed to remove some of the PFAS migrating to Clark's Marsh and the AuSable River, and not to stop the plume migration. For all the work they have done over the last 6 years, they have merely slowed down the discharge of the plume's PFAS mass to Clark's Marsh as evidenced by continued groundwater discharge in the historic plume discharge seepage areas along 100m of the marsh edge. This is very evident in the multiple seepage locations immediately downgradient of the newest extraction wells. If this continued seepage is at historic PFAS concentrations, this operating IRA does not comply with Mr. Owens' (DoD) directive for IRA's to prevent off-base migration of PFAS. This system should be upgraded to meet the current DoD specifications for hydraulic control of PFAS plumes from military facilities and should be upgraded to fully capture the FT-2 and OT-16 plumes in their entirety.

Response: The FT002 PTS, since its inception in 2015, has successfully reduced concentrations in areas downgradient of the capture zone by approximately an order of magnitude below historic levels. However, it should be realized that PFAS levels that are downgradient of the capture zones will still move towards Clark's Marsh and detections will continue for some time as desorption and diffusion of PFAS are released from the aquifer matrix at gradually declining rates.

Comment 21: 8) Page 20/27, RH col., PP 2; The AF states that “Alternative 4 would be the least implementable because of the additional inspection and analysis necessary to determine the condition of the storm sewer system.” It doesn’t seem like a routine maintenance task such as this would make Alternative 4 the least implementable.

Response: Implementability is not limited to the inspection and analysis of the condition of the storm sewer system as the commenter suggests. In addition to inspection of the storm sewer, if the inspection revealed that the existing storm sewer piping is in disrepair and subjected to groundwater infiltration, repair would be required. As part of the PFAS remedial investigation, and subsequent to public comment on the proposed plan, a video inspection of a portion of the storm sewer was completed. This inspection revealed that the storm sewer was subject to groundwater infiltration, and repair of sections of the storm sewer would be needed if Alternative 4 were selected. The time frame for the repair of the storm sewer is unknown but would undoubtedly cause significant delays in the implementation of Alternative 4.

Comment 22: *In my opinion, the BRAC Environmental team at Wurtsmith are not unreasonable people, nor incompetent. My only conclusion is that either they or their superiors have incorporated costs savings into the design of this AAA IRA in lieu of protecting human/environmental health, and are willing to continue to impose harm on Van Ettan Lake homeowners, Oscoda/Au Sable residents and visitors, and all other persons that unwittingly are exposed to the contamination released by the Air Force—the class of entities and ecosystem for which CERCLA mandates protection.*

Indeed, moreover, under CERCLA, cost is irrelevant with respect to eliminating harm or the threat of harm to human health and the environment. But even taking cost into consideration, I estimate that the capital and installation costs for one extraction well and its associated infrastructure for this AAA IRA is \$66,000. I also estimate that the Air Force would have to install—beyond the five wells in the Proposed Plan—an additional 15 extraction wells and associated infrastructure. From my correlation, adding 15 wells and associated infrastructure would, accordingly, cost \$990,000. Let’s call it \$1M.

As such, as compared to the \$6,467,115 estimated capital costs for Alternative 2 of the Proposed Plan, adding \$1M to that cost represents just 4.2% of the estimated 30-year time frame present worth of \$23,690,494 and provides considerable value added to the remedy.

Accordingly, for a mere 4.2% increase in lifetime costs, the Air Force can eliminate all PFAS from entering Van Ettan Lake (and the environment in general) along this portion of the base boundary, and not have to add any more costs with respect to this plume when it comes to design the final remedy.

Response: The selected interim remedy will protect human health and the environment through containment and treatment. The hydraulic control system will prevent the highest concentrations of PFAS from migrating towards Van Ettan Lake from the Alert Aircraft Area at Swise Road plume and is protective of human health. The selected interim remedy does not pose short-term risks or cross-media impacts. CERCLA human health and ecological risk assessments have not been completed at the former WAFB related to potential PFAS exposures. The RI is evaluating exposure pathways and potential PFAS receptors.

The USAF disagrees with the commentator’s statement that “under CERCLA, cost is irrelevant with respect to eliminating harm or the threat of harm to human health and the environment”. The NCP 40 CFR section 300.430(e)(9)(iii) identifies nine criteria that are required to be used to evaluate the remedial alternatives

for the selection of the preferred remedy. Cost is one of the nine criteria, and cost-effectiveness is a critical factor in this process. Both CERCLA 121, (42 U.S.C §9621) and the NCP (§300.430(f)(1)(ii)(D)) require that every remedy selected must be cost-effective.

The commentor greatly underestimates the costs associated with expanding the IRA as the commentor proposes. Adding 15 extraction wells would add approximately 675 gpm (15 extraction wells) to the proposed 235 gpm (5 extraction wells) for a total 910 gpm of extracted groundwater entering the treatment system building. A flow rate of 910 gpm exceeds the maximum design flow rate of 500 gpm for the proposed 3-vessel GAC treatment system and would require the installation of a second 3-vessel GAC treatment system to provide adequate contact time for PFAS adsorption. In addition, the mechanical and electrical infrastructure inside and outside of the treatment system building would need to be expanded to accommodate flow from 15 additional extraction wells, to operate and control the associated extraction well pumps and instrumentation (i.e., flow and water level indicating transmitters), and to monitor and control the additional treatment system process (i.e., flow rate, tank levels, and interlocks). Additional infiltration galleries and associated underground piping would need to be installed to manage the return of 675 additional gallons of treated groundwater back into the affected aquifer. Additional performance monitoring wells would need to be installed and routinely sampled to monitor performance of the hydraulic control system. The capital cost for installing two 3-vessel GAC treatment systems including equipment, instrumentation, electrical and mechanical infrastructure, and additional infiltration galleries, extraction wells, and performance monitoring wells would increase capital costs from \$6,467,114.84 to \$20,915,449.82; that would be an increase of approximately 223%. The yearly operation and maintenance and monitoring costs of two GAC treatment systems and monitoring of additional performance monitoring wells would increase from \$833,903.60 to \$1,856,640.00; that would be an increase of approximately 123%. The total present worth over 30 years of operation would increase from \$23,690,494 to \$59,262,345; that would be an increase of approximately 150%.

Comment 23: *To me, the worst problem with the plan, as presented, is that both the extraction wells and infiltration wells are well within the boundaries of the former base while the PFAS plume extends well beyond those boundaries. For a remedial action to be effective, it should address the full extent of the area affected by these pollutants, rather than merely the area where it has not escaped the former base boundaries.*

1. The extraction wells should be located as closely as possible to the area where the pollution stream enters the surface body water, rather than being located significantly upstream of the underwater flow direction from a major part of the plume.

2. The infiltration galleries are also located inside the former base boundaries so well before an area where PFOS concentrations are in the 1000-10,000 range based on the presentation depiction. This will not abate the flow of those contaminants, perhaps even expediting the flow of PFAS currently downstream from the extraction zone into Van Etten Lake.

Why filter water to clean it, then ensure that it again becomes contaminated before it enters the lake? Alternative solution #3 or #4 would be preferable, since they wouldn't speed the spread of PFAS chemicals which are beyond the planned extraction zone. If infiltration galleries are desired, placing them upstream of the known plume could speed the eventual cleanup with a flushing effect.

Response: The USAF assumes that the commentor is referring to the range of PFOS concentrations (1,000 – 10,000 ng/L) shown on Figure 2 of the proposed plan. Figure 2 was intended to be illustrative in nature and did not include the data points and PFOS analytical results used to create the plume. Please see Figure 3 in the Final Interim ROD which now includes the data points and analytical results used to generate the PFOS plume. The USAF disagrees that “*the infiltration galleries are also located inside the former base boundaries so well before an area where PFOS concentrations are in the 1000-10,000 range*”. As shown on Figure 3, the highest concentrations of PFOS in the Alert Aircraft Area plume (4,320 and 7,010 ng/L) are located upgradient of the extraction wells and infiltration galleries. Also, please note that these PFOS concentrations are based upon VAS data (see USAF response to Summary Comment No.1) which have shown in some instances to over report the concentration of PFAS in groundwater. The highest concentration of PFOS downgradient of the infiltration galleries is from a VAS (2,370 ng/L) co-located with a monitoring well (2,010 ng/L) location along Highway F-41 approximately 175 feet east of the infiltration galleries. PFOS concentrations down gradient of this location drop rapidly towards Van Etten Lake.

Regarding the comment that “*the extraction wells should be located as closely as possible to the area where the pollution stream enters the surface body water, rather than being located significantly upstream of the underwater flow direction from a major part of the plume,*” implementability is one of the nine criteria against which remedial alternatives must be evaluated. See 40 CFR section 300.430(e)(9)(iii). The USAF believes that installing the extraction wells and infiltration galleries on the former WAFB property can be implemented in a timelier fashion than installing the extraction wells on private property. Figure 7 of the Final Interim ROD shows the proposed layout of the selected alternative. In addition to the extraction wells and infiltration galleries, existing and proposed monitoring wells/piezometers will be required to monitor the hydraulic effectiveness of the IRA. As shown on Figure 7, the USAF does not believe there is sufficient space on the private properties located east of the Alert Aircraft Area to install the IRA infrastructure (e.g., extraction wells and infiltration galleries) and required performance monitoring wells.

When the federal government transferred former WAFB property as part of the base closure process, the government reserved the right to conduct response actions in the deeds which transferred the property. If the USAF were to seek access to private property it never owned to install the IRA infrastructure, the USAF anticipates that the negotiation and execution of the necessary documents could significantly delay the construction of the IRA. The USAF will still need to negotiate agreements with private property owners to install monitoring wells/piezometers on private property, but the USAF does not anticipate significant property owner objections to those relatively minor intrusions. However, the USAF anticipates that the installation of remediation infrastructure on private properties east of the Alert Aircraft Area would not be acceptable to the individual property owners. Installation of the extraction well infrastructure will likely require tree removal and the use of heavy equipment such as rotasonic drill rigs, excavators, and directional drilling equipment and would likely be disruptive to the property owners. Each extraction well would be completed aboveground and outfitted with protective bollards, stanchions with electrical disconnect boxes, and underground vaults with access doors.

The commentor’s suggestion that the infiltration galleries could be placed “upstream of the known plume” to “speed the eventual cleanup with a flushing effect” is not a cost-effective alternative. This would include installation of many thousands of feet of pipeline and pumps to move the treated groundwater upgradient; that would increase the costs of the IRA and would also increase the construction time frame. The infiltration galleries are located in close proximity to the extraction wells to assist in the hydraulic control of the PFAS plume by flattening the groundwater gradient and allowing the extraction wells to operate at

lower pumping rates while still maintaining hydraulic control of the plume. If the spacing between the infiltration galleries and extraction wells is increased, this would require increased pumping rates and potentially additional extraction wells would need to be installed to hydraulically control the plume.

Comment 24: *My question during the meeting was, will the Air Force consider any of the other Alternatives even though they support #2 already? I ask this because in the presentation it showed that #3 covered more area, cost relatively the same amount, and only took an extra month to make. I also would like to ask why both high density areas of PFAS are not getting attention at the same time if it will be more cost effective?*

Response: The target capture zone for Alternatives 2 and 3 is the same and both alternatives will capture the same width of plume as it crosses the well field. Lower pumping rates are required for Alternative 2 because the effect of infiltration galleries located downgradient of the extraction wells is to decrease the hydraulic gradient through the well field. The decrease in hydraulic gradient in turn decreases the groundwater flux, and therefore, decreases extraction well rates needed to maintain hydraulic control.

The USAF acknowledges that the IRA does not address all the PFAS plumes migrating towards Van Etten Lake from the Alert Aircraft Area. The proposed treatment system design includes “blank” lines as a contingency and the treatment system building is designed to accommodate an additional GAC system. If upon completion of the RI, the data indicates the need for additional extraction well(s) and treatment capacity, the additional well(s) and additional treatment capacity can be added in a subsequent decision document.

