Phase 2 Investigation Report
NMED PFAS Investigation
Cannon Air Force Base and Surrounding Area

Prepared for

New Mexico Environment Department
Hazardous Waste Bureau
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1. Introduction

To better understand the scope of potential and existing environmental contamination associated with per- and polyfluoroalkyl substances (collectively referred to as PFAS) around the state, the New Mexico Environment Department (NMED) has worked with state and federal partners to conduct sampling for PFAS in sediment, surface water, and groundwater around the state. The NMED Hazardous Waste Bureau (HWB) contracted with Daniel B. Stephens & Associates, Inc. (DBS&A) to characterize PFAS in groundwater on and in the vicinity of Cannon Air Force Base (AFB) in Curry County (the Cannon site). The Phase 1 work performed under this contract is discussed by DBS&A (2022). This report presents the results of the Phase 2 work conducted for the Cannon site between March and June 2023, including groundwater quality sampling, numerical modeling, and identifying recommendations for Phase 3 project activities.

2. Data Confidentiality

As discussed in the Phase 1 report (DBS&A, 2022), with two exceptions, the landowners downgradient of Cannon AFB gave permission to DBS&A to collect groundwater samples, but required that the results of the water sampling not be provided to NMED or included in the Phase 1 report. The exceptions were Mr. Arthur Schaap, owner and operator of Highland Dairy, and Mr. Juan Jimenez, on whose property new downgradient monitor well DBS-1 was installed. Copies of the laboratory results were sent to the owners of the properties from which the samples were obtained. The discussion of results in the Phase 1 report is limited to the samples from the Schaap and Jimenez properties. The laboratory reports for Phase 2 sampling during April 2023 are provided in Appendix A, and include the results from two downgradient domestic wells (without location information), as well as monitor well DBS-1.

3. Site Description

The NMED-directed Cannon site PFAS investigation project area is roughly bounded by the western Cannon AFB boundary on the west, U.S. Highway 70 (US 70) on the east, the Curry-Roosevelt County boundary on the south, and State Road 245 (SR 245) on the north. The project area encompasses all of Cannon AFB; most of the area outside of the base is occupied by a number of dairy farming operations and fields irrigated with center pivot sprinklers, with

some rural residences. The Ogallala Aquifer, also referred to as the High Plains Aquifer, is the primary source of potable water in the region, and provides the water supply for Cannon AFB, the City of Clovis, and the vicinity. Depth to groundwater is currently approximately 320 feet below ground surface (bgs) in the Cannon AFB area, and groundwater is unconfined. The local groundwater gradient is generally to the southeast at 0.0013 to 0.0028 foot per foot (ft/ft) (Hart and McAda, 1985).

Cannon AFB is located approximately 3 miles west-southwest of Clovis, New Mexico. It occupies 3,789 acres of federally owned land, and is the home of the Special Operations Air Force Base and the 27th Special Operations Force Support Squadron. Clovis is the largest city in eastern New Mexico, and is a principal center for trade and agricultural services for the region. The city is also a center for rail transportation, marketing livestock, and processing agricultural commodities, particularly grain, livestock, milk, and poultry. It is surrounded by thousands of acres of farming, ranching, and dairy land. The Cannon site Phase 1 PFAS investigation report (DBS&A, 2022) includes a thorough discussion of the environmental setting. A vicinity map showing Cannon AFB and the surrounding area is provided as Figure 1.

4. Background

PFAS are a large family (perhaps more than 8,000 [Buck et al., 2021]) of manmade organofluorine compounds that were developed in the early 1940s. Certain PFAS, such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), are mobile, persistent, and bioaccumulative, and are not known to degrade in the environment. PFAS chemical structure gives them unique and valuable properties, including the ability to reduce friction and make products more resistant to soil, stain, grease, water, fire, and temperature. These chemical properties make them useful components in a wide array of industrial and commercial applications, such as textiles and leather products, metal plating, the photographic industry, photolithography, semiconductors, paper and packaging, non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, and pesticides. Some PFAS are also used as high-performance surfactants in products where an even flow is essential, such as paints, coatings, cleaning products, and fire-fighting foams, such as aqueous film-forming foam (AFFF), for use on liquid (hydrocarbon) fuel fires (U.S. EPA, 2009 and 2021b).

PFAS are characterized by linear or branched carbon-fluorine chains connected to a functional group, and can vary in length from 4 to 14 molecules. The number of carbon atoms, and

therefore the length of the chain comprising a particular PFAS, affects its toxicity and persistence and behavior in humans, wildlife, and the environment. Perfluorosulfonic acids (PFSAs) with six or more carbons (e.g., PFOS) and perfluorinated carboxylic acids (PFCAs) with seven or more carbon atoms (e.g., PFOA) are considered long-chain substances (Buck et al., 2011; U.S. EPA, 2021b; ATSDR, 2021). In general, as chain length increases, the bioaccumulation potential of PFAS appears to increase. For reference, the names, acronyms, and families of PFAS discussed in this report are provided in Table 1.

PFAS are extremely persistent in environmental media because the highly stable carbon-fluorine structure of PFAS can only be broken down at very high temperature. Larger PFAS compounds may transform in the environment to so-called "terminal" PFAS compounds, which are typically less than or equal to eight carbon-chain molecules such as PFOA and PFOS, and are resistant to environmental degradation processes such as biodegradation, atmospheric photo-oxidation, direct photolysis, and hydrolysis (ITRC, 2021). Dissipation is by advection, dispersion, and sorption to particulate matter. PFOS has low volatility in ionized form, but can adsorb under limited hydrogeochemical conditions to positively charged sediment particles and be deposited on the ground and into surface water bodies. Due to its persistence, it can be transported long distances in air or water (U.S. EPA, 2016a).

Of particular concern at the Cannon site is the use of AFFF to extinguish fires involving highly flammable liquids. AFFF creates a vapor-sealing film on a hydrocarbon fuel surface, cooling the liquid fuel, depriving the fuel of oxygen, and providing protection against reignition by preventing evaporation (Leeson et al., 2021). The U.S. Air Force (USAF) began purchasing and using AFFF containing PFOS and PFOA for extinguishing petroleum fires and during firefighting training activities in 1970 (AFIMSC, 2017). By mid-2018, the USAF had transitioned to a new AFFF formula, Phos-Check 3 Percent, which is PFOS-free and contains only trace amounts of PFOA (AFCEC, 2018), although it is possible that stockpiles of old AFFF were used after that time. The USAF restricts use of AFFF to emergency responses, and treats all releases as hazardous spills. AFFF contained in aircraft hangar fire protection systems was scheduled to be completed by the end of 2018 (AFCEC, 2018).

The results of sampling for PFAS conducted by various parties in the Cannon site area indicate that releases of PFAS have occurred from multiple sources at Cannon AFB, which likely include (1) one or more of the FTAs located in the southeast quarter of the Base, (2) the former Sewage Lagoons, located on the east side of the base south of the current WWTP, (3) one or more of the former landfills, such as Landfill No. 5 located in the southeast corner of the base, and

(4) current wastewater discharge areas, such as the ponds and irrigated areas at the golf course and the North Playa Lake (Figure 2) (DBS&A, 2022).

Two main areas of PFAS contaminated groundwater have been identified at Cannon AFB: the area southeast of the former Sewage Lagoons and the area south and southeast of Landfill No. 5 (Figure 2) (DBS&A, 2022). NMED's PFAS data from December 2021 groundwater sampling at Cannon AFB indicate that PFAS concentrations in most of the so-called east monitor wells have decreased dramatically since the USAF site investigation (SI) in 2017 and 2018 (DBS&A, 2022). PFAS concentrations in groundwater in the southeast corner of the base have also declined, but high concentrations there indicate an ongoing source that presents a continuing threat to residential and agricultural wells downgradient of Cannon AFB. Additional investigation is required to determine the source(s) of PFAS impacts at Cannon AFB and what steps can be taken to stop what appear to be ongoing impacts to groundwater (DBS&A, 2022). Based on previous PFAS detection in soils, further characterization and remediation of PFAS-contaminated soils at and near Cannon AFB is required to address short- and long-term contamination of groundwater in the Ogallala aquifer system (DBS&A, 2022).

The Phase 1 work performed under this contract is discussed by DBS&A (2022), and included the following:

- Providing the background on PFAS sampling requirements, PFAS compounds and their use, toxicity, persistence, and human health effects, and regulatory framework
- Providing discussions of the project area, including Clovis and Cannon AFB, including the physical setting, climate, soil conditions, and the regional and local geology and hydrogeology
- Providing a brief discussion of the sources of PFAS contamination in the project area, factors controlling PFAS migration in soil and groundwater, and likely exposure pathways
- Summarizing the results of sampling for PFAS in the local area conducted by various parties
- Describing the NMED Phase I Investigation work performed by DBS&A, including compilation of relevant information, development of the work plan, sampling of water supply wells, installation and sampling of a monitor well, sample analysis, and data review
- Identifying data gaps and recommendations for further work

5. Regulatory Framework

In November 2009, the U.S. Environmental Protection Agency (EPA) issued residential soil screening levels (SSLs) of 16,000 micrograms per kilogram (µg/kg) for PFOA and 6,000 µg/kg for PFOS that were derived using EPA's regional screening level (RSL) calculator (U.S. EPA, 2009). In May 2016, the EPA issued a lifetime drinking water health advisory (HA) of 0.07 micrograms per liter (µg/L) (70 nanograms per liter [ng/L]) for PFOS and PFOA, both individually and combined (U.S. EPA, 2016a, 2016b, and 2017).

On June 15, 2022, EPA issued lifetime drinking water HAs for four perfluoroalkyl substances. These include two HAs that replace the HAs that EPA issued in 2016, and final HAs for two other PFAS: perfluorobutanesulfonic acid (PFBS) and hexafluoropropylene oxide dimer acid (HFPO-DA, also referred to as GenX chemicals) (U.S. EPA, 2022). These EPA HAs, which identify the concentration of chemicals in drinking water at or below which adverse health effects are not anticipated to occur, were 0.004 ng/L for PFOA, 0.02 ng/L for PFOS, 10 ng/L for HFPO-DA, and 2,000 ng/L for PFBS (FRL 9855-OW). These updated HAs were based on new science indicating that some negative health effects may occur with concentrations of PFOA or PFOS in water that are near zero (U.S. EPA, 2022). These interim HAs will remain in place until EPA establishes a National Primary Drinking Water Regulation (U.S. EPA, 2022).

On March 14, 2023, EPA announced non-enforceable proposed maximum contaminant levels (MCLs) for PFOA and PFOS of 4 ng/L, and proposed maximum contaminant level goals (MCLGs) of zero. At that time, EPA also announced a proposed MCL and MCLG for mixtures containing the following: perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), PFBS, and HFPO-DA (U.S. EPA, 2023). These proposed MCLs are higher than those the U.S. EPA had previously released as health goals. For PFNA, PFHxS, PFBS, and HFPO-DA, the combined hazard index (HI) must be less than 1 (U.S. EPA, 2023). The HI is made up of a sum of fractions for PFNA, PFHxS, PFBS, and HFPO-DA, comparing the measured levels to the levels determined not to cause health effects (U.S. EPA, 2023).

In 2018, the New Mexico Water Quality Control Commission (NMWQCC) added PFOA, PFOS, and PFHxS to the list of toxic pollutants as they relate to groundwater and surface water [20.6.2.3103(A)(2) NMAC and 20.6.2.7(T)(2)(s) NMAC]. In 2019, NMED established preliminary SSLs for PFOA, PFOS, and PFHxS in residential, industrial, and construction worker exposure scenarios at 1.56 milligrams per kilogram (mg/kg), 2.60 mg/kg, and 7.08 mg/kg, respectively. NMED also established a preliminary screening level for these three PFAS compounds in tap

water at 0.07 µg/L (NMED, 2019). These preliminary screening levels applied to each compound individually or in combination (NMED, 2019).