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TABLES

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Table 1a. Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries - Capital Costs

Alert Aircraft Apron Interim Remedial Action											
Alternative 2. Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries											
Capital Costs											
Item	Quantity	Unit	Subcontract	Labor	Material	Extended Costs				Subtotal Direct Costs	Comments
						Subcontract	Labor	Material	Equipment		
Labor											
Construction & Technical Oversight (Labor)	1	Lump Sum		\$ 623,159.00						\$ 623,159.00	Aerostar
Subcontractors											
Engineering Design	1	Lump Sum	\$ 247,550.00			\$ 247,550.00				\$ 247,550.00	Wood
Surveying	1	Lump Sum	\$ 50,120.00			\$ 50,120.00				\$ 50,120.00	Rigg
Geotechnical	1	Lump Sum	\$ 13,800.00			\$ 13,800.00				\$ 13,800.00	PSI
Utility Locates	1	Lump Sum	\$ 46,400.00			\$ 46,400.00				\$ 46,400.00	GPRS
6" Extraction Well Installation (5 Wells with Stainless Steel Screens) and Performance Monitoring Wells	1	Lump Sum	\$ 590,895.00			\$ 590,895.00				\$ 590,895.00	Cascade
Below Ground Mechanical (Piping, Cleanouts, Air Vents, and Infiltration Galleries)	1	Lump Sum	\$ 522,881.74			\$ 522,881.74				\$ 522,881.74	Freedom
Aboveground Mechanical (Piping, HVAC, and Process Equipment Installation and Materials), Testing and Onsite Support	1	Lump Sum	\$ 606,610.00			\$ 606,610.00				\$ 606,610.00	Goyette
Electrical	1	Lump Sum	\$ 361,650.00			\$ 361,650.00				\$ 361,650.00	Goyette
Pump Skids (Pumps, Motor Starters, Valves, and VFDs)	1	Lump Sum	\$ 230,900.00			\$ 230,900.00				\$ 230,900.00	Anguil
Controls	1	Lump Sum	\$ 256,705.00			\$ 256,705.00				\$ 256,705.00	Waste2Water
GAC Vessels with Carbon (3 Vessels)	1	Lump Sum	\$ 521,154.00			\$ 521,154.00				\$ 521,154.00	Calgon
Building Construction	1	Lump Sum	\$ 326,328.00			\$ 326,328.00				\$ 326,328.00	JBS Contracting
Concrete	1	Lump Sum	\$ 681,000.00			\$ 681,000.00				\$ 681,000.00	RCL
Waste Management	1	Lump Sum	\$ 20,786.00			\$ 20,786.00				\$ 20,786.00	US Ecology
Total Labor & Subs						\$ 4,476,779.74	\$ 623,159.00			\$ 5,099,938.74	
ODCs											
Equalization, Backwash, and Effluent Tanks	1	Lump Sum		\$ 165,834.00				\$ 165,834.00		\$ 165,834.00	ProTanks/Belding
Extraction Well Pumps	1	Lump Sum		\$ 4,638.50				\$ 4,638.50		\$ 4,638.50	Grundfos
Transducers	1	Lump Sum		\$ 3,819.75				\$ 3,819.75		\$ 3,819.75	Dwyer
Miscellaneous ODCs	1	Lump Sum		\$ 141,333.52				\$ 141,333.52		\$ 141,333.52	Various
Total ODCs								\$ 315,625.77		\$ 315,625.77	
		Overhead on Labor 20%						\$ 124,631.80		\$ 124,631.80	
		G&A on Subs and ODCs 10%				\$ 479,240.55				\$ 479,240.55	
		Profit on Subs 10%				\$ 447,677.97				\$ 447,677.97	
Total Direct Costs										\$ 6,467,114.84	

Table 1b. Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries - Operation, Maintenance & Monitoring Costs (1 Year)

Alert Aircraft Area Interim Remedial Action Alternative 2. Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries Operation & Maintenance and Monitoring Costs (Year 1)												
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments
							Subcontract	Labor	Material	Equipment		
Labor												
O&M and Monitoring Oversight	1	Lump Sum		\$ 384,856.00							\$ 384,856.00	Aerostar
Subcontractors												
Laboratory (Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00				\$ 174,395.00				\$ 174,395.00	ALS
GAC Changeout	1	Lump Sum	\$ 39,400.00				\$ 39,400.00				\$ 39,400.00	Calgon
Waste Management Sampling	1	Lump Sum	\$ 4,330.00				\$ 4,330.00				\$ 4,330.00	
Total Labor & Subs							\$ 218,125.00	\$ 384,856.00			\$ 602,981.00	
ODCs												
ODCs 1 Year Operation	1	Lump Sum		\$ 65,309.82					\$ 65,309.82		\$ 65,309.82	Various
Total ODCs									\$ 65,309.82		\$ 65,309.82	
		Overhead on Labor 20%						\$ 76,971.20			\$ 76,971.20	
		G&A on Subs and ODCs 10%					\$ 66,829.08				\$ 66,829.08	
		Profit on Subs 10%					\$ 21,812.50				\$ 21,812.50	
Total Direct Costs											\$ 833,903.60	

Table 1c. Alternative 2: Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries - Operation, Maintenance & Monitoring Costs (Year 2-30)

Alert Aircraft Area Interim Remedial Action												
Alternative 2. Hydraulic Control Using Pump and Treat with GAC - Discharge to Infiltration Galleries												
Operation & Maintenance and Monitoring Costs (Year 2-30)												
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments
							Subcontract	Labor	Material	Equipment		
Labor												
O&M and Monitoring Oversight	1	Lump Sum		\$ 384,856.00							\$ 384,856.00	Aerostar
Subcontractors												
Laboratory (Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00				\$ 174,395.00				\$ 174,395.00	ALS
Laboratory (Waste Characterization Sampling)	1	Lump Sum	\$ 4,330.00				\$ 4,330.00				\$ 4,330.00	
GAC Changeout (Estimated 1 Changeout per Year)	1	Lump Sum	\$ 39,400.00				\$ 39,400.00				\$ 39,400.00	Calgon
Total Labor & Subs							\$ 218,125.00	\$ 384,856.00			\$ 602,981.00	
ODCs												
ODCs 1 Year Operation	1	Lump Sum			\$65,309.82					\$ 65,309.82	\$ 65,309.82	Estimate
Total ODCs										\$ 65,309.82	\$ 65,309.82	
		Overhead on Labor 20%						\$ 76,971.20			\$ 76,971.20	
		G&A on Subs and ODCs 10%					\$ 66,829.08				\$ 66,829.08	
		Profit on Subs 10%					\$ 21,812.50				\$ 21,812.50	
Total Direct Costs											\$ 833,903.60	

**Table 1d. Alternative 2: Hydraulic Control Using Pump and Treat with GAC
- Discharge to Infiltration Galleries - Present Worth Analysis**

Year	Present Worth Factor	Capital Costs	O&M & Monitoring Costs	Present Worth
0	1.00	\$ 6,467,114.84		\$ 6,467,114.84
1	0.975		\$ 833,903.60	\$ 812,771.54
2	0.950		\$ 833,903.60	\$ 792,174.99
3	0.926		\$ 833,903.60	\$ 772,100.38
4	0.902		\$ 833,903.60	\$ 752,534.49
5	0.880		\$ 833,903.60	\$ 733,464.41
6	0.857		\$ 833,903.60	\$ 714,877.59
7	0.836		\$ 833,903.60	\$ 696,761.79
8	0.814		\$ 833,903.60	\$ 679,105.06
9	0.794		\$ 833,903.60	\$ 661,895.77
10	0.774		\$ 833,903.60	\$ 645,122.58
11	0.754		\$ 833,903.60	\$ 628,774.44
12	0.735		\$ 833,903.60	\$ 612,840.59
13	0.716		\$ 833,903.60	\$ 597,310.51
14	0.698		\$ 833,903.60	\$ 582,173.99
15	0.680		\$ 833,903.60	\$ 567,421.04
16	0.663		\$ 833,903.60	\$ 553,041.95
17	0.646		\$ 833,903.60	\$ 539,027.24
18	0.630		\$ 833,903.60	\$ 525,367.68
19	0.614		\$ 833,903.60	\$ 512,054.27
20	0.598		\$ 833,903.60	\$ 499,078.24
21	0.583		\$ 833,903.60	\$ 486,431.03
22	0.569		\$ 833,903.60	\$ 474,104.32
23	0.554		\$ 833,903.60	\$ 462,089.98
24	0.540		\$ 833,903.60	\$ 450,380.10
25	0.526		\$ 833,903.60	\$ 438,966.96
26	0.513		\$ 833,903.60	\$ 427,843.04
27	0.500		\$ 833,903.60	\$ 417,001.01
28	0.487		\$ 833,903.60	\$ 406,433.73
29	0.475		\$ 833,903.60	\$ 396,134.24
30	0.463		\$ 833,903.60	\$ 386,095.75
Total Present Worth of Alternative 2				\$ 23,690,494
Average O&M Costs Over 30 Years			\$ 833,903.60	

Discount Rate of 2.6% for 30-Year per OMB Circular No. A-94, valid for calendar year 2022.

Table 2a. Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake - Capital Costs

Alert Aircraft Area Interim Remedial Action											
Alternative 3. Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake											
Capital Costs											
Item	Quantity	Unit	Subcontract	Labor	Material	Extended Costs				Subtotal Direct Costs	Comments
						Subcontract	Labor	Material	Equipment		
Labor											
Construction & Technical Oversight (Labor)	1	Lump Sum		\$ 639,792.40						\$ 639,792.40	Aerostar
Subcontractors											
Engineering Design	1	Lump Sum	\$ 247,550.00			\$ 247,550.00				\$ 247,550.00	Wood
Surveying	1	Lump Sum	\$ 50,120.00			\$ 50,120.00				\$ 50,120.00	Rigg
Geotechnical	1	Lump Sum	\$ 13,800.00			\$ 13,800.00				\$ 13,800.00	PSI
Utility Locates	1	Lump Sum	\$ 46,400.00			\$ 46,400.00				\$ 46,400.00	GPRS
6" Extraction Well Installation (5 Wells with Stainless Steel Screens) and Performance Monitoring Wells	1	Lump Sum	\$ 590,895.00			\$ 590,895.00				\$ 590,895.00	Cascade
Below Ground Mechanical (Piping, Cleanouts, Air Vents, Manholes, and Head Wall)	1	Lump Sum	\$ 793,467.11			\$ 793,467.11				\$ 793,467.11	Freedom
Aboveground Mechanical (Piping, HVAC, and Process Equipment Installation and Materials). Testing and Onsite Support	1	Lump Sum	\$ 632,548.66			\$ 632,548.66				\$ 632,548.66	Goyette
Electrical	1	Lump Sum	\$ 373,687.50			\$ 373,687.50				\$ 373,687.50	Goyette
Pump Skids (Pumps, Motor Starters, Valves, and VFDs)	1	Lump Sum	\$ 275,700.00			\$ 275,700.00				\$ 275,700.00	Anguil
Controls	1	Lump Sum	\$ 261,742.29			\$ 261,742.29				\$ 261,742.29	Waste2Water
GAC Vessels with Carbon (3 Vessels)	1	Lump Sum	\$ 521,154.00			\$ 521,154.00				\$ 521,154.00	Calgon
Building Construction	1	Lump Sum	\$ 326,328.00			\$ 326,328.00				\$ 326,328.00	JBS Contracting
Concrete	1	Lump Sum	\$ 681,000.00			\$ 681,000.00				\$ 681,000.00	RCL
Waste Management	1	Lump Sum	\$ 20,786.00			\$ 20,786.00				\$ 20,786.00	US Ecology
Total Labor & Subs						\$ 4,835,178.56	\$ 639,792.40			\$ 5,474,970.96	
ODCs											
Equalization, Backwash, and Effluent Tanks	1	Lump Sum		\$ 165,834.00				\$ 165,834.00		\$ 165,834.00	ProTanks/Belding
Extraction Well Pumps	1	Lump Sum		\$ 4,638.50				\$ 4,638.50		\$ 4,638.50	Grundfos
Transducers	1	Lump Sum		\$ 3,819.75				\$ 3,819.75		\$ 3,819.75	Dwyer
Miscellaneous ODCs	1	Lump Sum		\$ 141,333.52				\$ 141,333.52		\$ 141,333.52	Various
Total ODCs								\$ 315,625.77		\$ 315,625.77	
		Overhead on Labor 20%					\$ 127,958.48			\$ 127,958.48	
		G&A on Subs and ODCs 10%				\$ 515,080.43				\$ 515,080.43	
		Profit on Subs 10%				\$ 483,517.86				\$ 483,517.86	
Total Direct Costs										\$ 6,917,153.50	

Table 2b. Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake - Operation, Maintenance & Monitoring Costs (1 Year)

Alert Aircraft Area Interim Remedial Action												
Alternative 3. Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake												
Operation & Maintenance and Monitoring Costs (Year 1)												
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments
							Subcontract	Labor	Material	Equipment		
Labor												
O&M and Monitoring Oversight	1	Lump Sum		\$ 396,959.34							\$ 396,959.34	Aerostar
Subcontractors												
Laboratory (Weekly Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00				\$ 174,395.00				\$ 174,395.00	ALS
Laboratory (Waste Characterization Sampling)	1	Lump Sum	\$ 4,330.00				\$ 4,330.00				\$ 4,330.00	ALS
Laboratory (Outfall Sampling)	1	Lump Sum	\$ 4,284.00				\$ 4,284.00				\$ 4,284.00	ALS
GAC Changeout (Estimated 1 Changeout)	1	Lump Sum	\$ 39,400.00				\$ 39,400.00				\$ 39,400.00	Calgon
Total Labor & Subs							\$ 222,409.00	\$ 396,959.34			\$ 619,368.34	
ODCs												
ODCs 1 Year Operation	1	Lump Sum		\$ 65,309.82					\$ 65,309.82		\$ 65,309.82	Estimate
Total ODCs											\$ 65,309.82	
		Overhead on Labor 20%					\$ 79,391.87				\$ 79,391.87	
		G&A on Subs and ODCs 10%				\$ 68,467.82					\$ 68,467.82	
		Profit on Subs 10%				\$ 22,240.90					\$ 22,240.90	
Total Direct Costs											\$ 854,778.74	

Table 2c. Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake- Operation, Maintenance & Monitoring Costs (Year 2-30)

Alert Aircraft Area Interim Remedial Action												
Alternative 3. Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake												
Operation & Maintenance and Monitoring Costs (Year 2-30)												
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments
							Subcontract	Labor	Material	Equipment		
Labor												
O&M and Monitoring Oversight	1	Lump Sum		\$ 396,959.34							\$ 396,959.34	Aerostar
Subcontractors												
Laboratory (Weekly Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00					\$ 174,395.00			\$ 174,395.00	ALS
Laboratory (Waste Characterization Sampling)	1	Lump Sum	\$ 4,330.00					\$ 4,330.00			\$ 4,330.00	ALS
Laboratory (Outfall Sampling)	1	Lump Sum	\$ 4,284.00					\$ 4,284.00			\$ 4,284.00	ALS
GAC Changeout (Estimated 1 Changeout per Year)	1	Lump Sum	\$ 39,400.00					\$ 39,400.00			\$ 39,400.00	Calgon
Total Labor & Subs								\$ 222,409.00	\$ 396,959.34		\$ 619,368.34	
ODCs												
ODCs 1 Year Operation	1	Lump Sum		\$65,309.82						\$ 65,309.82	\$ 65,309.82	Various
Total ODCs										\$ 65,309.82	\$ 65,309.82	
		Overhead on Labor 20%							\$ 79,391.87		\$ 79,391.87	
		G&A on Subs and ODCs 10%						\$ 68,467.82			\$ 68,467.82	
		Profit on Subs 10%						\$ 22,240.90			\$ 22,240.90	
Total Direct Costs											\$ 854,778.74	

Table 2d. Alternative 3: Hydraulic Control Using Pump and Treat with GAC - Discharge to Van Etten Lake - Present Worth Analysis

Year	Present Worth Factor	Capital Costs	O&M & Monitoring Costs	Present Worth
0	1.00	\$ 6,917,153.50		\$ 6,917,153.50
1	0.975		\$ 854,778.74	\$ 833,117.68
2	0.950		\$ 854,778.74	\$ 812,005.54
3	0.926		\$ 854,778.74	\$ 791,428.40
4	0.902		\$ 854,778.74	\$ 771,372.71
5	0.880		\$ 854,778.74	\$ 751,825.25
6	0.857		\$ 854,778.74	\$ 732,773.15
7	0.836		\$ 854,778.74	\$ 714,203.85
8	0.814		\$ 854,778.74	\$ 696,105.12
9	0.794		\$ 854,778.74	\$ 678,465.03
10	0.774		\$ 854,778.74	\$ 661,271.96
11	0.754		\$ 854,778.74	\$ 644,514.58
12	0.735		\$ 854,778.74	\$ 628,181.85
13	0.716		\$ 854,778.74	\$ 612,263.01
14	0.698		\$ 854,778.74	\$ 596,747.58
15	0.680		\$ 854,778.74	\$ 581,625.32
16	0.663		\$ 854,778.74	\$ 566,886.27
17	0.646		\$ 854,778.74	\$ 552,520.73
18	0.630		\$ 854,778.74	\$ 538,519.23
19	0.614		\$ 854,778.74	\$ 524,872.55
20	0.598		\$ 854,778.74	\$ 511,571.68
21	0.583		\$ 854,778.74	\$ 498,607.88
22	0.569		\$ 854,778.74	\$ 485,972.59
23	0.554		\$ 854,778.74	\$ 473,657.50
24	0.540		\$ 854,778.74	\$ 461,654.48
25	0.526		\$ 854,778.74	\$ 449,955.63
26	0.513		\$ 854,778.74	\$ 438,553.25
27	0.500		\$ 854,778.74	\$ 427,439.81
28	0.487		\$ 854,778.74	\$ 416,608.01
29	0.475		\$ 854,778.74	\$ 406,050.69
30	0.463		\$ 854,778.74	\$ 395,760.91
Total Present Worth of Alternative 2				\$ 24,571,686
Average O&M Costs Over 30 Years			\$ 854,779	

Discount Rate of 2.6% for 30-Year per OMB Circular No. A-94, valid for calendar year 2022.

Table 3a. Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System- Capital Costs

Alert Aircraft Area Interim Remedial Action											
Alternative 4. Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System											
Capital Costs											
Item	Quantity	Unit	Subcontract	Labor	Material	Extended Costs				Subtotal Direct Costs	Comments
						Subcontract	Labor	Material	Equipment		
Labor											
Construction & Technical Oversight (Labor)	1	Lump Sum		\$ 649,605.60						\$ 649,605.60	Aerostar
Subcontractors											
Engineering Design	1	Lump Sum	\$ 247,550.00			\$ 247,550.00				\$ 247,550.00	Wood
Surveying	1	Lump Sum	\$ 50,120.00			\$ 50,120.00				\$ 50,120.00	Rigg
Geotechnical	1	Lump Sum	\$ 13,800.00			\$ 13,800.00				\$ 13,800.00	PSI
Utility Locates	1	Lump Sum	\$ 46,400.00			\$ 46,400.00				\$ 46,400.00	GPRS
6" Extraction Well Installation (5 Wells with Stainless Steel Screens) and Performance Monitoring Wells	1	Lump Sum	\$ 590,895.00			\$ 590,895.00				\$ 590,895.00	Cascade
Below Ground Mechanical (Piping, Cleanouts, Air Vents, and Manholes)	1	Lump Sum	\$ 690,072.69			\$ 690,072.69				\$ 690,072.69	Freedom
Aboveground Mechanical (Piping, HVAC, and Process Equipment Installation and Materials). Testing and Onsite Support	1	Lump Sum	\$ 632,548.66			\$ 632,548.66				\$ 632,548.66	Goyette
Electrical	1	Lump Sum	\$ 373,687.50			\$ 373,687.50				\$ 373,687.50	Goyette
Pump Skids (Pumps, Motor Starters, Valves, and VFDs)	1	Lump Sum	\$ 275,700.00			\$ 275,700.00				\$ 275,700.00	Anguil
Controls	1	Lump Sum	\$ 261,742.29			\$ 261,742.29				\$ 261,742.29	Waste2Water
GAC Vessels with Carbon (3 Vessels)	1	Lump Sum	\$ 521,154.00			\$ 521,154.00				\$ 521,154.00	Calgon
Building Construction	1	Lump Sum	\$ 326,328.00			\$ 326,328.00				\$ 326,328.00	JBS Contracting
Concrete	1	Lump Sum	\$ 681,000.00			\$ 681,000.00				\$ 681,000.00	RCL
Waste Management	1	Lump Sum	\$ 20,786.00			\$ 20,786.00				\$ 20,786.00	US Ecology
Storm Sewer Survey	1	Lump Sum	\$ 60,060.00			\$ 60,060.00				\$ 60,060.00	Estimated
Total Labor & Subs						\$ 4,791,844.14	\$ 649,605.60			\$ 5,441,449.74	
ODCs											
Equalization, Backwash, and Effluent Tanks	1	Lump Sum		\$ 165,834.00				\$ 165,834.00		\$ 165,834.00	ProTanks/Belding
Extraction Well Pumps	1	Lump Sum		\$ 4,638.50				\$ 4,638.50		\$ 4,638.50	Grundfos
Transducers	1	Lump Sum		\$ 3,819.75				\$ 3,819.75		\$ 3,819.75	Dwyer
Miscellaneous ODCs	1	Lump Sum		\$ 141,333.52				\$ 141,333.52		\$ 141,333.52	Various
Total ODCs								\$ 315,625.77		\$ 315,625.77	
		Overhead on Labor 20%					\$ 129,921.12			\$ 129,921.12	
		G&A on Subs and ODCs 10%				\$ 510,746.99				\$ 510,746.99	
		Profit on Subs 10%				\$ 479,184.41				\$ 479,184.41	
Total Direct Costs										\$ 6,876,928.04	

Table 3b. Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System - Operation, Maintenance & Monitoring Costs (1 Year)

Alert Aircraft Area Interim Remedial Action													
Alternative 4. Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System													
Operation & Maintenance and Monitoring Costs (Year 1)													
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments	
							Subcontract	Labor	Material	Equipment			
Labor													
O&M and Monitoring Oversight	1	Lump Sum		\$ 409,062.68						\$ 409,062.68		Aerostar	
Subcontractors													
Laboratory (Weekly Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00							\$ 174,395.00		ALS	
Laboratory (Waste Characterization Sampling)	1	Lump Sum	\$ 4,330.00							\$ 4,330.00		ALS	
Laboratory (Outfall Sampling)	1	Lump Sum	\$ 4,284.00							\$ 4,284.00		ALS	
GAC Changeout (Estimated 1 Changeout)	1	Lump Sum	\$ 39,400.00							\$ 39,400.00		Calgon	
Total Labor & Subs										\$ 222,409.00	\$ 409,062.68	\$ 631,471.68	
ODCs													
ODCs 1 Year Operation	1	Lump Sum			\$ 65,309.82					\$ 65,309.82		Estimate	
Total ODCs										\$ 65,309.82		\$ 65,309.82	
		Overhead on Labor 20%						\$ 81,812.54	0			\$ 81,812.54	
		G&A on Subs and ODCs 10%					\$ 69,678.15					\$ 69,678.15	
		Profit on Subs 10%					\$ 22,240.90					\$ 22,240.90	
Total Direct Costs												\$ 870,513.09	

Table 3c. Alternative 4: Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System- Operation, Maintenance & Monitoring Costs (Year 2-30)

Alert Aircraft Area Interim Remedial Action												
Alternative 4. Hydraulic Control Using Pump and Treat with GAC - Discharge to Storm Sewer System												
Operation & Maintenance and Monitoring Costs (Year 2-30)												
Item	Quantity	Unit	Subcontract	Labor	Material	Equipment	Extended Costs				Subtotal Direct Costs	Comments
							Subcontract	Labor	Material	Equipment		
Labor												
O&M and Monitoring Oversight	1	Lump Sum		\$ 409,062.68							\$ 409,062.68	Aerostar
Subcontractors												
Laboratory (Weekly Treatment System Sampling and Performance Monitoring Well Sampling)	1	Lump Sum	\$ 174,395.00					\$ 174,395.00			\$ 174,395.00	ALS
Laboratory (Waste Characterization Sampling)	1	Lump Sum	\$ 4,330.00					\$ 4,330.00			\$ 4,330.00	ALS
Laboratory (Outfall Sampling)	1	Lump Sum	\$ 4,284.00					\$ 4,284.00			\$ 4,284.00	
GAC Changeout (Estimated 1 Changeout per Year)	1	Lump Sum	\$ 39,400.00					\$ 39,400.00			\$ 39,400.00	Calgon
Total Labor & Subs								\$ 222,409.00	\$ 409,062.68		\$ 631,471.68	
ODCs												
ODCs 1 Year Operation	1	Lump Sum		\$65,309.82						\$ 65,309.82	\$ 65,309.82	Estimate
Total ODCs										\$ 65,309.82	\$ 65,309.82	
		Overhead on Labor 20%						\$ 81,812.54			\$ 81,812.54	
		G&A on Subs and ODCs 10%					\$ 69,678.15				\$ 69,678.15	
		Profit on Subs 10%					\$ 22,240.90				\$ 22,240.90	
Total Direct Costs											\$ 870,513.09	

Table 3d. Alternative 4: Hydraulic Control Using Pump and Treat with GAC and Discharge to Storm Sewer System - Present Worth Analysis

Year	Present Worth Factor	Capital Costs	O&M & Monitoring Costs	Present Worth
0	1.00	\$ 6,876,928.04		\$ 6,876,928.04
1	0.975		\$ 870,513.09	\$ 848,453.30
2	0.950		\$ 870,513.09	\$ 826,952.53
3	0.926		\$ 870,513.09	\$ 805,996.62
4	0.902		\$ 870,513.09	\$ 785,571.76
5	0.880		\$ 870,513.09	\$ 765,664.48
6	0.857		\$ 870,513.09	\$ 746,261.68
7	0.836		\$ 870,513.09	\$ 727,350.56
8	0.814		\$ 870,513.09	\$ 708,918.68
9	0.794		\$ 870,513.09	\$ 690,953.88
10	0.774		\$ 870,513.09	\$ 673,444.32
11	0.754		\$ 870,513.09	\$ 656,378.48
12	0.735		\$ 870,513.09	\$ 639,745.11
13	0.716		\$ 870,513.09	\$ 623,533.25
14	0.698		\$ 870,513.09	\$ 607,732.21
15	0.680		\$ 870,513.09	\$ 592,331.59
16	0.663		\$ 870,513.09	\$ 577,321.23
17	0.646		\$ 870,513.09	\$ 562,691.26
18	0.630		\$ 870,513.09	\$ 548,432.03
19	0.614		\$ 870,513.09	\$ 534,534.14
20	0.598		\$ 870,513.09	\$ 520,988.44
21	0.583		\$ 870,513.09	\$ 507,786.01
22	0.569		\$ 870,513.09	\$ 494,918.13
23	0.554		\$ 870,513.09	\$ 482,376.35
24	0.540		\$ 870,513.09	\$ 470,152.39
25	0.526		\$ 870,513.09	\$ 458,238.19
26	0.513		\$ 870,513.09	\$ 446,625.92
27	0.500		\$ 870,513.09	\$ 435,307.91
28	0.487		\$ 870,513.09	\$ 424,276.72
29	0.475		\$ 870,513.09	\$ 413,525.07
30	0.463		\$ 870,513.09	\$ 403,045.88
Total Present Worth of Alternative 2				\$ 24,856,436
Average O&M Costs Over 30 Years			\$ 870,513.09	

Discount Rate of 2.6% for 30-Year per OMB Circular No. A-94, valid for calendar year 2022.