In June 2022, NMED issued updated preliminary SSLs for PFAS. These include cancer SSLs for perfluorooctanoate and PFOA for residential, industrial/occupational, and construction worker exposure scenarios of 76.1 mg/kg, 498 mg/kg, and 2,690 mg/kg, respectively, as well as a cancer screening level of 11.1 µg/L for tap water (NMED, 2022). Noncancer SSLs were also issued for 12 PFAS compounds, as follows (NMED, 2022):

- Noncancer SSLs of 18.5 mg/kg, 374 mg/kg, and 80.7 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 6.02 µg/L for tap water for PFBS and potassium perfluorobutanesulfonate
- Noncancer SSLs of 1.23 mg/kg, 24.9 mg/kg, and 5.38 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 0.401 µg/L for tap water for perfluorohexanesulfonate and PFHxS
- Noncancer SSLs of 0.185 mg/kg, 3.74 mg/kg, and 0.807 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 0.0602 µg/L for tap water, for perfluorononanoate, PFNA, perfluorooctanesulfonate, PFOS, perfluorooctanoate, PFOA, and potassium perfluorooctanesulfonate

EPA issued the final toxicity assessments for PFBS (U.S. EPA, 2021a) and GenX chemicals in 2021 (U.S. EPA, 2021d) and planned to issue drinking water HAs for these constituents in spring 2022 (U.S. EPA, 2021c). EPA is currently developing toxicity assessments for five other PFAS—perfluorobutanoic acid (PFBA), perfluorohexanoic acid (PFHxA), PFHxS, PFNA, and perfluorodecanoic acid (PFDA) (U.S. EPA, 2021c).

Table 2 summarizes the EPA and NMED PFAS regulatory levels.

In October 2021, EPA issued its PFAS Strategic Roadmap, which establishes timelines for specific actions to protect human health and the environment from PFAS contamination. This effort was to include establishing enforceable MCLs for PFOA and PFOS while evaluating additional PFAS and groups of PFAS (U.S. EPA, 2021c). EPA anticipated issuing proposed rules in fall 2022, with final rules in fall 2023 (U.S. EPA, 2021c). At least 28 states have established advisory or regulatory limits or screening levels for two or more PFAS (ITRC, 2021 and 2022).

6. Exposure Pathways

Soil and groundwater data indicate that the most significant PFAS source areas are the former sewage lagoons and the North Playa Lake on the east side of Cannon AFB. While the firefighting training areas in the southeast portion of Cannon AFB are considered likely sources of PFAS, the groundwater flow direction and the distribution of PFAS in monitor wells in the southeast corner of the base indicate that Landfill No. 5 is also a likely source of PFAS. PFAS have migrated through the vadose zone and impacted groundwater in the Ogallala Aquifer in and downgradient of these areas (Figure 2). Residual PFAS may have accumulated at the soil gas-sediment interface in the vadose zone under unsaturated flow conditions (Brusseau et al., 2019), which could provide a long-term source of contamination if not remediated.

Since the PFAS reached groundwater, these compounds have flowed with groundwater downgradient to the south and southeast of Cannon AFB. PFAS has likely migrated at the same rate as average groundwater flow in the Ogallala aquifer, with minimal adsorption onto aquifer materials. It is likely that PFAS movement in the Ogallala Aquifer has been affected by seasonal pumping of irrigation wells, creating increasing hydraulic gradients, southeast of Cannon AFB.

7. Planning Documents, Requirements, and PFAS Protocols

The project field sampling plan (FSP) and quality assurance project plan (QAPP) were prepared during Phase 1, and were combined into a single sampling and analysis plan (SAP). The SAP detailed sample collection procedures and analytical methods to be used at the sites during the investigations. DBS&A prepared the SAP in accordance with the applicable EPA guidance documents. The SAP describes procedures to assure that the project-specific data quality objectives (DQOs) are met and that the quality of data is known and documented. The SAP presents the project description, project organization and responsibilities, and quality assurance (QA) objectives associated with the sampling and analytical services to be provided. This document was used for the project's Phase 2 continuation.

As required by the project SAP, field quality control (QC) samples are required to assess the quality of data that are generated by sampling activities. These samples include field duplicates, field blanks, equipment blanks (for samples collected using a Bennett pump), matrix spike and

matrix spike duplicates (MS/MSDs), and temperature blanks. Required QC samples are summarized in Table 3.

All laboratories that perform analytical work under this project must adhere to a Level IV QA program that is used to monitor and control all laboratory QC activities for this project. Each laboratory must have a written QA manual that describes the QA program in detail. The laboratory QA manager is responsible for ensuring that all laboratory internal QC checks are conducted in accordance with EPA methods and protocols, the laboratory's QA manual, and the requirements of the project SAP.

DBS&A prepared a site-specific health and safety plan (HASP) in accordance with the requirements of Title 29, Code of Federal Regulations (CFR), Part 1910.120 to govern the field activities performed. The site-specific HASP was written to address health and safety issues associated with the proposed project activities. The Phase 1 HASP was used for the project's Phase 2 continuation.

It is well established that, due to widespread presence of PFAS in products used in everyday life, PFAS samples are easily susceptible to cross contamination during the sample collection and handling stage. DBS&A and its subcontractors strictly adhere to sampling and hygiene protocols during sampling designed to eliminate potential sources of PFAS that may result in cross contamination of environmental samples. Potential sources of PFAS can be found in field clothing, field equipment, sample containers, and supplies for equipment decontamination. For example, items banned from the work area will include clothing washed with fabric softener, plastic clipboards and binders, adhesives, all materials containing Teflon, and most brands of waterproof field logbooks. Use of cosmetics, hand creams, and moisturizers, as well as certain liquids, such as sunscreen and insect repellant on exposed skin, will not be allowed. All sample containers and container cap liners will be made of high-density polyethylene (HDPE) or polypropylene.

8. Phase 1 Investigation Report Recommendations

The Cannon site Phase 1 PFAS investigation report dated June 30, 2022 recommended that additional Phase 2 PFAS investigations occur in fiscal year (FY) 2023. In addition, USAF is currently conducting a remedial investigation (RI) of PFAS contamination at Cannon AFB and downgradient of the base. The first phase of the RI is occurring on-base, but the EPA-approved

work plan (Bristol, 2021) indicates that substantial work will be conducted off-base (DBS&A, 2022). The ongoing RI should be factored into NMED's plans for additional PFAS investigation.

The Phase 2 Cannon site PFAS investigation project objectives that were outlined in the Phase 1 report include the following:

- Establish a technical dialogue between NMED, USAF, and EPA to determine the nature and extent of USAF's plans for off-site investigation and to coordinate field and data collection efforts.
- Provide better definition of existing groundwater plume geometry and modeled predictions of future plume migration, including empirically derived rates of movements of PFAS contaminants in the subsurface.

Specific recommendations that were included in the Phase 1 report for Phase 2 project activities at the Cannon site included the following:

- Conduct analytical and/or numerical modeling activities to assess groundwater flow and PFAS transport, and to better define the nature and extent of PFAS contamination at the Cannon site.
- Obtain monthly or quarterly progress reports on activities associated with the USAF RI from the USAF or EPA, including access to preliminary data. The USAF RI report documenting the results of the investigation will likely not be prepared for some time. Therefore, NMED should coordinate with USAF to obtain characterization data for PFAS-contaminated sediment in the vadose zone and groundwater sample splits from new and existing monitor wells.

9. Phase 2 Project Activities

NMED did not issue a work order allowing DBS&A to initiate the Phase 2 PFAS investigation until spring 2023. Given that the fiscal year ends on June 30, 2023, it was not possible to accomplish the project objectives that were outlined in the Phase 1 report. This section summarizes the work conducted during the Phase 2 investigation.

9.1 DBS-1 Monitor Well Pump Installation

DBS&A installed one downgradient monitor well in Curry County during Phase 1 (DBS-1). A dedicated pump with certified PFAS-free tubing was purchased during Phase 1, and this pump was set in monitor well DBS-1 during Phase 2. This well was also resampled for PFAS (Section 9.2).

9.2 Groundwater Sampling

NMED contracted with Hall Environmental Analysis Laboratory (HEAL) in Albuquerque for laboratory analysis of groundwater samples for the Phase 2 investigation. HEAL subcontracted with Enthalpy Analytical (Enthalpy, formerly Vista) in El Dorado Hills, California, for the PFAS analysis. The same laboratory analyzed samples for PFAS during the Phase 1 of the project, and this laboratory is certified by the Department of Defense (DoD) and the Department of Energy (DOE) to perform PFAS analysis of soil and water samples. Sample containers with appropriate preservatives were provided by HEAL. Upon collection, all samples were placed on ice in dedicated sample coolers and shipped to HEAL under appropriate chain of custody. HEAL forwarded the containers to Enthalpy for PFAS analysis.

DBS&A sampled three wells downgradient (east and southeast) of Cannon AFB in April 2023. These included two domestic wells and downgradient monitor well DBS-1, which was installed during Phase 1. Enthalpy analyzed the groundwater samples for 29 PFAS compounds using EPA methods 533 and 537.1.

Field parameter measurements for the samples from these three locations are provided in Table 4. The laboratory results for PFAS analysis of the samples from these three locations are provided in Table 5. The laboratory report for groundwater samples analyzed by Enthalpy are provided in Appendix A. EPA methods 533 and 537.1 are validated and approved by EPA for analysis of PFAS in drinking water, and have different, but overlapping, target analyte lists. For analytes analyzed by both methods, the lowest result was reported in Table 5 for non-detects and the highest result was reported for detections.

PFAS were detected in one sample (COS-36). PFOA and PFOS were not detected in this sample, but the sample contained a total PFAS concentration of 80.02 ng/L. The sample contained four PFCAs (PFBA, PFPeA, PFHxA, and PFHpA) and three PFSAs (PFBS, PFPeS, and PFHxS). PFCAs comprise approximately 70 percent of total PFAS detected, dominated by PFPeA (22.8 ng/L) and PFHxA (22 ng/L). The dominant PFSA was PFHxS (13.4 ng/L).

On June 15, 2022, EPA issued updated lifetime drinking water HAs for PFOA (0.004 ng/L), PFOS (0.02 ng/L), PFBS (2,000 ng/L), and HFPO-DA (10 ng/L). None of the PFAS concentrations detected in the COS-36 sample exceed those standards. However, exceedances for PFOA and PFOS cannot be ruled out because the reporting limits for PFOA and PFOS (1.91 to 1.94 ng/L, respectively, in the COS-36 sample) currently achievable by accredited laboratories are well above these standards.

On March 14, 2023, EPA announced non-enforceable proposed maximum contaminant levels for PFOA and PFOS of 4 ng/L, and proposed MCLGs of zero. At that time, EPA also announced a proposed MCL and MCLG for mixtures containing the following: PFNA, PFHxS, PFBS, and HFPO-DA (U.S. EPA, 2023). The April 2023 COS-36 sample exceeds the proposed MCL for mixtures based on the detected concentration of PFHxS.

Well COS-36 (or a well at or near the same location) was sampled by the USAF on September 25, 2018 (AFW, 2019). That September 2018 sample, designated CANON-RES1495-01-SP, was analyzed for PFAS; none were detected at a reporting limit of 4.2 ng/L. The USAF results are presented in Table 13 of the Phase 1 report (DBS&A, 2022).

During the Phase 1 investigation, DBS&A installed monitor well DBS-1 approximately 5.4 miles east-southeast of the southeast corner of Cannon AFB (Figure 3), from which one of the PFAS plumes emanate. The laboratory reported that the initial sample collected from DBS-1 in February 2022 contained PFBA at an estimated concentration (below the reporting limit and qualified) of 2.18 ng/L. DBS&A resampled DBS-1 in April 2023, and no PFAS were detected in the primary or duplicate samples (Table 5). A second sample was collected from DBS-1 in June 2023, but the results were not available at the time this report was prepared. Those results will be discussed in the Phase 3 report.

A total of 14 PFAS were detected in one or more of the groundwater samples from the Cannon off-site (COS) wells collected during Phase 1 by DBS&A. Of the 14 PFAS detected, 6 were PFCAs 5 were PFSAs, and 3 were FTSs. The PFAS data were analyzed by examining the proportions (percent) of individual PFAS detected in each sample.

- PFAS were detected in approximately 70 percent of the COS wells sampled during Phase 1. Total PFAS detected in the Phase 1 COS wells ranged from 1.8 ng/L to 37,732.87 ng/L.
- The proportions of PFCAs exceeded the proportions of PFSAs in about 40 percent of the wells in which PFAS were detected. Most of the wells along the east side of Cannon AFB are dominated by PFCAs, and on average contain 62 percent PFCAs, 34 percent PFSAs, and

4 percent FTSs. The April 2023 COS-36 sample falls within this category, but contains no FTSs.