Table 4. List of Applicable or Relevant and Appropriate Requirements

Regulation ¹	ARAR Status	Requirement	Analysis
Federal ARARs			
Endangered Species Act and its implementing regulations: 16 USC § 1536(a), 16 USC § 1538(a)(1)(B) and (a)(2)(B), 16 USC §1539(a)(1)(B) and (a)(2)(A). 50 CFR § 402.13.	Applicable	Requires protection of federally threatened and endangered wildlife or plant species and their habitats. If a federal action might affect a listed species or critical habitat, the federal agency must consult with the U.S. Fish & Wildlife Service. ESA prohibits the take of any such wildlife species or the removal of any such plant species.	The Air Force conducted informal consultation with the U.S. Fish & Wildlife Service pursuant to 50 CFR §402.13. The federally endangered eastern massasauga rattlesnake habitat is present in IRA work areas. The Air Force will take mitigative measures to avoid adversely affecting the endangered species. Operations will not destroy nests or habitats.
State ARARS			
NREPA, Part 55 - Air Pollution Control Mich. Admin. Code, Rule R. 336.1372(8)(b)	Chemical Specific <input type="checkbox"/> Action Specific <input checked="" type="checkbox"/> Relevant and Appropriate Location Specific <input type="checkbox"/>	Prohibits operation of a source that emits air pollutants that are or can become injurious to human health or welfare, to animal life, to plant life, or to property, or that interfere with the enjoyment of life and property unless authorized under the statute and rules. Rules prohibit the emission of fugitive dust from certain construction, renovation, or demolition activities in quantities which cause injurious effects to human health, animal life, plant life, or significant economic value, and/or property. Establishes common measures to mitigate the generation of fugitive dust during construction work.	The Part 55 rules apply to remedial alternatives that generate air emissions (e.g., fumes, gas, mist, odor, equipment emissions and dust from excavation, soil stabilization, or compaction). Air emissions must comply with substantive requirements of permits and monitoring would be required. The restrictions on fugitive dust emissions at R 336.1372(8)(b) are relevant and appropriate for remedial actions where contaminated soil may become airborne during construction, renovation or demolition activities that would generate fugitive dust and air emissions at trigger levels. Onsite CERCLA actions are exempt from administrative requirements such as administrative reviews and permitting; however, for certain remedial alternatives, air emissions must comply with substantive requirements and monitoring may be required.
NREPA, Part 91 - Soil Erosion and Sediment Control Mich. Comp. Laws 324.9112(1) & (2), 9116 Mich. Admin. Code, Rules R. 323.1702, 1703, 1704, 1708, 1709, 1710	Chemical Specific <input type="checkbox"/> Action Specific <input checked="" type="checkbox"/> Applicable or Relevant and Appropriate Location Specific <input checked="" type="checkbox"/>	Establishes rules for the control of soil erosion and sedimentation during earth-change operations	Relevant and appropriate to the excavation of contaminated soil. Applicable if more than 1 acre will be disturbed or for any disturbance within 500 feet of the water's edge of a lake or stream, or if an earth change activity otherwise would cause or result in violation of substantive provisions of Part 91. Onsite CERCLA actions are exempt from administrative requirements such as administrative reviews and permitting; however, the substantive requirements must be met.

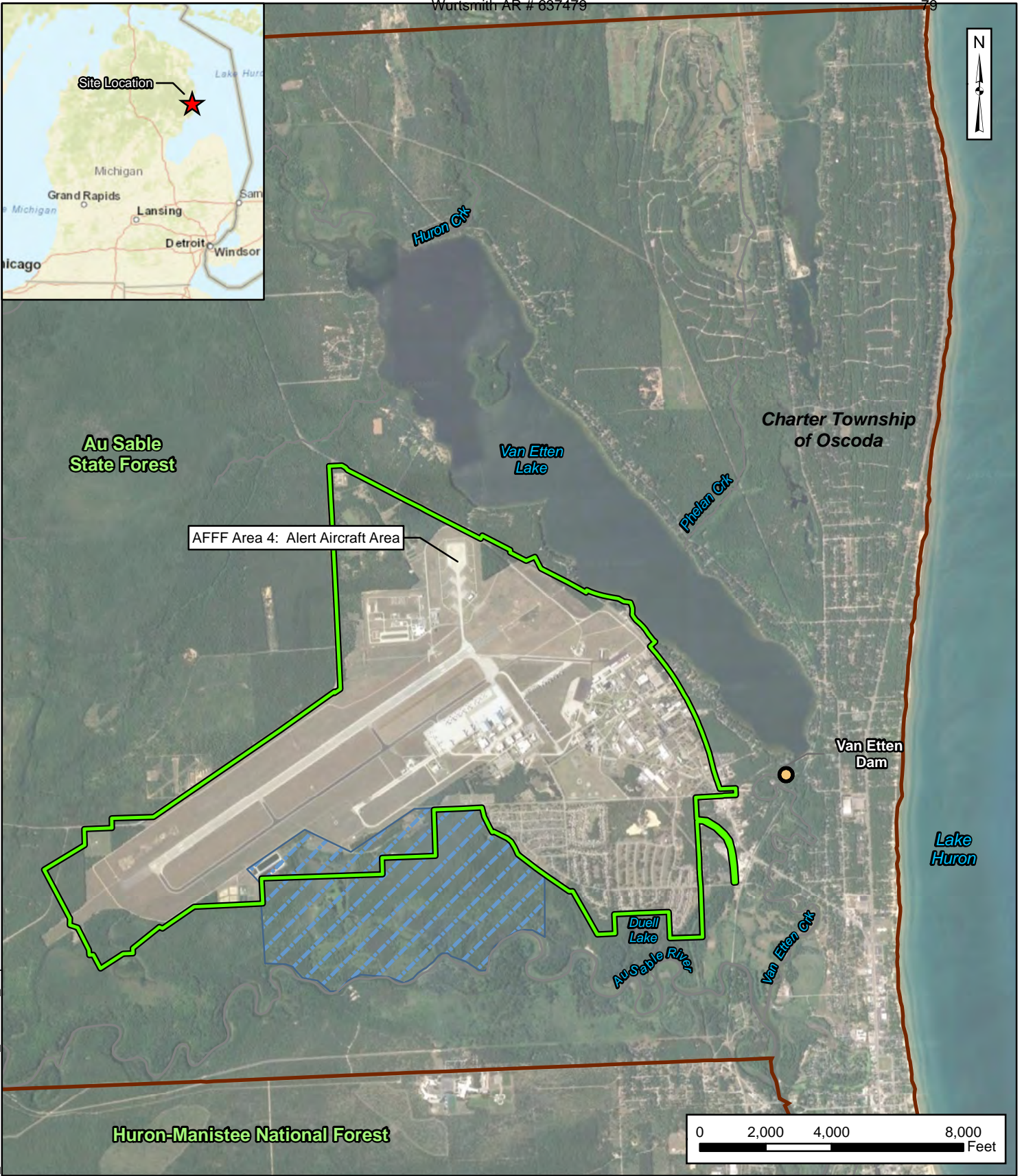
¹ Based on assurances from the USAF, EGLE has largely removed the definitional and legislative purpose provisions from its list of identified ARARs. This is based on the understanding that if a provision that has been identified as an ARAR requires interpretation or reference to definitions or purpose language, the USAF and the State of Michigan will apply the relevant definitions from the relevant statutes and regulations, and will refer to the purpose statements, as needed.

Regulation ¹	ARAR Status	Requirement	Analysis
<p>NREPA, Part 111-Hazardous Waste Management</p> <p>Mich. Comp. Laws 324.11105, 11123, 11128, 11135, 11138</p> <p>Mich. Admin. Code, Rules:</p> <p>299.9212 characteristics of hazardous waste</p> <p>299.9216-7 methods/identification of hazardous wastes</p> <p>299.9302 hazardous waste determination</p> <p>299.9305 pre-transport requirements</p> <p>299.9306 Accumulation time</p> <p>299.9309 manifest requirements</p> <p>299.9310 pre-transport requirements (onsite)</p>	<p>Chemical Specific <input type="checkbox"/></p> <p>Action Specific <input checked="" type="checkbox"/> Applicable</p> <p>Location Specific <input type="checkbox"/></p>	<p>Prohibits generation, disposal, storage, treatment, or transport of hazardous waste except in compliance with Part. Establishes requirements for hazardous waste generators, transporters, and treatment/storage/disposal facilities.</p> <p>Administrative rules define hazardous waste based on analytical procedures, usage, and process of generation</p> <p>Pre-transport regulations (299.9305) establish minimum standards for preparing hazardous waste for shipment offsite and will only apply if hazardous waste is generated as part of the IRA.</p> <p>Accumulation time regs (299.9306) establish minimum standards for managing hazardous wastes onsite. The requirements of 40 CFR Part 265 are incorporated by reference. R. 299.9306 will only apply if hazardous waste is generated as part of the IRA</p> <p>Manifest requirements for generated wastes being shipped if necessary to arrange for transportation to appropriate facility. R 299.9309 and R 299.9310 will only apply if hazardous waste is generated as part of the IRA</p>	<p>Remedial activities may generate waste material that may be classified as hazardous waste as part of IRA. Used for characterizing and identifying hazardous wastes and determining appropriate disposal options.</p> <p>Haz waste determination (299.9302) is applicable to all wastes managed on site. Used for characterizing and identifying hazardous wastes and determining appropriate disposal options. Determining whether wastes qualify as hazardous will often establish the applicability of other regulations.</p> <p>The permit and fee provisions of MCL 324.11123 and 11135 are not ARARs; only the substantive provisions of these sections (prohibited actions involving hazardous wastes and manifest requirements) apply if hazardous waste is generated as part of the IRA.</p> <p>Pre-transport requirements are applicable if hazardous waste is generated and managed onsite prior to offsite shipment and disposal.</p> <p>Accumulation time regs are applicable if hazardous waste is generated and managed onsite prior to offsite shipment and disposal</p>
<p>NREPA, Part 413, Invasive Species</p> <p>Mich. Comp. Laws 324. 41301 and 324.41305</p>	<p>Chemical Specific <input type="checkbox"/></p> <p>Action Specific <input checked="" type="checkbox"/> Potentially Relevant and Appropriate</p> <p>Location Specific <input type="checkbox"/></p>	<p>Lists nonnative species that are prohibited or restricted in Michigan; prohibits possession or introduction of listed species unless authorized under Part.</p>	<p>Any remedial actions should not introduce a listed prohibited or restricted species, a genetically engineered or nonnative bird, crustacean, fish, insect, mammal, mollusk, or aquatic plant in this state at any specific location where the organism is not already naturalized, unless otherwise allowed by Part 413.</p> <p>Would not be considered an ARAR unless federal invasive species standards are less stringent.</p>
<p>NREPA, Part 201. Environmental Remediation</p> <p>Mich. Comp. Laws 324.20120a and 324.20120e(1)(a)</p> <p>Mich. Admin. Code, Rules:</p> <p>R 323.2210(u) Items permitted to be discharged without permit</p> <p>R 299.44 Table 1 Generic groundwater cleanup criteria</p>	<p>Chemical Specific <input checked="" type="checkbox"/></p> <p>Action Specific <input checked="" type="checkbox"/> Relevant and Appropriate</p> <p>Location Specific <input type="checkbox"/></p>	<p>Rule 299.44 Table 1 lists the drinking water criteria and groundwater surface water interface (GSI) criteria for discharges of PFNA, PFOA, PFOS, and PFHxS, to groundwater. Table 1 also lists the residential drinking water criterion for PFHxA; there is no GSI criterion for PFHxA. With the exception of PFOS, each substance's residential drinking water criterion is more stringent than the GSI criterion for the same substance. The more stringent of each substance's criteria is an applicable requirement for this interim remedial action. The applicable requirement for each of these five PFAS are:</p> <p style="padding-left: 40px;">perfluorononanoic acid (PFNA) – 6 ppt perfluorooctanoic acid (PFOA) – 8 ppt perfluorooctane sulfonic acid (PFOS) – 12 ppt perfluorohexane sulfonic acid (PFHxS) – 51 ppt perfluorohexanoic acid (PFHxA) – 400,000 ppt</p>	<p>Pursuant to 42 U.S.C. § 9621(e), the interim remedial action's onsite discharge does not require a federal, state or local permit. In addition, Michigan Rule 323.2210(u) states that a person may discharge wastewater associated with a remedial action without a permit if the discharge will be at or below the residential criteria authorized by the Part 201 statutes.</p> <p>The Alert Aircraft Area interim remedial action will return treated groundwater to the affected aquifer within the Alert Aircraft Area PFAS groundwater plume via infiltration galleries. The discharge of treated groundwater will be designed to comply with the Rule 299.44 Table 1 PFAS criteria listed in the "Requirement" column prior to discharge to the infiltration galleries.</p>

Regulation ¹	ARAR Status	Requirement	Analysis
Michigan Best Professional Judgment Guidelines	To Be Considered	Using its best professional judgment, EGLE has determined that the discharge criterion for perfluorobutane sulfonic acid (PFBS) in this interim remedial action is a treatment technology-based effluent limit of 250 ppt.	The more stringent of Rule 299.44 Table 1's two criteria for perfluorobutane sulfonic acid (PFBS) is 420 ppt. However, EGLE has exercised its best professional judgment and determined that the discharge criterion for PFBS in this interim remedial action is a treatment technology-based effluent limit of 250 ppt. Because the discharge criterion is based on EGLE guidelines rather than statutes or regulations, the criterion is a To Be Considered criterion, rather than an ARAR.
Mich. Admin. Code, Rule R 323.2223(1)-(4)	Chemical Specific <input type="checkbox"/> Action Specific <input checked="" type="checkbox"/> Relevant and Appropriate Location Specific <input type="checkbox"/>	Rule 323.2223(1)-(4) lists requirements for designing, constructing, monitoring and abandoning groundwater monitoring wells.	Rule 323.2223 applies to groundwater discharge monitoring. Onsite CERCLA actions are exempt from administrative requirements such as administrative reviews, reports and permitting; however, the IRA shall comply with the substantive requirements. A monitoring plan will be developed as part of the remedial design phase of the IRA.

FIGURES

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Document Path: G:\Wurtsmith_AAA\MXD\ROD\Site_Location_Map.mxd



Air Force Civil Engineer Center
 2261 Hughes Avenue
 Building 171, Ste 155
 JBSA Lackland, Texas 78236

Map projection: NAD 1983 StatePlane Michigan Central
 Units: feet
 Submitted by: Aersostar SES, Oak Ridge, TN
 Service Layer Credits: Esri ArcGIS Online Aerial
 Photography

Legend

- Township Boundary
- Former Installation Boundary
- Clark's Marsh Wildlife Area

Figure 1
Site Location Map

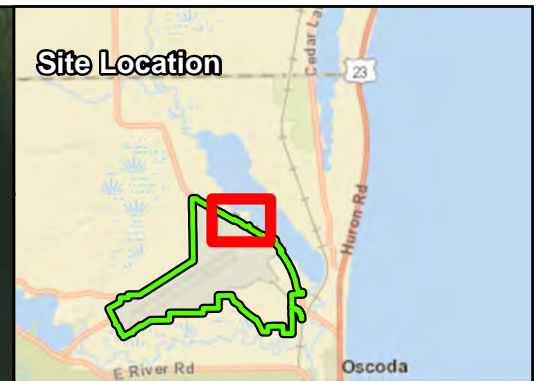
Former Wurtsmith Air Force Base



Document Name: Site_Location_Map

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Date: 3/4/2024



Legend

- ▲ Surface Water Sample (2023)
- ⊙ Seep Sample Location (2021)
- ▲ Historical Surface Water Sample (2018)
- ◆ Historical Pore Water Sample (2018)
- Former Installation Boundary

0 500 1,000
Feet

Former Wurtsmith AFB
Iosco County, Michigan

Figure 2
Alert Aircraft Area at Swise Road
Interim Remedial Action
Van Etten Lake Surface Water, Pore Water,
and Seep Sample Results

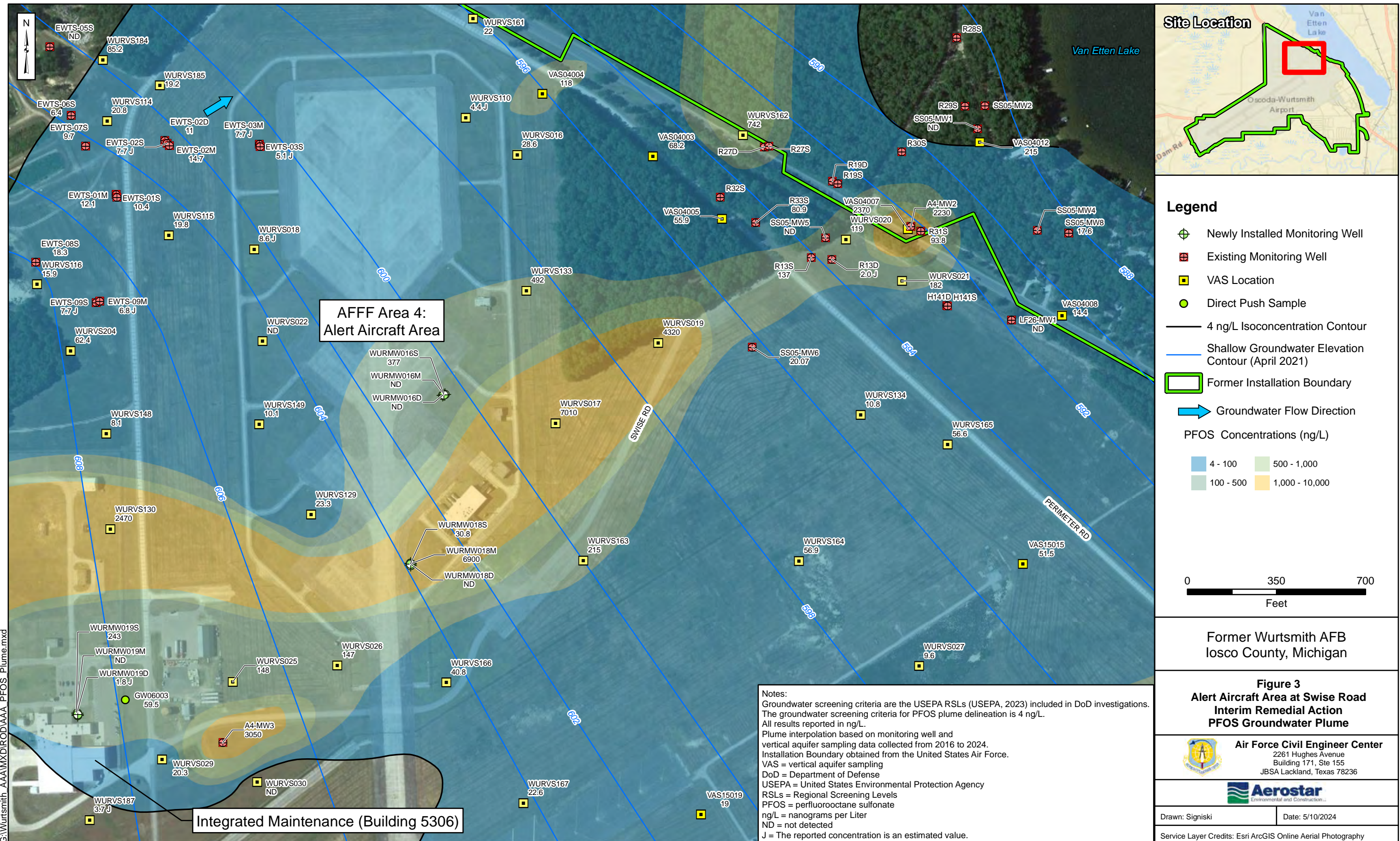
Air Force Civil Engineer Center
2261 Hughes Avenue
Building 171, Ste 155
JBSA Lackland, Texas 78236



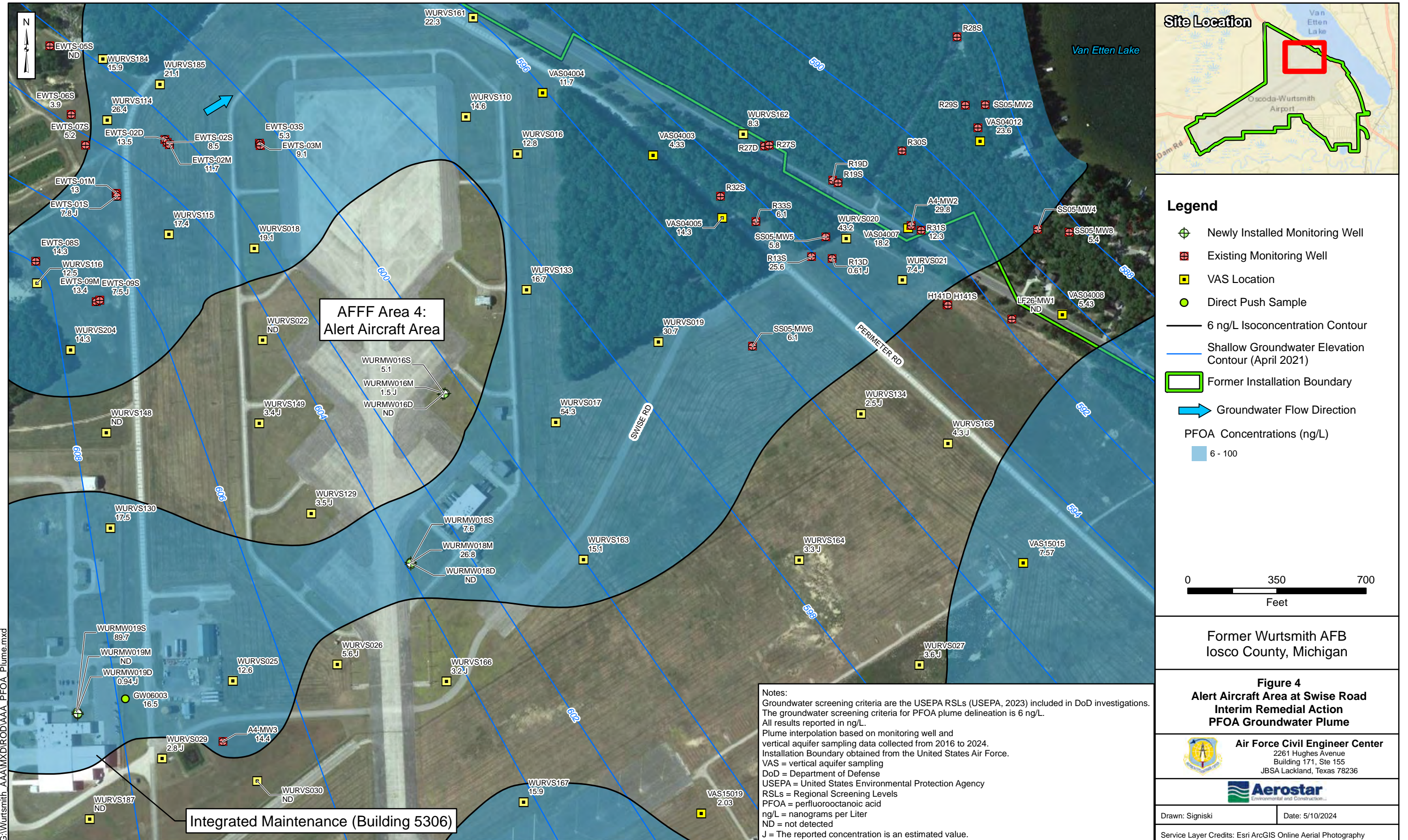
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Notes:
Historical sampling locations and results obtained from EGLE reports (AECOM, June 10, 2020, and AECOM, February 6, 2019).
The screening criteria are the Rule 323.1057 Toxic Substances of Part 4 Water Quality Standards Human Non-Cancer Values (HNVs) (EGLE, 2023).
The EGLE Rule 57 HNVs are 12 ng/L for PFOS and 170 ng/L for PFOA.
All results reported in ng/L
ng/L = nanograms per liter
Installation Boundary obtained from the United States Air Force.
PFOS = perfluorooctane sulfonate
PFOA = perfluorooctanoic acid
J = The reported concentration is an estimated value
U = Not detected above the laboratory detection limit
ft = feet
bgs = below ground surface