- The proportions of PFSAs exceeded the proportions of PFCAs in 60 percent of the wells in which PFAS were detected. Most of the wells within the plume emanating from the southeast corner of the CAFB are dominated by PFSAs, and on average contain 60 percent PFSAs, 34 percent PFCAs, and 6 percent FTSs.

In June 2023, DBS&A resampled monitor well DBS-1 and the two domestic wells that were sampled in April 2023, and also sampled seven other domestic wells. The June 2023 groundwater samples will be analyzed for 40 PFAS compounds using isotope dilution liquid chromatography/tandem mass spectrometry (LC/MS/MS) methods. This is the method that was used during Phase 1, and that was used for DoD compliant projects (adhering to Table B-24 of the DOD's Quality Systems Manual). The number of PFAS compounds being analyzed is larger than the list of compounds analyzed during Phase 1 and during other DoD sampling events discussed in the Phase 1 report. The number of PFAS compounds has been increased from 29 to 40 to be consistent with the compounds that are analyzed by EPA's draft method 1633. The DoD has begun using draft method 1633 for PFAS analyses, but a number of states have not (Christmann, 2023). Draft method 1633 is expected to be finalized by the end of 2023. The June 2023 groundwater quality results had not been received at the time this report was prepared.

9.3 Numerical Modeling

To evaluate PFOS and PFOA transport, an existing regional groundwater model that covers a large area including Cannon AFB was used as a starting point. Although existing regional models that include the region of interest are too coarse for detailed plume simulation, they can provide useful information on aquifer hydraulic properties, regional groundwater stresses, and changes in groundwater flow directions over time. The results of the regional model were used to obtain the hydraulic head values at the boundaries of a smaller, local groundwater model developed for the vicinity of Cannon AFB. The approach of developing an embedded local model based on a larger-scale regional model is particularly important for the Ogallala Aquifer because the PFOS and PFOA plumes have developed over time while aquifer conditions have been changing. In this type of situation, it is advantageous to use a regional model to define transient boundary conditions at the edge of a more detailed groundwater flow and solute transport model.

This section describes the regional and local models developed for PFOS and PFOA plume evaluation, and presents the results of initial PFOS and PFOA transport simulations. There are three models discussed: the regional groundwater model, the local groundwater model, and the local contaminant transport model.

9.3.1 Regional Groundwater Flow Model

DBS&A developed two regional groundwater flow models (Blandford et al., 2003 and 2008) for the Texas Water Development Board (TWDB) that cover the Ogallala Aquifer in Texas and eastern New Mexico. The models were developed as part of the Texas initiative to develop groundwater availability models (GAMs) for the major and minor aquifers in Texas. As part of these models, lithologic data from well logs was used in conjunction with specific capacity data to estimate Ogallala Aquifer hydraulic conductivity. The two models developed by DBS&A were the basis of a subsequent GAM that extended the simulation period and added the underlying Dockum Aquifer to the model (Deeds and Jigmond, 2015). The Ogallala Aquifer portion of that model was, for the most part, unchanged from previous GAMs. The Deeds and Jigmond (2015) model is a three-dimensional groundwater flow model that simulates historical water levels between 1930 and 2012. The model covers an area of 466 miles by 290 miles, and the model grid is divided into 932 rows and 580 columns; each grid cell is 0.5 mile by 0.5 mile. The extent of the model is shown in Figure 4. The model has four layers, in which Layer 1 represents the Ogallala Aquifer. Layer 2 is a dummy layer in the vicinity of Cannon AFB; it provides connectivity between the Ogallala (Layer 1) and the Upper and Lower Dockum (Layers 3 and 4 of the model, respectively).

Another regional model (Musharrfieh and Logan, 1999) was developed by the New Mexico Office of the State Engineer (OSE). This is a two-dimensional groundwater flow model (one model layer representing the Ogallala Aquifer) that simulates aquifer conditions between 1909 and 1990. The model grid has 74 rows and 58 columns; each grid cell is 1 mile by 1 mile. The extent of this model is also shown in Figure 4.

9.3.1.1 Evaluation of Regional Models

DBS&A evaluated both the OSE regional model and the most recent TWDB Ogallala Aquifer GAM to determine the best model for use as a starting point to develop a local model around Cannon AFB. Figure 5 shows a comparison of simulated horizontal hydraulic conductivity in the OSE model and in Layer 1 of the TWDB GAM (both representing the Ogallala Aquifer) in the vicinity of Cannon AFB. The figure shows a more detailed distribution of hydraulic conductivity in the TWDB GAM than in the OSE model. More importantly, a high hydraulic conductivity value

is simulated in the TWDB GAM along the paleochannel that runs across Cannon AFB (Figure 5). This paleochannel was depicted in Appendix B of the Cannon AFB Phase 1 investigation report (DBS&A, 2022) by mapping the base elevation of the Ogallala Formation. A paleochannel in the same general area was simulated in the Blandford et al. (2003) model (Figure 5). As detailed in Blandford et al. (2003), paleochannels in the Ogallala Aquifer tend to have higher aquifer hydraulic conductivity relative to adjacent, non-paleochannel regions. This observation is incorporated in the hydraulic conductivity distribution of the TWDB GAM (Figure 5).

Based on review of the two models, the determination was made to use the TWDB GAM as a starting point to develop the local model around Cannon AFB. This determination was made primarily because:

- The TWDB GAM has a more detailed hydraulic conductivity distribution that follows the lithologic understanding of higher hydraulic conductivity within paleochannels, including in the area of Cannon AFB.
- The TWDB GAM simulates conditions through more recent time (2012 vs. 1990 in OSE model)

The TWDB GAM of Deeds and Jigmond (2015) is hereafter referred to as the regional model.

9.3.1.2 Calibration Evaluation of the Regional Model

The calibration of the regional model in the vicinity of Cannon AFB was evaluated by plotting measured and simulated water levels at 55 monitor wells in the vicinity of Cannon AFB. These wells are listed in Table 6. Well locations are shown in Figure 6. For the wells inside Cannon AFB, measured water level data were obtained from Cannon AFB. For wells outside Cannon AFB, water levels were obtained from the USGS National Water Information System (NWIS).

Appendix B shows measured and simulated water levels at the 55 wells. The comparison shows that the model reasonably simulates the observed trend in water levels at most wells. There are several wells where the model overestimates or underestimates the observed water levels. One quantitative measure of the goodness of fit of a groundwater model is the root mean squared error (RMSE), which is a statistical measure of the difference between measured and simulated water levels. RMSE of the regional model in the vicinity of Cannon AFB is 32.8 feet, which represents 12.6 percent of the difference between highest measured water level and lowest measured water level in all 55 wells. One common rule of thumb to determine an acceptable model calibration is to have a RMSE of 10 percent or less of the range in observed water levels,

a measure unmet by the regional model in the vicinity of Cannon AFB. Therefore, it was decided to update the regional model calibration in the vicinity of Cannon AFB to better match observed water levels. Rather than conduct the updated calibration using the full regional model, a local groundwater model was developed around Cannon AFB, and adjustments were made to the local model.

9.3.2 Local Groundwater Flow Model

The local groundwater flow model developed around Cannon AFB covers an area of 24 miles by 26 miles with a model grid divided into 384 rows and 416 columns (Figure 7). Each grid cell is 330 feet by 330 feet. The local model has only one layer, and the top and bottom elevations of the layer are imported from Layer 1 of the regional model. Each regional model grid cell is represented by 64 local model grid cells (Figure 7). To ensure smoothness of the top and bottom elevation surfaces in the local model, elevations of the regional model (the coarse grid) were linearly interpolated to obtain values at each local model grid cell.

The local groundwater model simulates conditions from 1930 through 2022; the USGS MODFLOW-NWT (Niswonger et al., 2011) platform was used for model development. One feature of MODFLOW-NWT different from previous versions of MODFLOW is that the user can specify a minimum layer thickness fraction at which the pumping from a model cell is automatically scaled back. This capability allows for the simulation of the decline in pumping rate that has occurred at Ogallala Aquifer wells due to the reduction in saturated thickness. A minor modification was made to the source code to change the way the minimum thickness fraction is specified. In the original code, the minimum thickness is specified as a fraction of the cell thickness. The modification allows the user to enter a minimum saturated thickness value (in feet) at which pumping will be curtailed. In the local groundwater model, the minimum thickness at which pumping would be curtailed was set to 30 feet, consistent with the regional model.

9.3.2.1 Local Model Boundary Conditions

Groundwater stresses, such as pumping and recharge, were obtained from the reginal model for the period 1930 through 2012. Stresses from 2013 through 2022 were held constant at 2012 values. Because the model automatically curtailed the pumping from a model cell when the saturated thickness reached 30 feet in that cell, simulated pumping from many of the wells in the period 2013 through 2022 were lower than the 2012 values.

The local model is surrounded by specified head boundaries on all four sides (Figure 7), with time-series specified head values obtained from the simulated heads of the regional model at those locations. Because the regional model has coarser grid cells than the local model, simulated heads at the regional model grid cells at those edges were linearly interpolated and applied to the finer grid cells of the local model.

Any pumping well in a regional model grid cell within the local model extent (except for wells within Cannon AFB) was applied to one local model cell in the middle of the 64 local model grid cells that represent the regional model grid cell (Figure 6). All simulated pumping in the regional model within Cannon AFB was removed and replaced by currently active wells of the Cannon AFB public water system. As explained in Bristol (2021), Well #4A mainly supplies irrigation water for the golf course, while Wells #5, #8, #9, and #12 currently supply drinking water (Figure 7). Simulated pumping values in the local model are 125, 100, 112.5, 150, and 175 gallons per minute (gpm) for wells 4A, 5, 8, 9, and 12, respectively. These values represent 50 percent of the average pumping rates listed in Bristol (2021). Total simulated pumping from wells in Cannon AFB is approximately 955,000 gallons per day (gpd), which is similar to the 1,000,000 gpd value listed in Bristol (2021).

For all boundary conditions other than pumping and specified hydraulic head at the local model boundary, the simulated value in a regional model grid cell was applied to all equivalent 64 local model grid cells.

9.3.2.2 Local Model Calibration

Aquifer hydraulic properties (e.g., hydraulic conductivity and storage coefficient) were initially taken from the regional model, but were modified during model calibration. Initially, the hydraulic property from a regional model grid cell was applied to all 64 local models grid cells included in the regional model grid cell. This approach led to simulated results from the local model similar to those of the regional model.

The local groundwater flow model calibration was consisted of minimizing the differences (the RMSE) between simulated and observed water levels at 55 monitor wells. Because the specified head boundaries at the edges of the local model were obtained from the regional model, it was necessary to keep the changes to hydraulic properties in the local model at distance from the local model boundaries to minimize effects on the simulated hydraulic heads results at the edges of the local model. Figure 8 shows the area of the local model within which hydraulic conductivity was allowed to change from the values of regional model; this area is 4 miles from the edges of the local model.

Within the zone where the hydraulic conductivity was allowed to change, the pilot point approach was used to populate a hydraulic conductivity value in each local model cell. Each pilot point is a parameter that can have a unique value of hydraulic conductivity. The set of pilot points is then interpolated to the model grid to create a heterogeneous distribution. Automated parameter estimation program (PEST) (Doherty, 2010) was used to obtain a unique value in each pilot point, such that when the hydraulic conductivity values of all pilot points are interpolated, they result in a hydraulic conductivity distribution that minimizes the RMSE between measured and simulated heads in the monitor wells.

A total of 106 pilot points were used in the model (Figure 8). Of those points, 90 are placed in the model in a uniform grid pattern. Another 16 pilot points were added, mostly along the inferred paleochannel (Figure 8). Of those pilot points, 6 (at the edge of the zone where hydraulic conductivity was allowed to change) had fixed values to ensure a smooth transition between hydraulic conductivity outside that zone and resulting hydraulic conductivity inside that zone. Thus, PEST was allowed to change the hydraulic conductivity at 100 pilot points within a given range prescribed for each point.