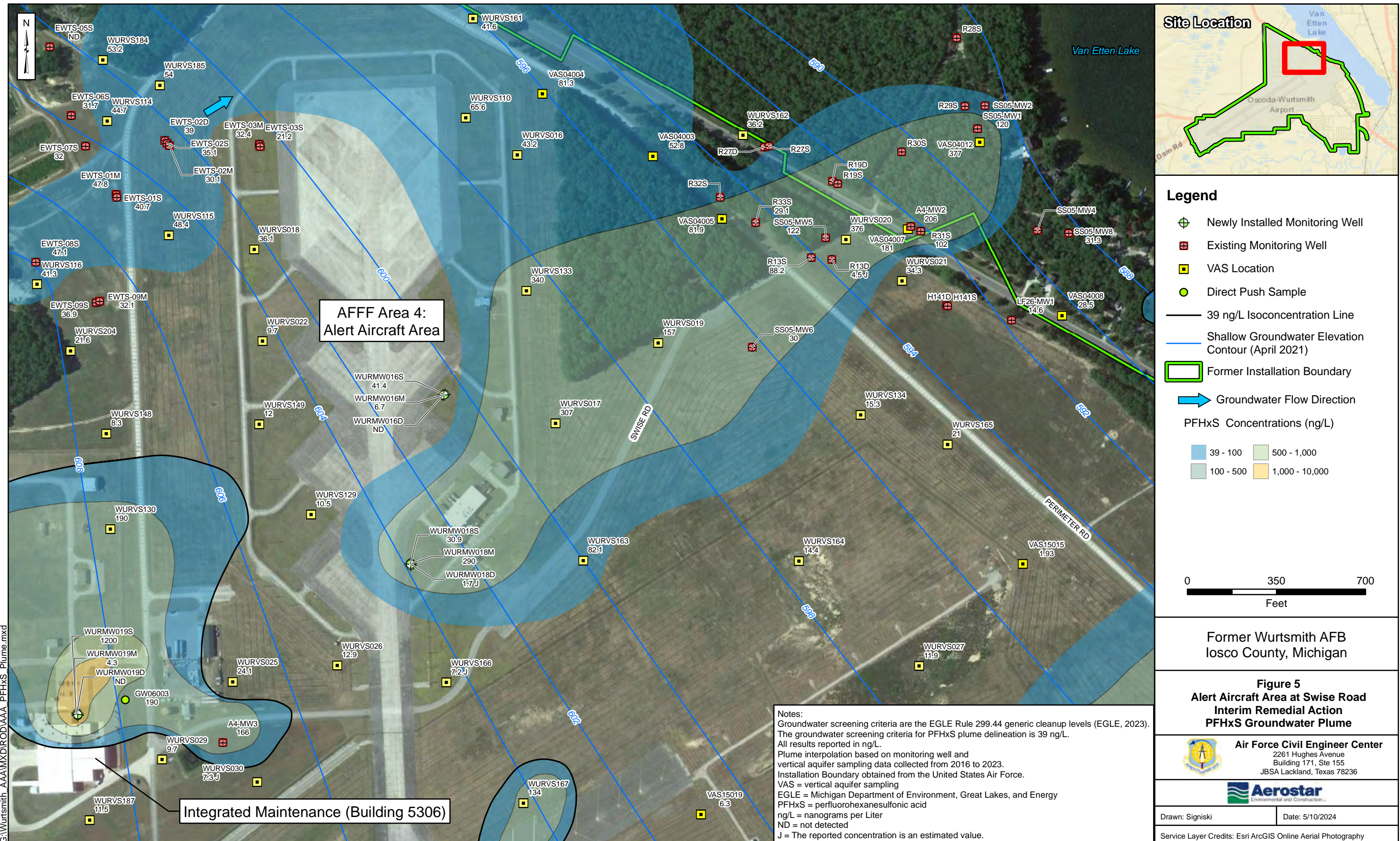
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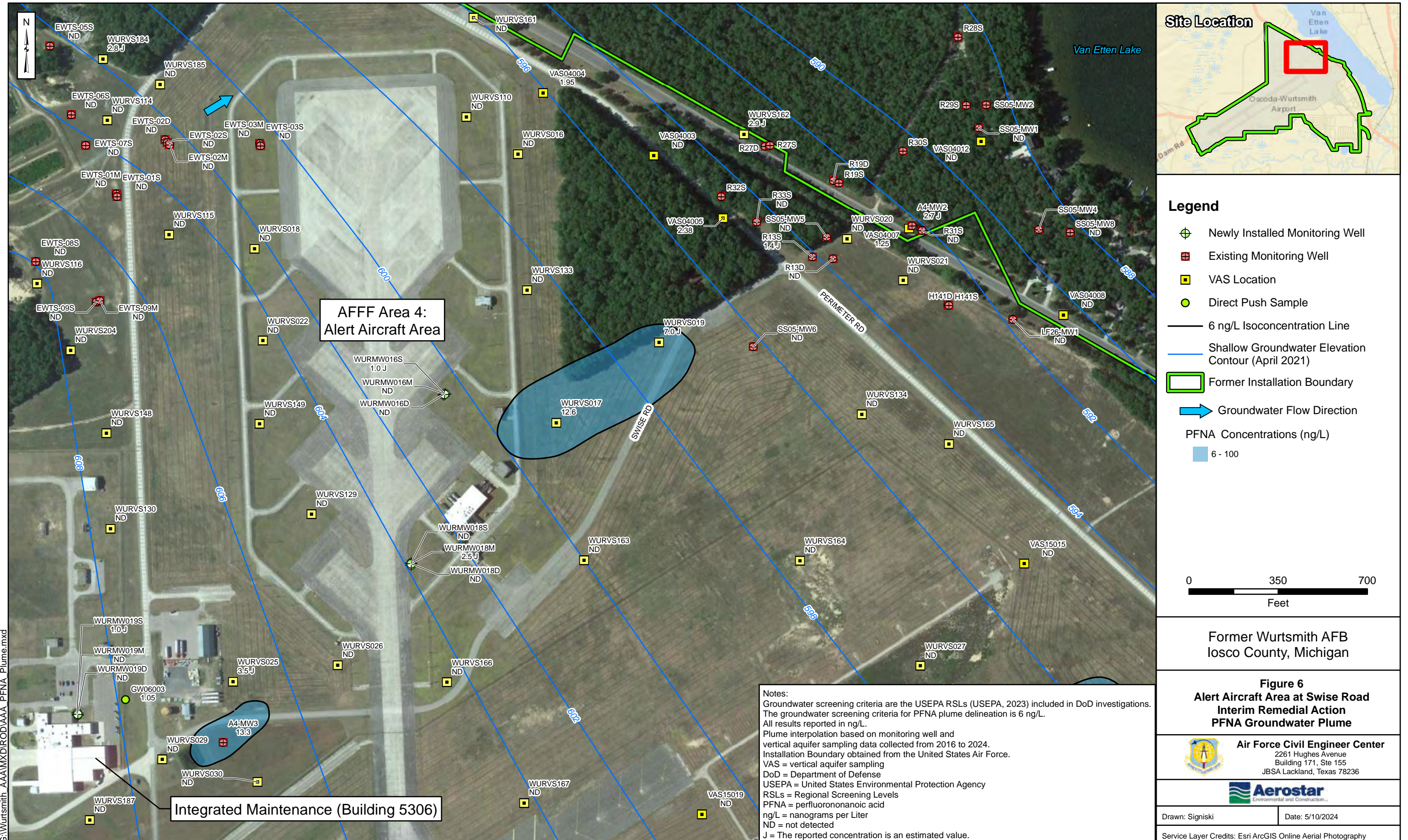
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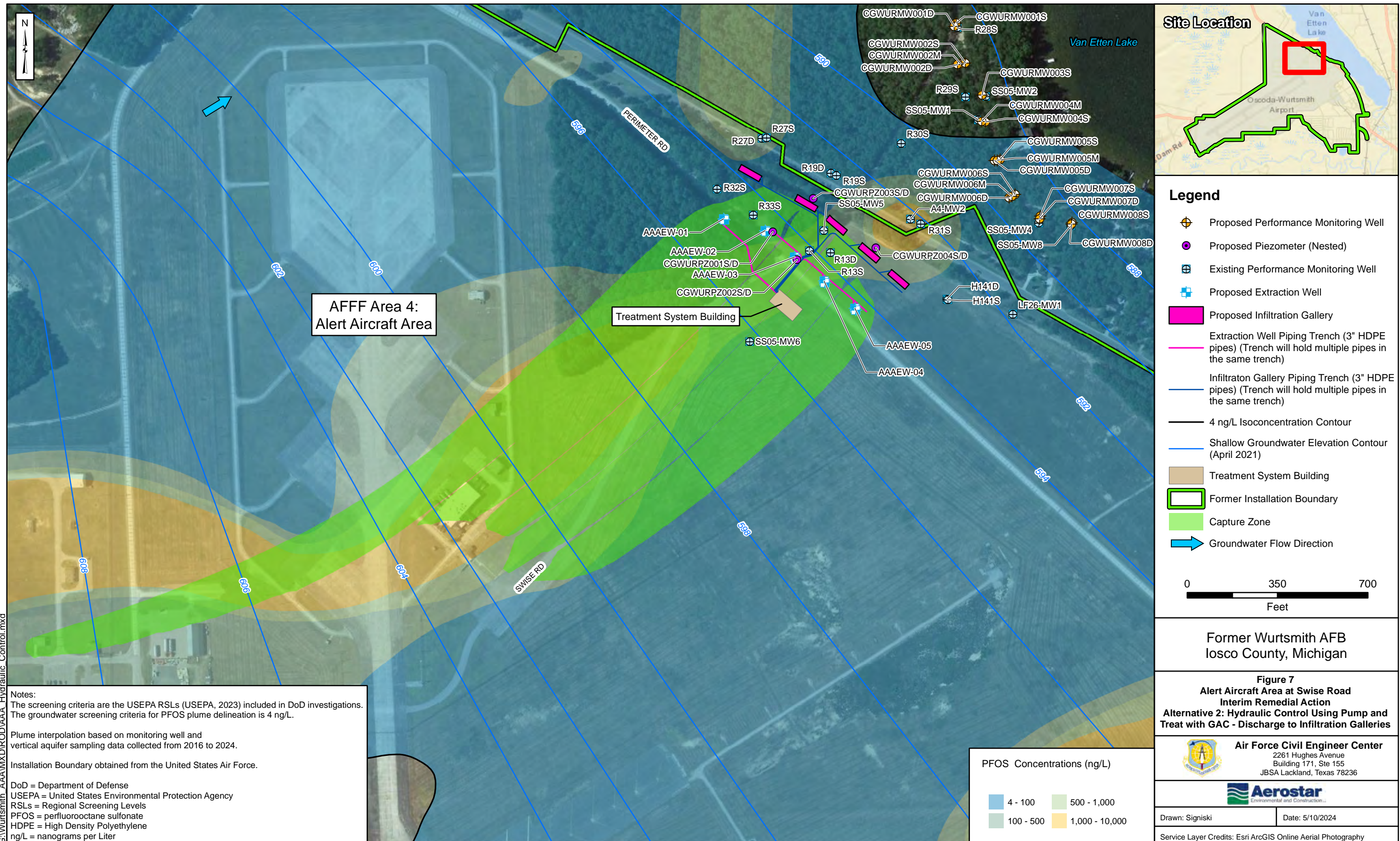
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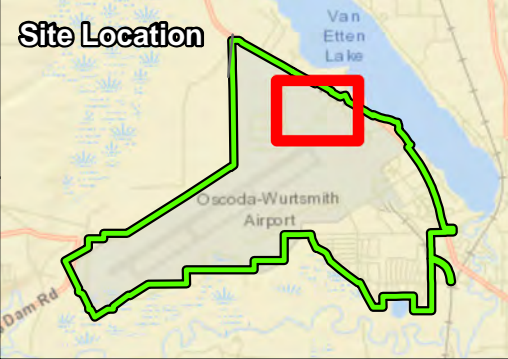


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**AFFF Area 4:
Alert Aircraft Area**

Treatment System Building



Legend

- Proposed Performance Monitoring Well
- Proposed Piezometer (Nested)
- Existing Performance Monitoring Well
- Proposed Extraction Well
- Proposed Infiltration Gallery
- Extraction Well Piping Trench (3" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- Infiltration Gallery Piping Trench (3" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- 4 ng/L Isoconcentration Contour
- Shallow Groundwater Elevation Contour (April 2021)
- Treatment System Building
- Former Installation Boundary
- Capture Zone
- Groundwater Flow Direction

0 350 700
Feet

**Former Wurtsmith AFB
Iosco County, Michigan**

**Figure 7
Alert Aircraft Area at Swise Road
Interim Remedial Action
Alternative 2: Hydraulic Control Using Pump and
Treat with GAC - Discharge to Infiltration Galleries**

Air Force Civil Engineer Center
2261 Hughes Avenue
Building 171, Ste 155
JBSA Lackland, Texas 78236



Drawn: Signiski Date: 5/10/2024

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PFOS Concentrations (ng/L)

4 - 100	500 - 1,000
100 - 500	1,000 - 10,000

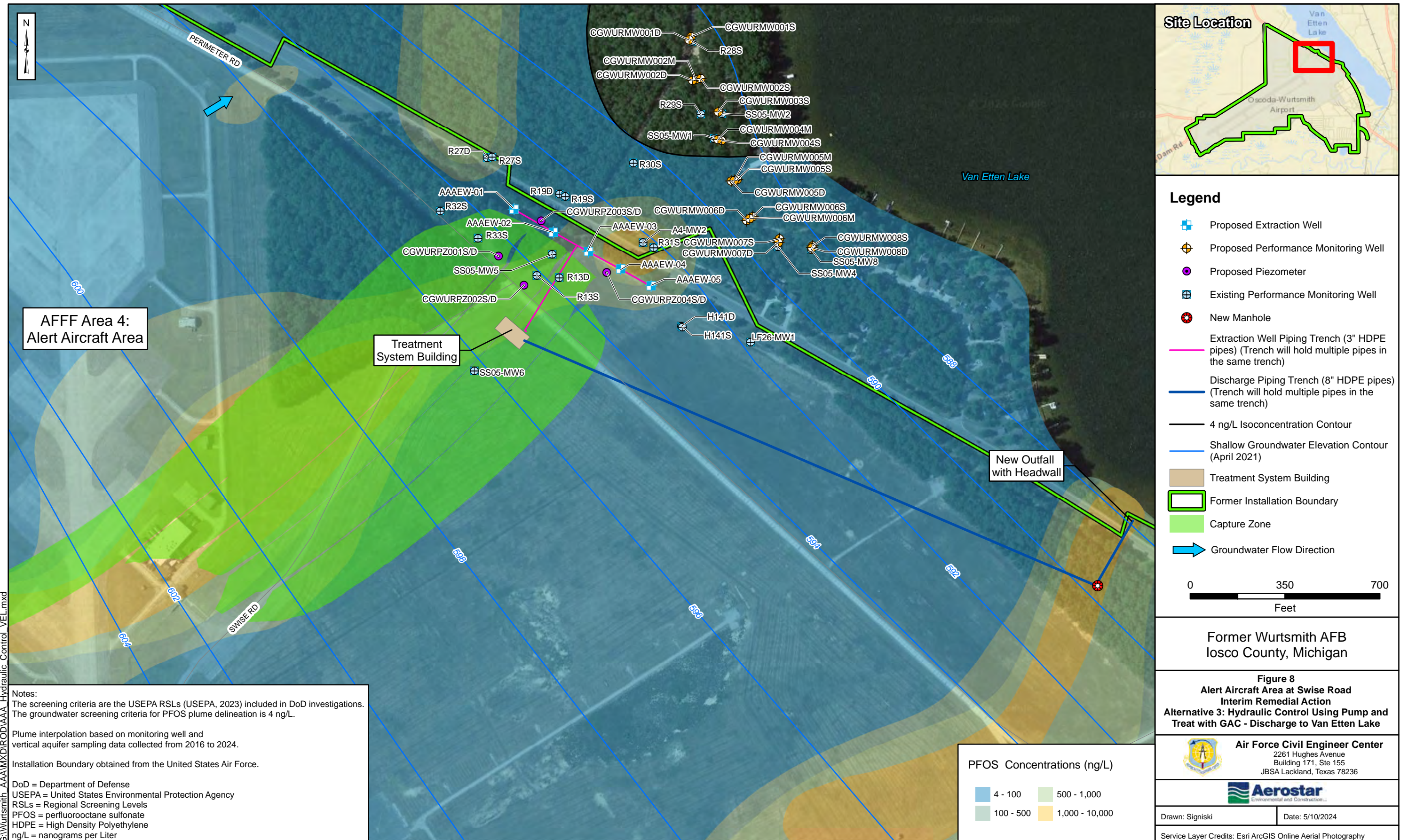
Notes:
The screening criteria are the USEPA RSLs (USEPA, 2023) included in DoD investigations. The groundwater screening criteria for PFOS plume delineation is 4 ng/L.

Plume interpolation based on monitoring well and vertical aquifer sampling data collected from 2016 to 2024.

Installation Boundary obtained from the United States Air Force.

DoD = Department of Defense
USEPA = United States Environmental Protection Agency
RSLs = Regional Screening Levels
PFOS = perfluorooctane sulfonate
HDPE = High Density Polyethylene
ng/L = nanograms per Liter

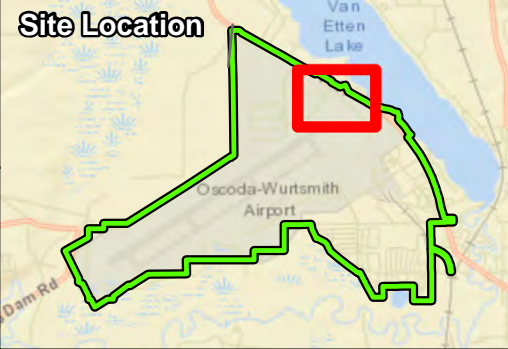
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**AFFF Area 4:
Alert Aircraft Area**

**Treatment
System Building**

**New Outfall
with Headwall**



Legend

- Proposed Extraction Well
- Proposed Performance Monitoring Well
- Proposed Piezometer
- ⊕ Existing Performance Monitoring Well
- New Manhole
- Extraction Well Piping Trench (3" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- Discharge Piping Trench (8" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- 4 ng/L Isoconcentration Contour
- Shallow Groundwater Elevation Contour (April 2021)
- Treatment System Building
- Former Installation Boundary
- Capture Zone
- ➔ Groundwater Flow Direction

0 350 700
Feet

**Former Wurtsmith AFB
Iosco County, Michigan**

**Figure 8
Alert Aircraft Area at Swise Road
Interim Remedial Action
Alternative 3: Hydraulic Control Using Pump and
Treat with GAC - Discharge to Van Etten Lake**

Air Force Civil Engineer Center
2261 Hughes Avenue
Building 171, Ste 155
JBSA Lackland, Texas 78236



Drawn: Signiski Date: 5/10/2024

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Notes:
The screening criteria are the USEPA RSLs (USEPA, 2023) included in DoD investigations. The groundwater screening criteria for PFOS plume delineation is 4 ng/L.

Plume interpolation based on monitoring well and vertical aquifer sampling data collected from 2016 to 2024.

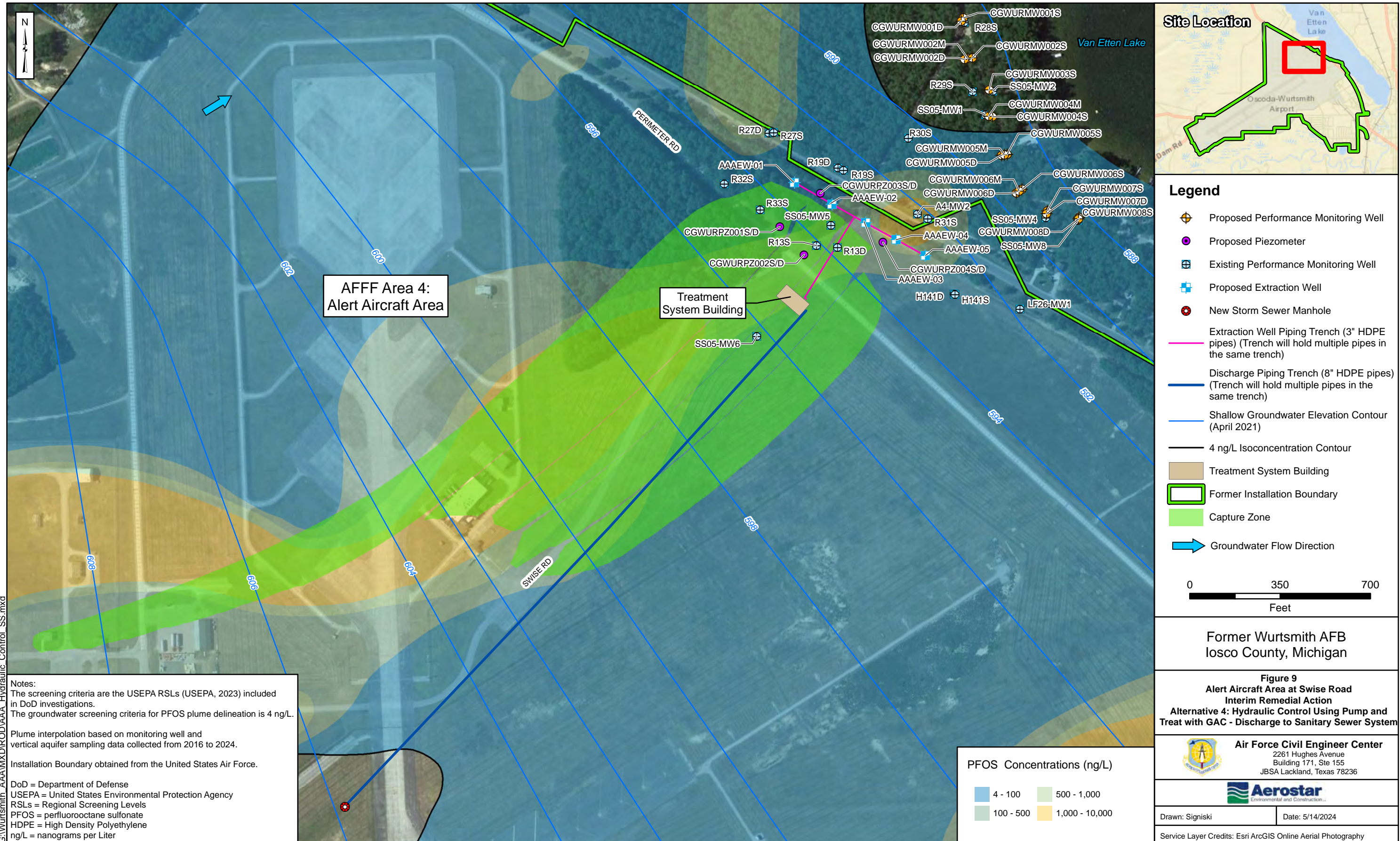
Installation Boundary obtained from the United States Air Force.

DoD = Department of Defense
USEPA = United States Environmental Protection Agency
RSLs = Regional Screening Levels
PFOS = perfluorooctane sulfonate
HDPE = High Density Polyethylene
ng/L = nanograms per Liter

PFOS Concentrations (ng/L)

4 - 100	500 - 1,000
100 - 500	1,000 - 10,000

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AFFF Area 4:
Alert Aircraft Area

Treatment
System Building

Site Location

Legend

- Proposed Performance Monitoring Well
- Proposed Piezometer
- Existing Performance Monitoring Well
- Proposed Extraction Well
- New Storm Sewer Manhole
- Extraction Well Piping Trench (3" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- Discharge Piping Trench (8" HDPE pipes) (Trench will hold multiple pipes in the same trench)
- Shallow Groundwater Elevation Contour (April 2021)
- 4 ng/L Isoconcentration Contour
- Treatment System Building
- Former Installation Boundary
- Capture Zone
- Groundwater Flow Direction

0 350 700
Feet

Former Wurtsmith AFB
Iosco County, Michigan

Figure 9
Alert Aircraft Area at Swise Road
Interim Remedial Action
Alternative 4: Hydraulic Control Using Pump and
Treat with GAC - Discharge to Sanitary Sewer System

Air Force Civil Engineer Center
2261 Hughes Avenue
Building 171, Ste 155
JBSA Lackland, Texas 78236



Drawn: Signiski Date: 5/14/2024

Service Layer Credits: Esri ArcGIS Online Aerial Photography

PFOS Concentrations (ng/L)

4 - 100	500 - 1,000
100 - 500	1,000 - 10,000

Notes:
The screening criteria are the USEPA RSLs (USEPA, 2023) included in DoD investigations.
The groundwater screening criteria for PFOS plume delineation is 4 ng/L.

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APPENDIX A
Public Notice

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SPORTS

TRIATHLON

Continued from Page 1B

Approximately 125 athletes from Michigan, Ohio, Wisconsin and Illinois, competed in one of seven distance events. Racers ranged in age from 23 to 79.

Kenny Krell, owner of the sponsoring 3 Disciplines Racing, said he also is noticing a trend that is occurring nationally in the sport. "Running events are up and multi-sport events are down," he said of fewer athletes taking part in triathlons. "COVID is still having an impact. Tri-athletes are spending more time with their families rather than training by themselves."

In the Sprint triathlon – 500-meter swim, 20-kilometer bike and 5K run – Christopher Schnettler, 29, of Sault Ste. Marie, was first in 1:16:35; Mark Mischle, 33, of Clarkston, was second in 1:18:23; and Davin Leidecker, 32, of Wyandotte, was third in 1:21:39.

For the women in the same distance, finishing first was Jenna Stainbrook, 36, of Saginaw, in 1:24:11; Susan Newmyer, 51, of Gladwin, was second in 1:29:24; and Tinella Zigila, 48, of Frederic, was third in 1:29:39.

The lone Iosco County finisher was Alexander Revord, 32, of East Tawas, in 1:34:07 in 21st place overall.

Women captured the first four places in the Super Sprint triathlon – a 200-meter swim, 10K bike and one-mile run. Sarah Schroeder, 36, of Oregon, Ohio was first in 54:42; Kristine Below, 28, of Berkley, Ohio, was second in 54:43; Alicia Mata, 27, of Traverse City, was third in 1:01:11; and Dana Atwater, 56, of Flushing, was fourth in



Photo by John Morris

SPRINT ATHLETE – Sprint-distance athlete Susan Newmyer of Gladwin heads out for her 20-kilometer bike portion of the triathlon.

1:01:46.

The top male finisher was Matthew Winkler, 27, of Midland, in 1:06:03, for fifth place; while Katelyn Winkler, 26, of Midland, was sixth in 1:06:11.