Most of the pilot points (64) were assigned a range of allowable hydraulic conductivity of 5 to 75 feet per day (ft/d). This range is consistent with Howard (1954), who estimated hydraulic conductivity ranging from 8 to 92 ft/d in the area east of Clovis. This range is also consistent with the estimated hydraulic conductivities from the Cannon AFB production well and two nearby irrigation wells, which ranged from 20 to 60 ft/d (Trinity, 2012). A total of 21 pilot points, mostly along the inferred paleochannel, had an allowable hydraulic conductivity range of 50 to 200 ft/d, which is the highest end of the range of Hart and McAda (1985) for the High Plains Aquifer in Curry County. The remaining 21 pilot points provide a transition between pilot points with a low hydraulic conductivity range and those with a high hydraulic conductivity range. The range of hydraulic conductivity values for those 21 pilot points is 25 to 125 ft/d.

PEST was run and the optimization algorithm required over 1,000 local groundwater model simulations. Details of the optimization algorithm can be found in (Doherty, 2010). The optimum hydraulic conductivity determined for each pilot point and the resulting hydraulic conductivity of the local model are shown in Figure 9. Appendix B shows improved calibration of the local model in almost all calibration wells compared to the regional model. The RMSE of the local model is 12.1 feet, which is 4.6 percent of the range of the measured water level data, well below the 10 percent threshold. Figure 10 shows simulated heads as of 2022, which shows southeasterly flow direction consistent with DBS&A (2022).

9.3.3 Transport Model

A second local model that covers an even smaller region than the local groundwater model was developed to conduct solute transport simulations. This model is referred to as the transport model. This transport model covers a subregion of the local groundwater flow model, and boundary conditions are determined based on the local groundwater flow model using the same approach as described for the regional and local groundwater models.

The transport model has dimensions of 10 miles by 12 miles (Figure 11), and the model grid is discretized into cells of 110 feet by 110 feet. Hydraulic properties and boundary conditions for the transport model were imported from the local groundwater flow model without modification. As a result of importing the hydraulic properties from the local groundwater flow model "as is," and imposing boundaries at the edges of the transport model using the results of the local groundwater flow model, the simulated heads in the transport model are nearly identical to those of the local groundwater flow model (Figure 11).

A preliminary PFOS and PFOA fate and transport simulation was conducted to simulate plume migration downgradient of Cannon AFB. Additional transport simulations will be conducted in the future as part of a separate scope of work. The contaminant transport modeling was conducted using with MT3D-USGS (Bedekar et al., 2016). The contaminant transport simulation assumed constant concentrations of PFOS and PFOA at seven model cells at the southeast corner of Cannon AFB, consistent with the locations of highest measured concentrations as of December 2021 (Figure 12). The constant concentration at the cell at the right was assigned measured concentration of well MW-Ca as of December 2021. The constant concentration at the cell at the left was assigned the observed concentration of well MW-D as of December 2021. The concentration was linearly interpolated between those two cells to estimate concentration values at the five model cells between those two bounding cells. For all seven cells, the prescribed concentration was held constant from 1970 through 2022, a period of 53 years.

Values of contaminant transport parameters (e.g., dispersivity, effective porosity, and retardation factor) used in the simulations for both PFOS and PFOA are listed in Table 7. Although these values are reasonable estimates, they may be adjusted when additional solute transport simulations are conducted.

Simulated concentrations for PFOS and PFOA as of 2022 are depicted in Figures 13 and 14, respectively. The model shows that the PFOS plume is approximately 1.6 miles long (Figure 13). The simulated PFOA plume, which is subject to a lower assigned retardation factor, is approximately 3 miles long (Figure 14).

10. Cannon AFB Remedial Investigation

10.1 Proposed Activities

An AFFF release area Phase I RI work plan was developed for Cannon AFB and downgradient of the base by Bristol Environmental Solutions, LLC (Bristol) and Geosyntec Consultants, Inc. (Geosyntec) in 2021 (Bristol, 2021). The RI is currently underway under EPA Region 6 oversight. The RI will include on-base investigations at AFFF release areas 2 through 6 and 8 through 10 (Table 6 of DBS&A, 2022). Area 8 has been expanded to include other areas of Cannon AFB where treated wastewater has been used for irrigation. The scope of work for the RI includes the following:

- Sample 19 existing groundwater monitor wells on Cannon AFB and up to 40 off-base irrigation wells on two occasions, six months apart.
- Install and sample at least 8 new groundwater monitor wells on Cannon AFB and up to 15 new groundwater monitor wells off-base. Soil samples will be collected from each boring at 9 to 10 feet bgs and just above the water table. At one on-base location, soil samples will be collected every 50 feet. Groundwater will be sampled on two occasions, six months apart.
- Collect surface soil samples at more than 70 locations on Cannon AFB.
- Collect soil samples from more than 150 borings on Cannon AFB.
- Sample irrigated soil from 40 off-base irrigation well locations at 0 to 0.5 feet bgs and 1.5 to 2 feet bgs.
- Install 12 lysimeters at six locations during the wet season and sample porewater.

New monitor wells will be installed using sonic drilling methods. The locations of the proposed off-base activities, including new monitor wells, are currently not known because those portions of the work plan (Bristol, 2021) have been redacted.

The USAF is also conducting an aquifer performance test in a newly installed extraction well in the southeast corner of Cannon AFB. The purpose of the test is to develop estimates of site-specific aquifer parameters to facilitate the design and construction of a pilot-scale groundwater containment and treatment system (Brice-AECOM, 2021).

10.2 Status

Bristol began drilling in April 2022, and by the end of July 2022 had completed 7 of 13 permitted monitor wells on Cannon AFB. It is likely that they would have completed all of the wells by the end of 2022, but the OSE database only has data for 7 wells. These logs, a figure showing the monitor well locations, and a table summarizing their well completion information are provided in Appendix C. No permits from OSE had been identified for any off-site monitor well locations.

DBS&A contacted the USAF in May 2023 to request an update on the status of the RI at Cannon AFB. The U.S. Air Force Civil Engineer Center restoration project manager at Cannon AFB said that 9 of 13 proposed on-base monitor wells have been completed, and that 15 off-base monitor wells are proposed and will be installed after the USAF negotiates access for the proposed locations (Gierke, 2023).

An RI report will be prepared that will include descriptions of field activities and a summary of the scope of work and any deviations, as well as a base-wide conceptual site model addressing hydrogeologic conditions, the nature and extent of contamination, potential sources of PFAS contamination, fate and transport of PFAS, and potential exposure pathways and receptors (Bristol, 2021). The time frame for this report is unknown, but it will likely not be prepared until all RI activities are complete.

11. Recommendations

Recommendations from the Phase 1 report that were not addressed during Phase 2 that DBS&A recommends be the focus of Phase 3 of the project include the following:

- Establish a technical dialogue between NMED, USAF, and EPA to determine the nature and extent of the USAF's plans for off-site investigation and to coordinate field and data collection efforts.
- Obtain monthly or quarterly progress reports on activities associated with the USAF RI from the USAF or EPA, including access to preliminary data. The USAF RI report documenting the results of the investigation will not be available for some time. Therefore, NMED should coordinate with USAF to obtain characterization data for PFAS-contaminated sediment in the vadose zone and groundwater sample splits from new and existing monitor wells.

- Conduct analytical and/or numerical modeling activities to assess groundwater flow and PFAS transport and to better define the nature and extent of PFAS contamination at the Cannon site.

Coordination with the USAF regarding their ongoing RI and the potential for splitting samples for their proposed off-base monitor wells is seen as the highest priority action for the Cannon site in FY 2024. The initial Cannon site groundwater modeling was performed during Phase 2 (Section 9.3). DBS&A proposes to discuss the Phase 2 Cannon site modeling and results with NMED before outlining potential future modeling activities.

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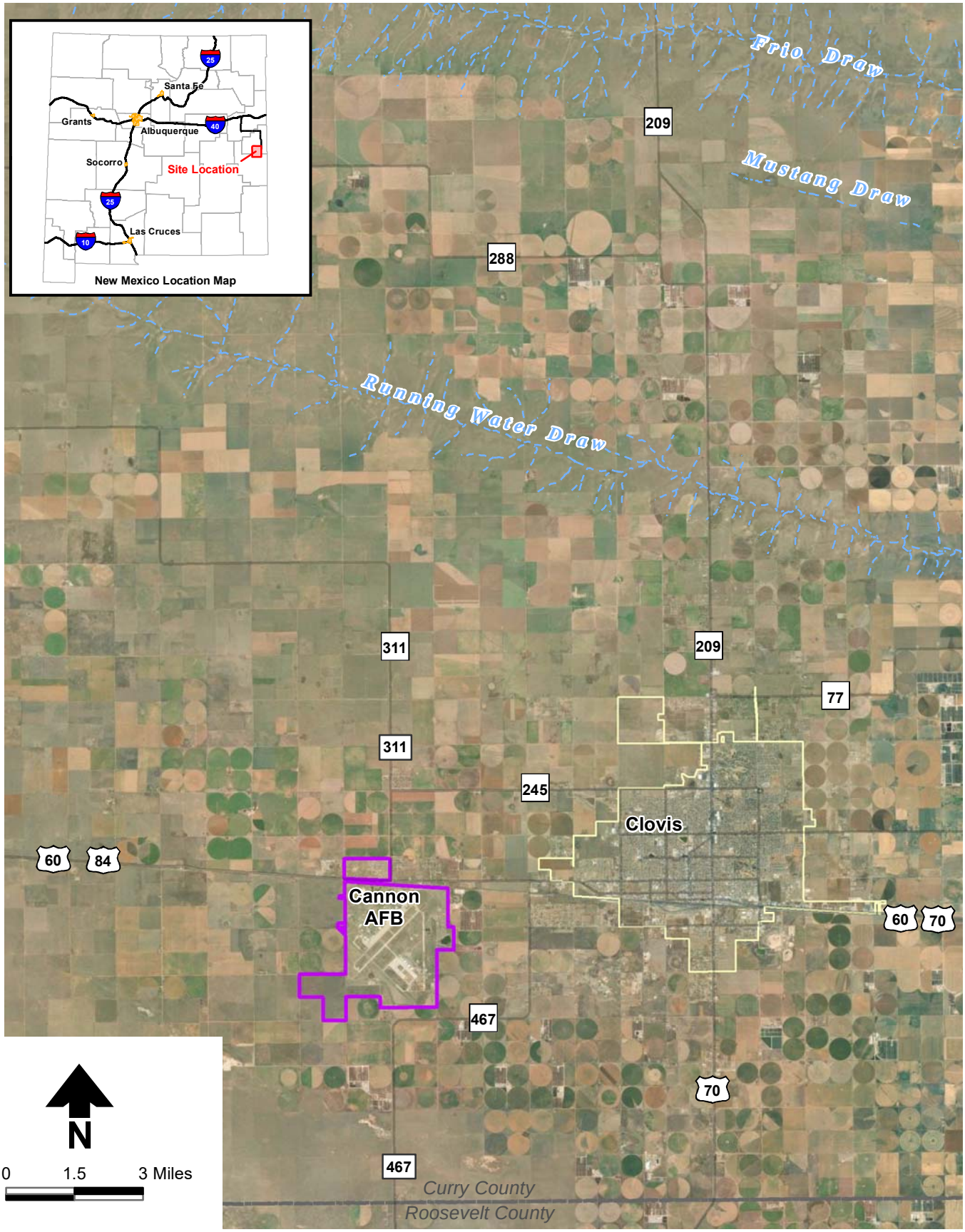
Figures



Explanation

Cannon Air Force Base | City of Clovis | Road

Source: Maxar, Vivid 2017-2018 composite

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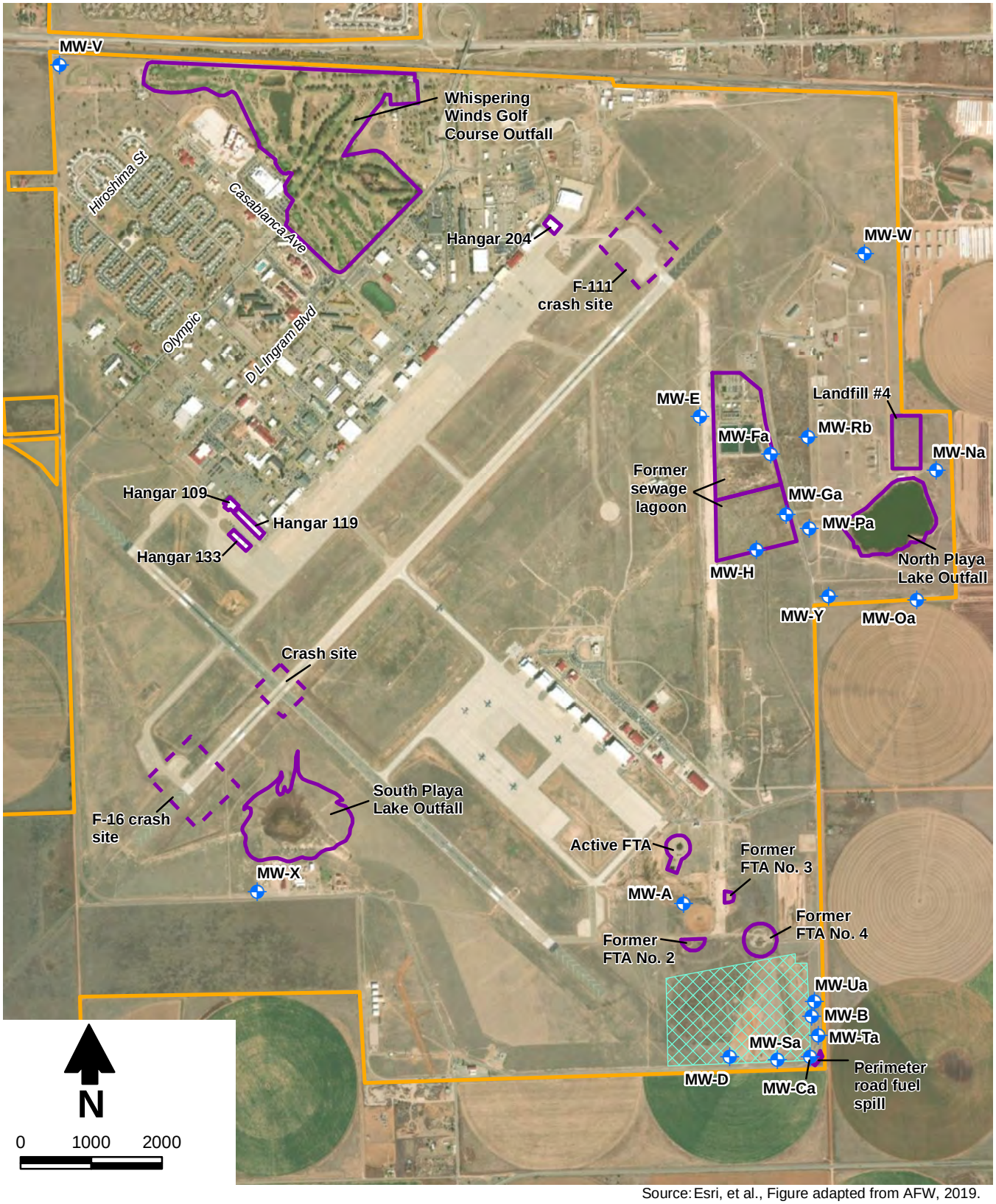
NMED PFAS INVESTIGATION, CANNON AFB

Vicinity Map

Figure 1



Source: Esri, et al., Figure adapted from AFW, 2019.

Explanation

- Monitor well
- AFFF release area
- Approximate AFFF release area
- Landfill 5
- Cannon AFB Installation boundary

S:\Projects\DB23.1087_NMED_PFAS_FY2023\VR_Drawings\Illustrator\F02 Cannon AFFF Release Areas.ai

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NMED PFAS INVESTIGATION, CANNON AFB

AFFF Release Areas

Figure 2

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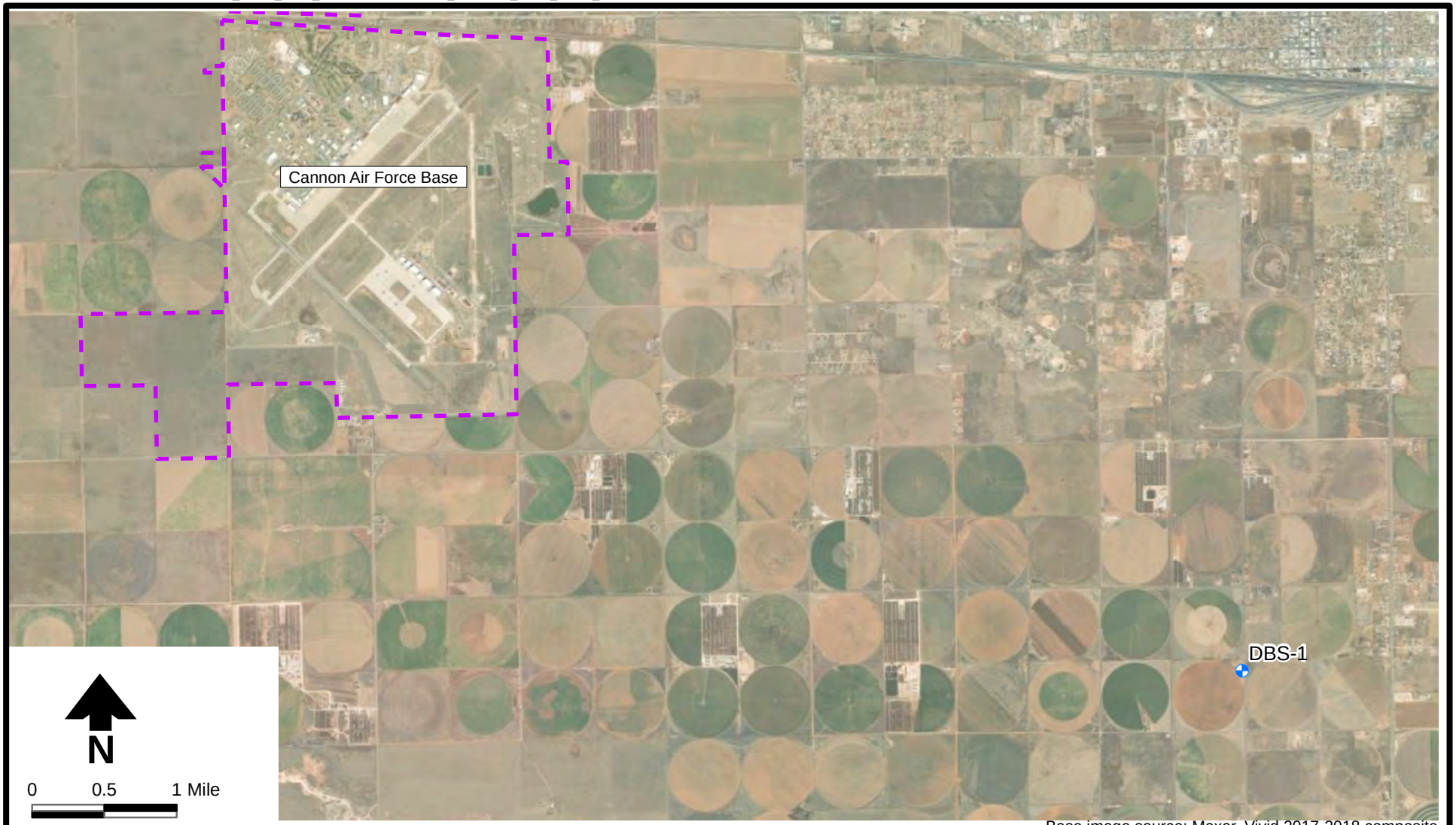

Base image source: Maxar, Vivid 2017-2018 composite

Explanation

- DBS-1

Figure 3

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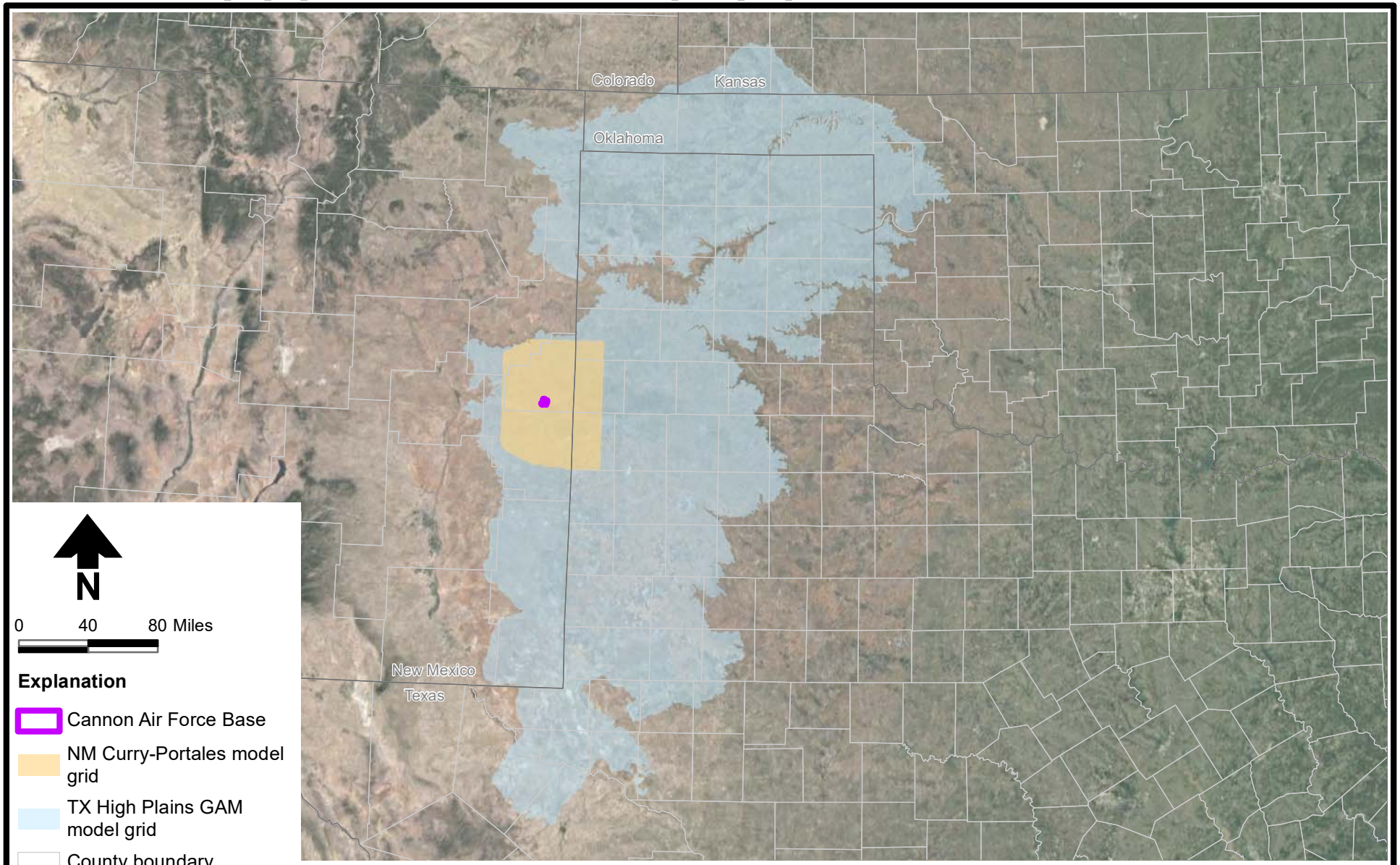
NMED PFAS INVESTIGATION, CANNON AFB

Monitor Well DBS-1 Location

\\SS6ABQ\DATAS\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE04_REGIONAL_MODEL_GRIDS.MXD



Source: Google Earth, 2/16/2020

Figure 4

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NMED PFAS INVESTIGATION, CANNON AFB

Regional Model Grids

S:\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE05_HORIZONTAL_HYDRAULIC_CONDUCTIVITY.MXD

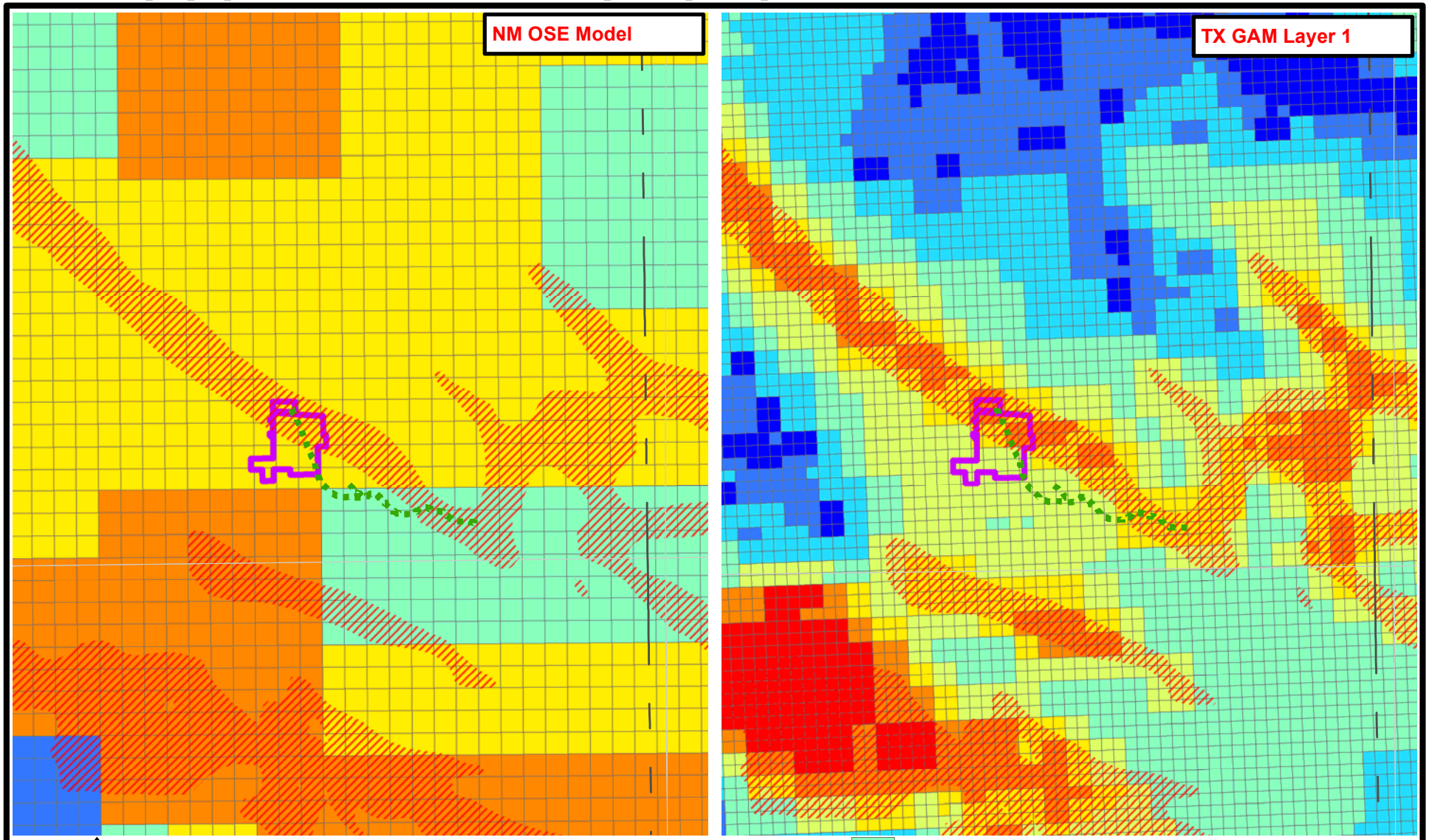

Figure 5

NMED PFAS INVESTIGATION, CANNON AFB

Horizontal Hydraulic Conductivity

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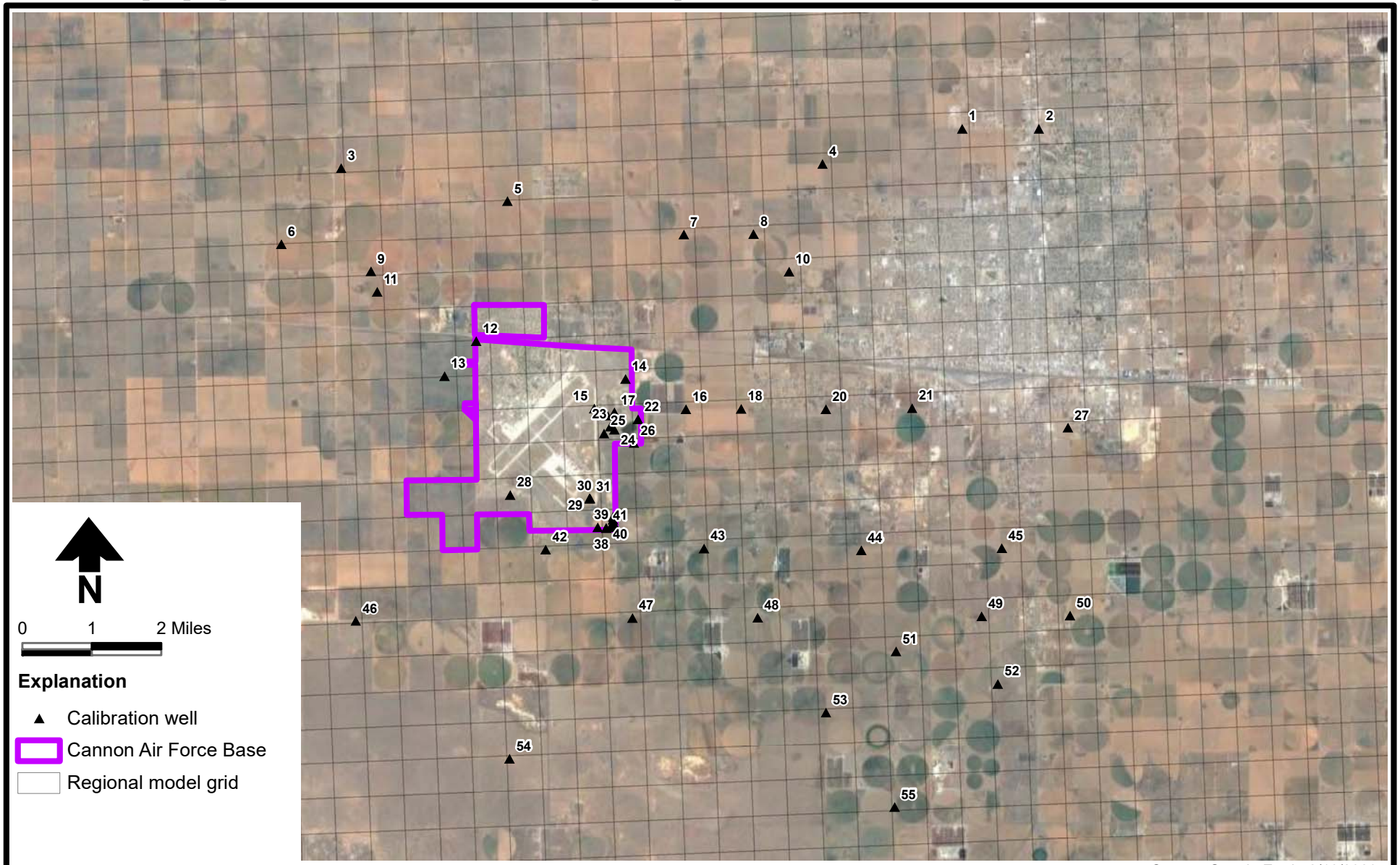

Source: Google Earth, 2/16/2020

Figure 6

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NMED PFAS INVESTIGATION, CANNON AFB

Calibration Wells

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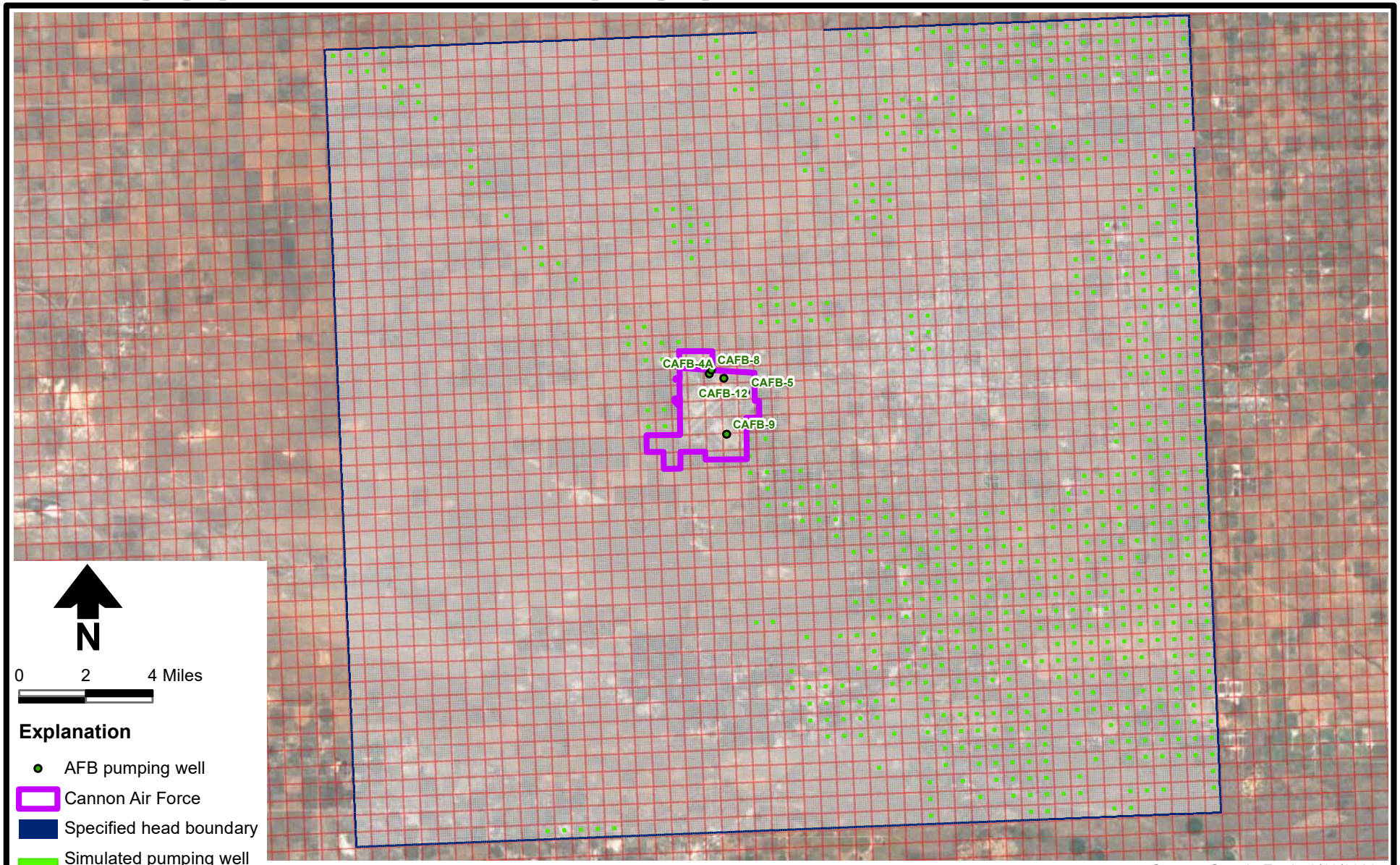

Source: Google Earth, 2/16/2020

Figure 7

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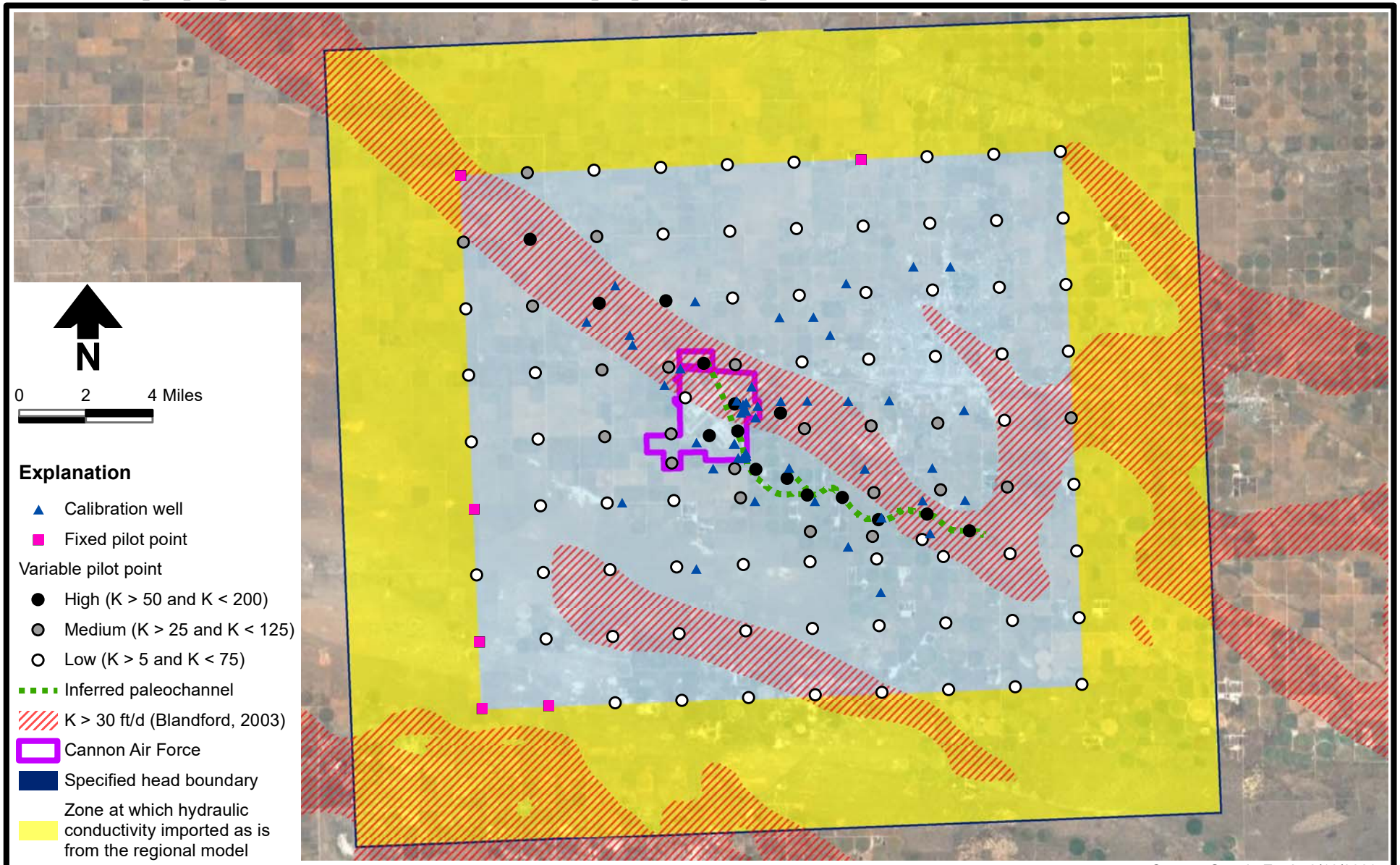
NMED PFAS INVESTIGATION, CANNON AFB

Regional and Local Model Grids

S:\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE08_PILOT_POINTS_CALIBRATED_ZONES.MXD



Source: Google Earth, 2/16/2020

Figure 8

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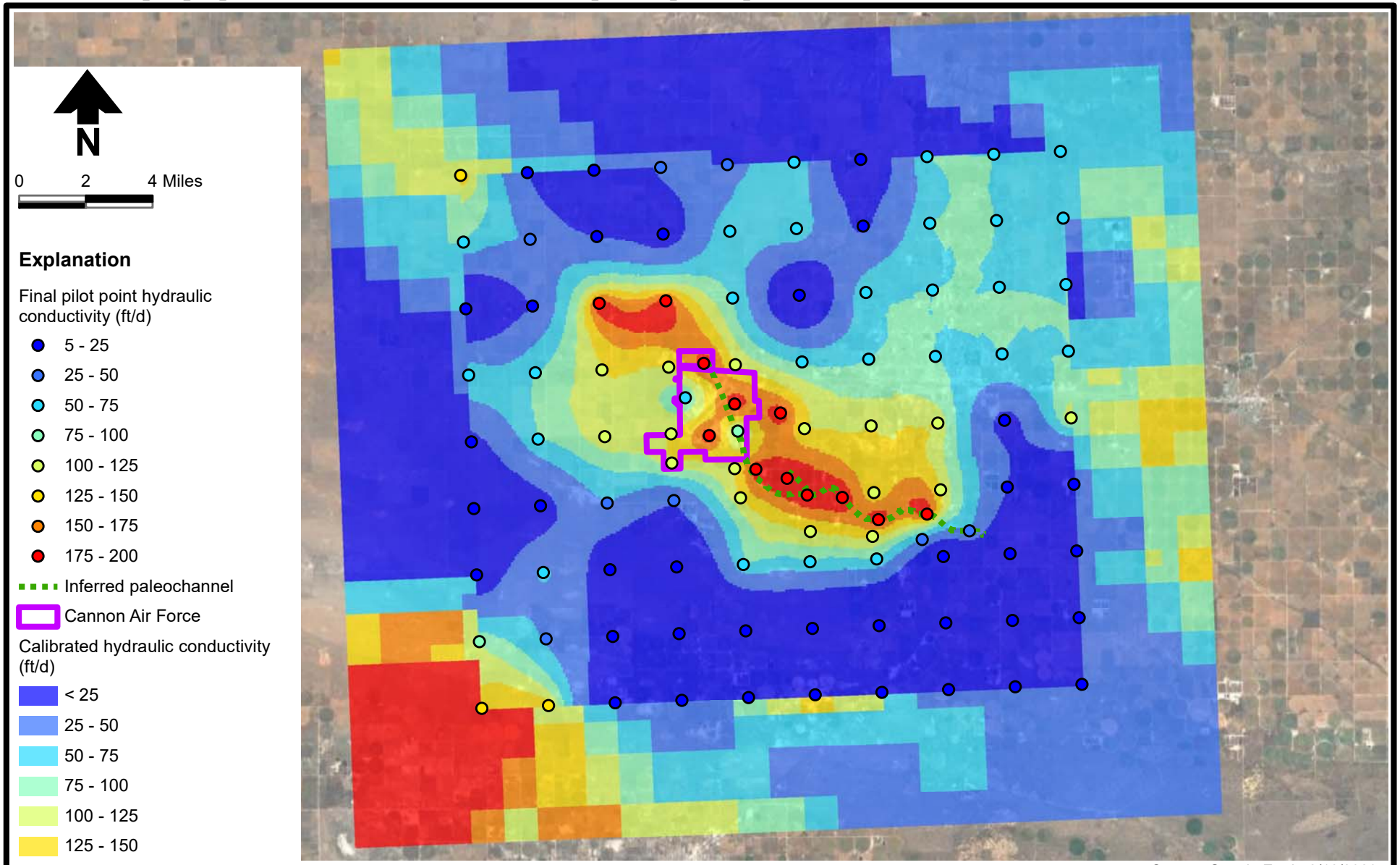
NMED PFAS INVESTIGATION, CANNON AFB

Pilot Points and Calibrated Hydraulic Conductivity Zones

S:\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE09_CALIBRATED_HYDRAULIC_CONDUCTIVITY.MXD



Source: Google Earth, 2/16/2020

Notes:
1. Hydraulic conductivities outside the area of pilot points are imported from the regional model.
2. Hydraulic conductivities inside the area of pilot points are the result of pilot point interpolation.

Figure 9

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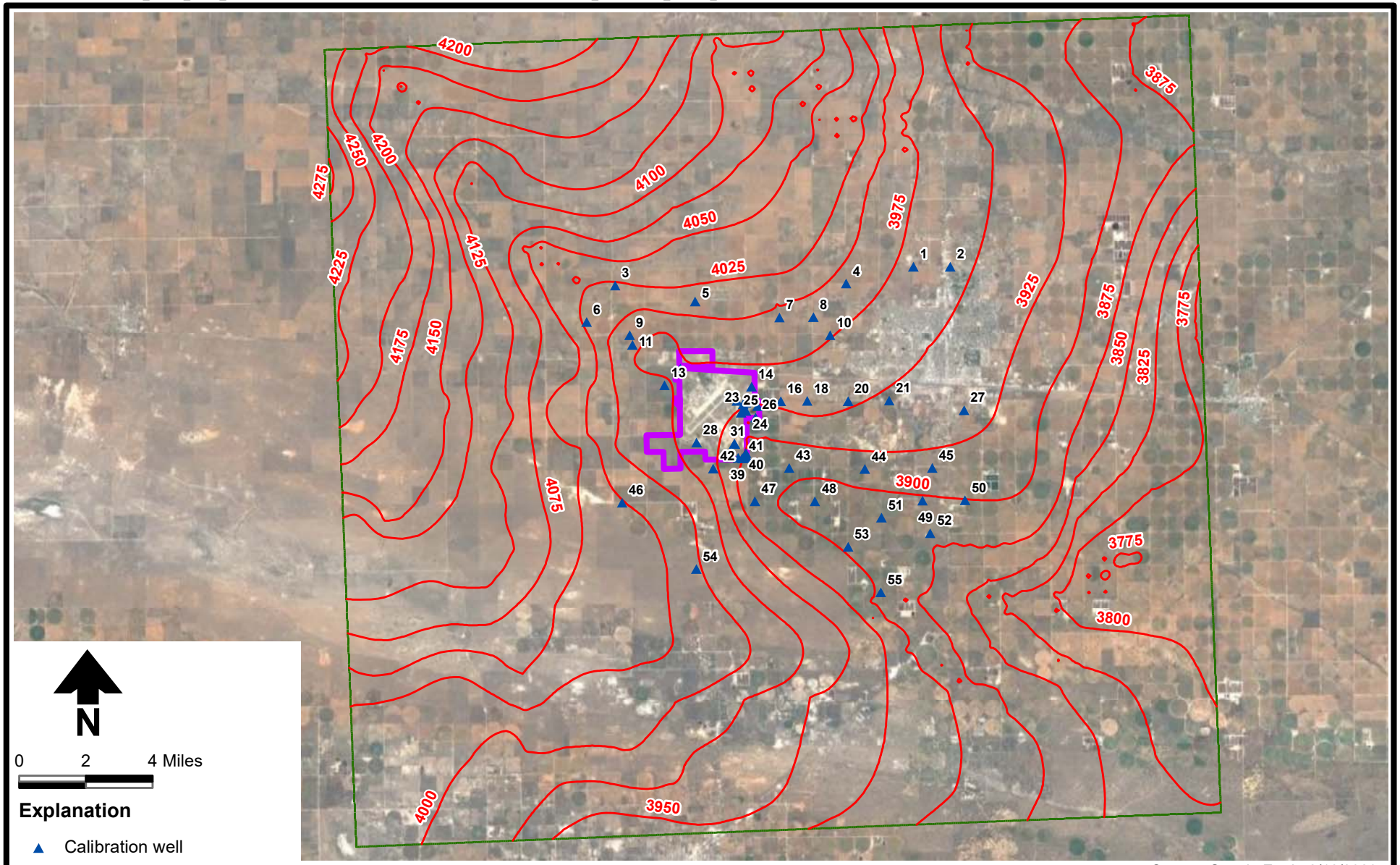
6/29/2023 DB23.1087

NMED PFAS INVESTIGATION, CANNON AFB

Local Model Calibrated Hydraulic Conductivity

S:\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE10_SIMULATED_HEADS_2022.MXD



Source: Google Earth, 2/16/2020

Figure 10

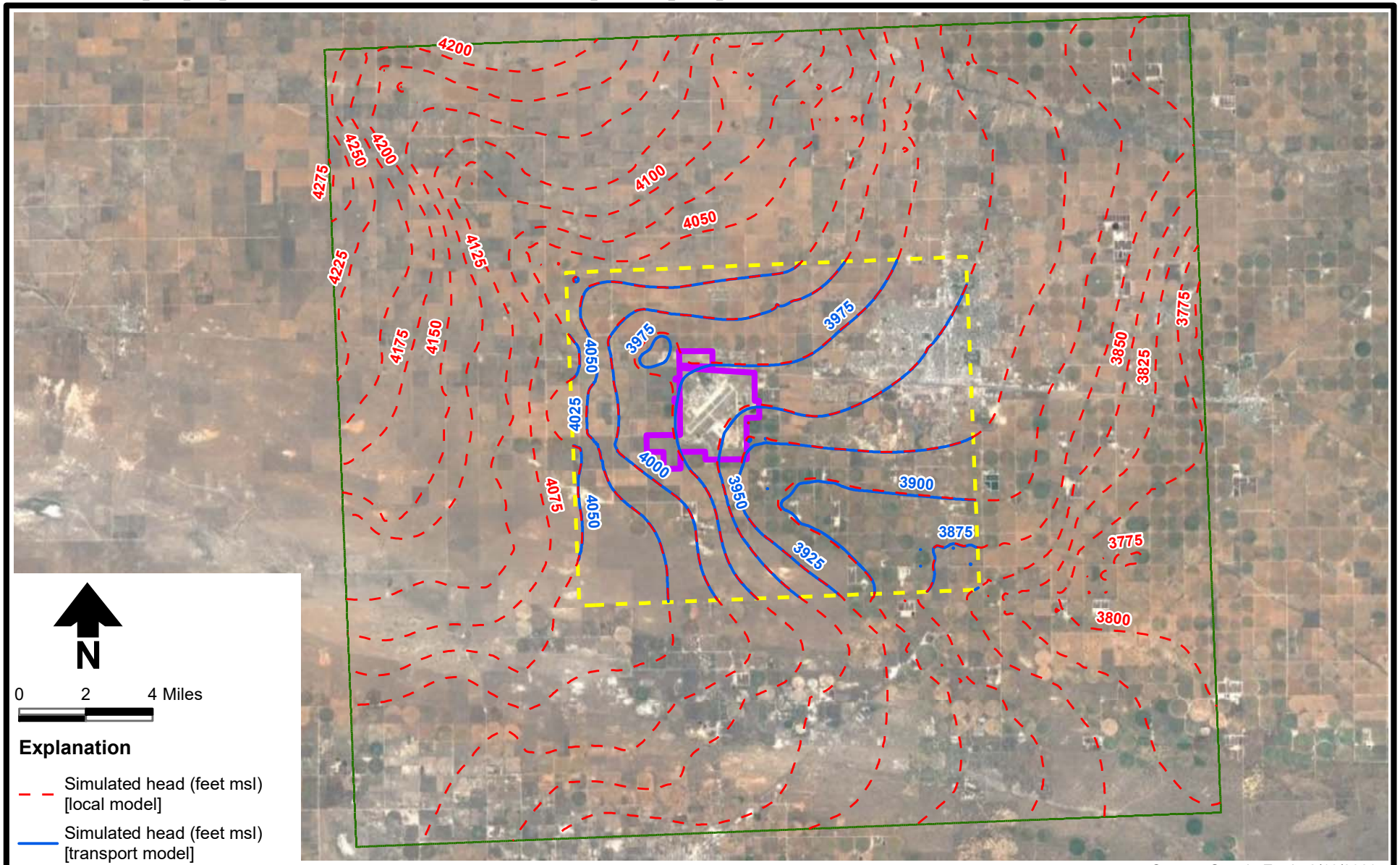
NMED PFAS INVESTIGATION, CANNON AFB

Simulated Heads as of 2022, Calibrated Local Model

DBS&A a Geo-Logic Company

6/29/2023 DB23.1087

S:\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE11_TRANSPORT_MODEL_EXTENT.MXD



Source: Google Earth, 2/16/2020

Figure 11

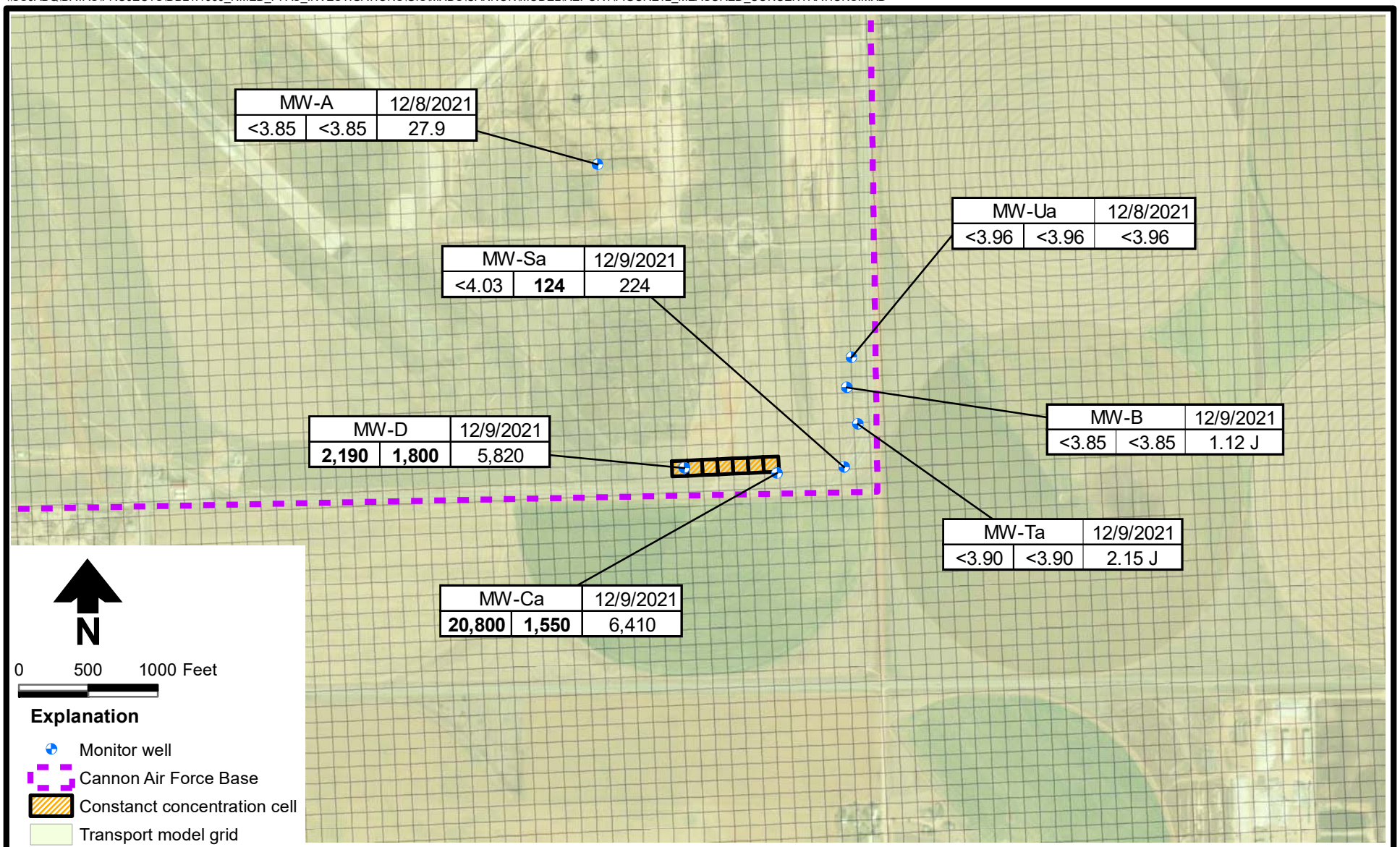
NMED PFAS INVESTIGATION, CANNON AFB

Extent of Transport Model Grid and Comparison of 2022 Simulated Heads of Calibrated Local Model and Transport Model

DBS&A a Geo-Logic Company

6/29/2023 DB23.1087

\\SS6ABQ\DATAS\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE12_MEASURED_CONCENTRATIONS.MXD



Notes:
1. All results are in nanograms per liter (ng/L)
2. J = Concentration below the reporting limit and is considered an estimate
3. **Bold** indicates concentration exceeds lifetime health advisory level of 70 ng/L

Location ID		Sample Date
PFOS	PFOA	PFHxS

Source: Google Earth, 2/16/2020

Figure 12

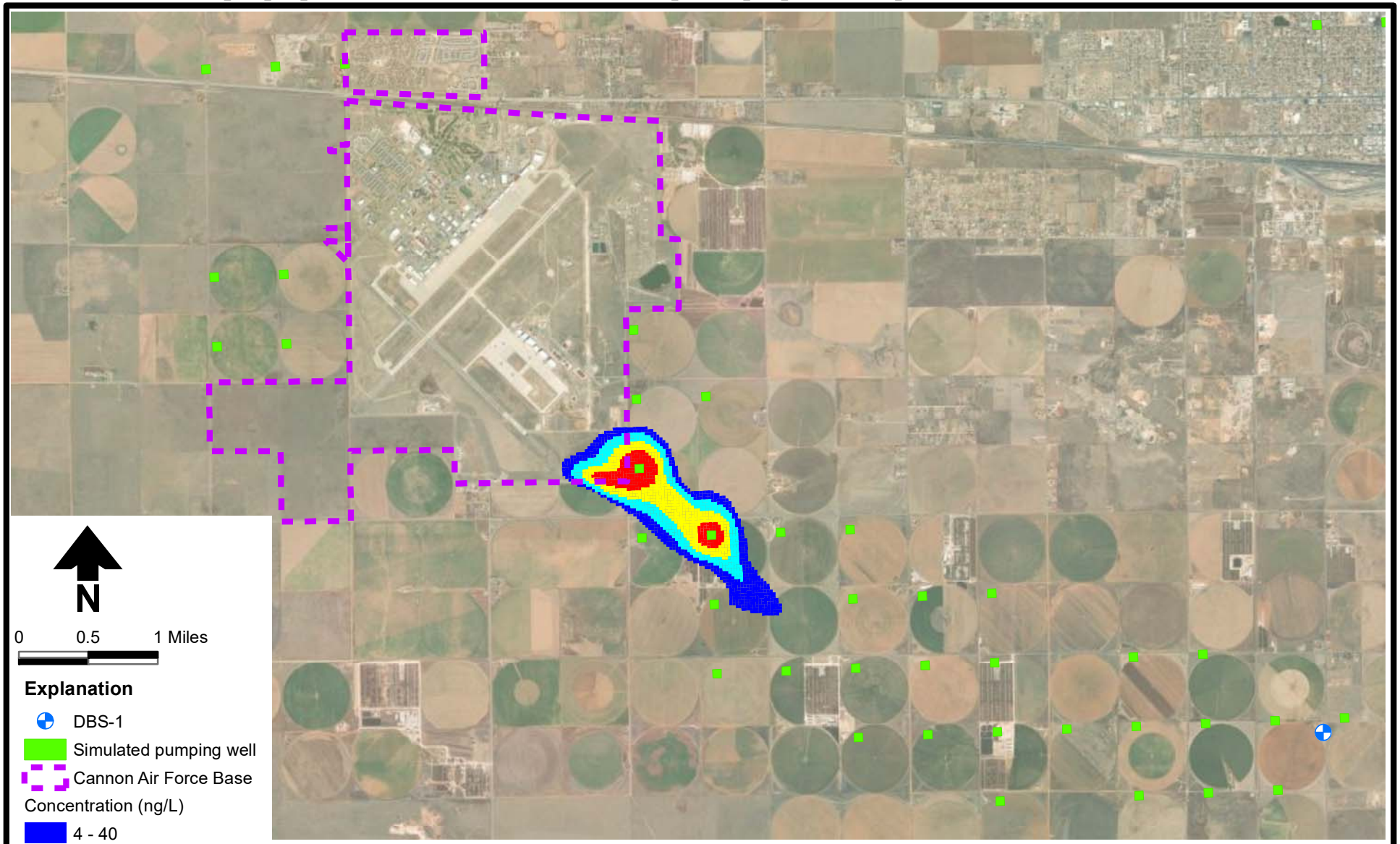
NMED PFAS INVESTIGATION, CANNON AFB

PFOS, PFOA, and PFHxS Concentrations in December 2021 and Simulated Constant Concentration Cells

DBS&A a Geo-Logic Company

6/30/2023 DB23.1087

\\SS6ABQ\DATAS\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE13_SIMULATED_PFOS_CONCENTRATIONS_2022.MXD



Source: Google Earth, 2/16/2020

Figure 13