Locally, William Stoll, 63, of East Tawas, was ninth in 1:25:42.

Michigan resident Even Richardson, 37, won the duathlon – 2.5K run, 20K bike and 5K run – in 58:18. Bonnie Baxter, 53, of Frankenmuth, was the top female

finisher in 1:25:56.

In the Olympic aquabike – 1,500-meter swim, 40K bike – Cecily Barajas, 33, of Alsip, Ill., won the event in 2:23:28. The top two finishers of the Sprint aquabike – 500-meter swim, 20k bike – Tim Zigila, 54, of Michigan, was first in 1:16:00, and Anna O'Hara, 28, of Traverse City, was second in 1:16:54.

Derrick Fries, 70, of Clarkston, won the Kaya-Tri event – two miles in a kayak or standup paddleboard,

20k bike and a 5k run – in 1:42:21, and Brittney Benedetto, 27, of Ann Arbor, was second in 2:23:42.

The Olympic relay event went to the Calum Stec team of Mount Clemens in 2:55:40 and the Sprint

relay event was won by the Filip Filkoski team of Canton in 1:33:16.

Weather conditions on Saturday at the start of the races was an air temperature of 50 degrees and a water temperature of 68.

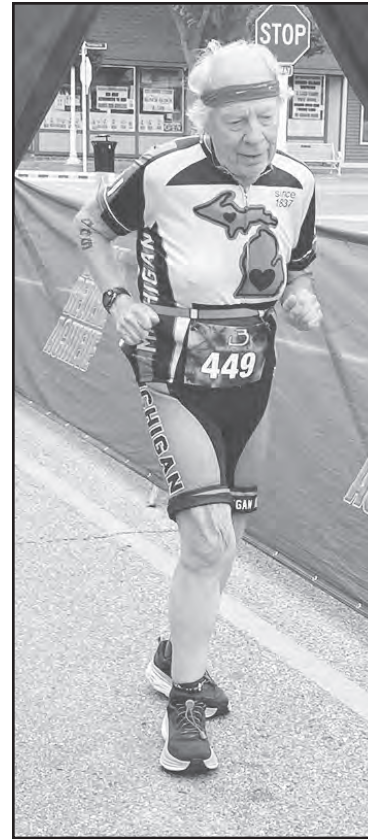


Photo by John Morris

OLDEST COMPETITOR – Robert Stocker, 79, of Okemos, finishes his Sprint-distance triathlon in 2:13:45.



Photo by John Morris

ON THE RUN – Emma Grooms of Cadillac runs her 5k portion of the Sprint-distance triathlon.



Photo by John Morris

READY TO GO – Sprint distance triathlon athletes prepare to enter Tawas Bay for a 500-meter swim during the first leg of the Sunrise Side Triathlons Sept. 9 in East Tawas.

**Notice of Availability
Proposed Plan and Public Meeting
Alert Aircraft Area
Interim Remedial Action
Former Wurtsmith AFB, Michigan**

The lead agency, the United States Air Force (Air Force) will hold a public meeting to discuss the proposed plan for the interim remedial action (IRA) to prevent the highest concentrations of per- and polyfluoroalkyl substances (PFAS) at the Alert Aircraft Area from migrating towards Van Etten Lake. The Alert Aircraft Area is located at the former Wurtsmith Air Force Base, Oscoda, Michigan. The proposed plan identifies the Preferred Alternative, and the Air Force invites the public to comment on the proposed plan.

The Air Force evaluated the following IRA alternatives:

- Alternative 1: No Action;
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**PUBLIC COMMENT PERIOD:
20 September 2023 through 20 October 2023**

The Air Force will accept written comments on the proposed plan during the 30-day public comment period. Comment letters must be postmarked by 20 October 2023, and should be submitted to:

Mr. Steven Willis
BRAC Environmental Coordinator
Air Force Civil Engineer Center
2261 Hughes Avenue, Suite 155
JBSA Lackland, TX 78236
Email: steven.willis.15@us.af.mil

For more information, see the Administrative Record file at <https://ar.afcec-cloud.af.mil>.

The public can access the proposed plan on the electronic administrative record, as well as view the proposed plan and other items in the information repository, at the following location:

Robert J. Parks Public Library
6010 Skeel Avenue
Oscoda, Michigan 48750
Phone (989) 739-9581
Hours:
Mon, Tues, and Friday – 9 am to 5:00 pm
Wed and Thurs – 9 am to 7:00 pm
Sat – 9 am to 2:00 pm
Closed Sunday

**PUBLIC MEETING:
11 October 2023 at 5:00 p.m. EDT**

The public meeting will be held in-person at the Oscoda United Methodist Church located at 120 W Dwight Ave, Oscoda, MI 48750.

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OUTDOORS

Invasive balsam woolly adelgid confirmed in Missaukee County

Lansing – The Michigan Department of Agriculture and Rural Development (MDARD) verified the detection of invasive balsam woolly adelgid (BWA) at a residential property in Missaukee County.

The U.S. Department of Agriculture confirmed a sample taken from the site as positive for balsam woolly adelgid, making Missaukee the second county in Michigan to have a confirmed infestation.

“The infestation was found by a consulting forester who was working with the landowner. We don’t know how balsam woolly adelgid was introduced to this site, but early detection is a fundamental component of successful response efforts,” said Mike Philip, director of MDARD’s Pesticide and Plant Pest Management Division. “MDARD and its partner agencies have begun survey work to determine the extent of the infestation.”

This is the second detection of balsam woolly adelgid in Michigan. The pest was found near Rockford in Kent County in 2021. The site was treated, and survey

efforts are ongoing to ensure successful eradication.

Balsam woolly adelgid is a tiny, sap-feeding insect that attacks true fir trees, including balsam, Fraser and concolor (white) fir. The pest is on Michigan’s Invasive Species Watch List because repeated attacks from the pest weaken trees, cause twig gouting, kill branches and, over the course of many years, cause trees to decline or die.

Symptoms of balsam woolly adelgid infestation include:

- Tiny one-to-two-millimeter white woolly tufts on the lower trunk of the tree and possibly on large branches in the spring and summer.
- Swelling and distortion of the twigs, commonly called “gout.”
- Flagging – A branch or branches that turn brick-red and die.
- Tree crowns that become narrow and misshapen with few needles.

Although not native to

See Adelgid, Page 9B

No silver carp eDNA in new St. Joseph River samples

LANSING – The Michigan Department of Natural Resources (DNR) announced Thursday that no silver carp environmental DNA was found in a Sept. 6 resampling of the St. Joseph River.

Following notification that one of 220 samples taken on the St. Joseph River in June by the U. S. Fish and Wildlife Service contained eDNA from invasive silver carp, the area was resampled.

A total of 220 new samples were collected from stretches of the river between Lake Michigan and Berrien Springs, and according to the USFWS, none of the samples tested positive for bighead or silver carp eDNA. These species of invasive carp are not known to be in the Great Lakes basin, and this sampling provides an early detection process for their potential presence.

Testing for eDNA involves collecting water samples throughout a river or lake and analyzing each sample for silver or bighead carp genetic material. Repeated sampling is used to verify results and to assess whether the detections may have come from a live fish.

“Based on all the available monitoring data, it is unlikely that live silver carp are present in the St. Joseph River,” said Lucas Nathan, Michigan DNR aquatic invasive species coordinator. “Even with this good news, we will continue

to work with our Fish and Wildlife Service partners to monitor the river for any signs of invasive carp.”

In addition to eDNA monitoring, the USFWS has conducted monthly electrofishing and netting in the St. Joseph River for the last two summers to capture and remove grass carp. No silver carp have been observed or captured in these efforts, which will continue through October and begin again next spring.

Since 2013, the DNR has coordinated with the USFWS to implement the eDNA surveillance program in Michigan’s major tributaries to all the Great Lakes except Lake Superior, because it has been deemed very low-risk for the introduction and establishment of invasive carp. Results of these surveys are available at FWS.gov.

Anglers across the state are encouraged to learn to identify invasive carp. Keep and report any suspected invasive carp captures. Identification and reporting information is available at *Michigan.gov/InvasiveCarp*.

Boaters and anglers are reminded to clean, drain and dry boats and gear and properly dispose of bait in accordance with state laws – measures that help limit the spread of invasive species and protect Michigan’s rivers, lakes and streams.

Unique ways to enjoy fall’s color

LANSING – Michigan’s fall foliage is all the rage this time of the year, and the Department of Natural Resources (DNR) is sharing a few different ways to experience that red, orange and gold brilliance.

Leaf peepers in the western Upper Peninsula can catch bird’s-eye views of stunning fall color on a chairlift ride in Porcupine Mountains Wilderness State Park (Ontonagon County). Need another reason? Ontonagon – home of the Porkies – was named among Country Living’s “55 of the Best Fall Towns in the U.S. for Foliage.”

The triple chairlift takes you to the top of the Porkies Winter Sports Complex’s ski hill Saturdays and Sundays through Oct. 14; rides are available noon to 6 p.m. All you need is a Recreation Passport for vehicle entry to the park and a \$10 (per person) lift ticket. Children 10 and under ride free, but must be accompanied by an adult.

At three state parks, specially adapted EnChroma lenses help those with colorblindness more easily see the entire color spectrum. Viewers are available at three locations in Porcupine Mountains Wilderness State Park, and single locations at Ludington State Park

See Fall, Page 9B

Northeast Michigan Fishing Report



TAWAS: Windy conditions kept anglers off the water and the fish from biting. A few walleye were caught here and there, as well as some smaller perch.

OSCODA/AUSABLE: Anglers reported catching coho and some Chinook salmon at Foote Dam. Using spoons and stick baits yielded the best results. The mouth of the river slowed down, with most salmon caught in the early morning and late evening. The occasional walleye was caught at the mouth of the river. Boat anglers did not report having good luck.

AUGRES: Wind and choppy water conditions kept boat anglers off the water for a few days. Prior to the windy conditions, anglers caught some nice-sized perch in 30 to 40 feet of water, as well as a handful of walleye.

ALPENA: Anglers found success fishing the pier for Chinook before and after dark on glow spoons and body baits. Those trolling the cement plant to the turning body had hit-or-miss success. A few walleye were caught along the north shore in 16 to 25 feet of water. Purple, black and yellow body baits worked the best when trolled late in the evening. Anglers reported marginal success on Chinook and coho fishing in 50 to 70 feet of water. Baitfish were plentiful and on the move, which made fish difficult to find at times.

THUNDER BAY RIVER: Boat anglers trolled spoons, plugs and crankbaits with moderate success for salmon. Green, chartreuse and black/silver worked well. Anglers reported catching a few nice pike along with the occasional walleye. Those fishing from shore reported moderate success casting spoons and crankbaits in fire tiger, green and silver. Floating spawn caught a decent number of fish at the 9th Street Dam and below the 9th Street Bridge.

PRESQUE ISLE: Anglers reported good success for Chinook, coho, steelhead and lake trout. Trolling lighthouse to lighthouse was good in depths of 60 to 100 feet of water. Green/white, black and chartreuse spoons worked well for salmon 40 to 55 feet down. Early and late in the day had the best results, with the occa-

sional fish being caught throughout the day. Spoons that were run high in the water column caught a good number of steelhead, with oranges, golds and watermelon being the go-to colors. Lake trout were caught from 50 feet of water down to the bottom on a wide variety of spoons and spin glows. A few walleye were caught from the new lighthouse to Thompson Harbor. Chinook were seen from Thompson Harbor into North Bay in 10 to 30 feet of water. A few fish were caught while long-lining body baits.

ROCKPORT: Anglers caught limits of lake trout when fishing in 100 to 140 feet of water. Those who headed up to Stoneport caught both Chinook and steelhead.

ROGERS CITY: Angler pressure significantly decreased, but great fishing remained. Adult Chinook salmon were staging off Swan Bay in less than 50 feet of water. Anglers reported having a hard time getting these fish to bite, but did catch a few before sun-up and after sunset. Anglers ran mostly bombers and j-plugs off highlines behind boards. Anglers who fished deeper waters reported catching a mixed bag. They caught young Chinook salmon, steelhead, lake trout, and an occasional coho and walleye. The best depths were anywhere from 55 to 85 feet of water. Anglers had the best results when locating the bait fish and fishing around them. Anglers ran lines throughout the water column. Running smaller spoons of greens, blues, oranges, silver, yellow and glow stuff early and late was best.

OCQUEOC RIVER: A few anglers were targeting salmon and drifting spawn under bobbers. Fishing was slow, but anglers did report catching a few.

CHEBOYGAN RIVER: Shore fishing below the dam was very inconsistent. Only one dam gate was open, which improved the spillway currents for those bobber fishing with skein/spawn bags. Anglers reported mornings as better than evenings. The vast majority of fish were caught on skein, although spawn bags, artificial eggs, crankbaits, spinners and flies have all caught fish.

Notice of Availability Proposed Plan and Public Meeting Alert Aircraft Area Interim Remedial Action Former Wurtsmith AFB, Michigan

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https://ses-grp.zoom.us/meeting/register/tZIsfuuvrzwuHN04nKuYji_1wfV6cwvtZekn

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE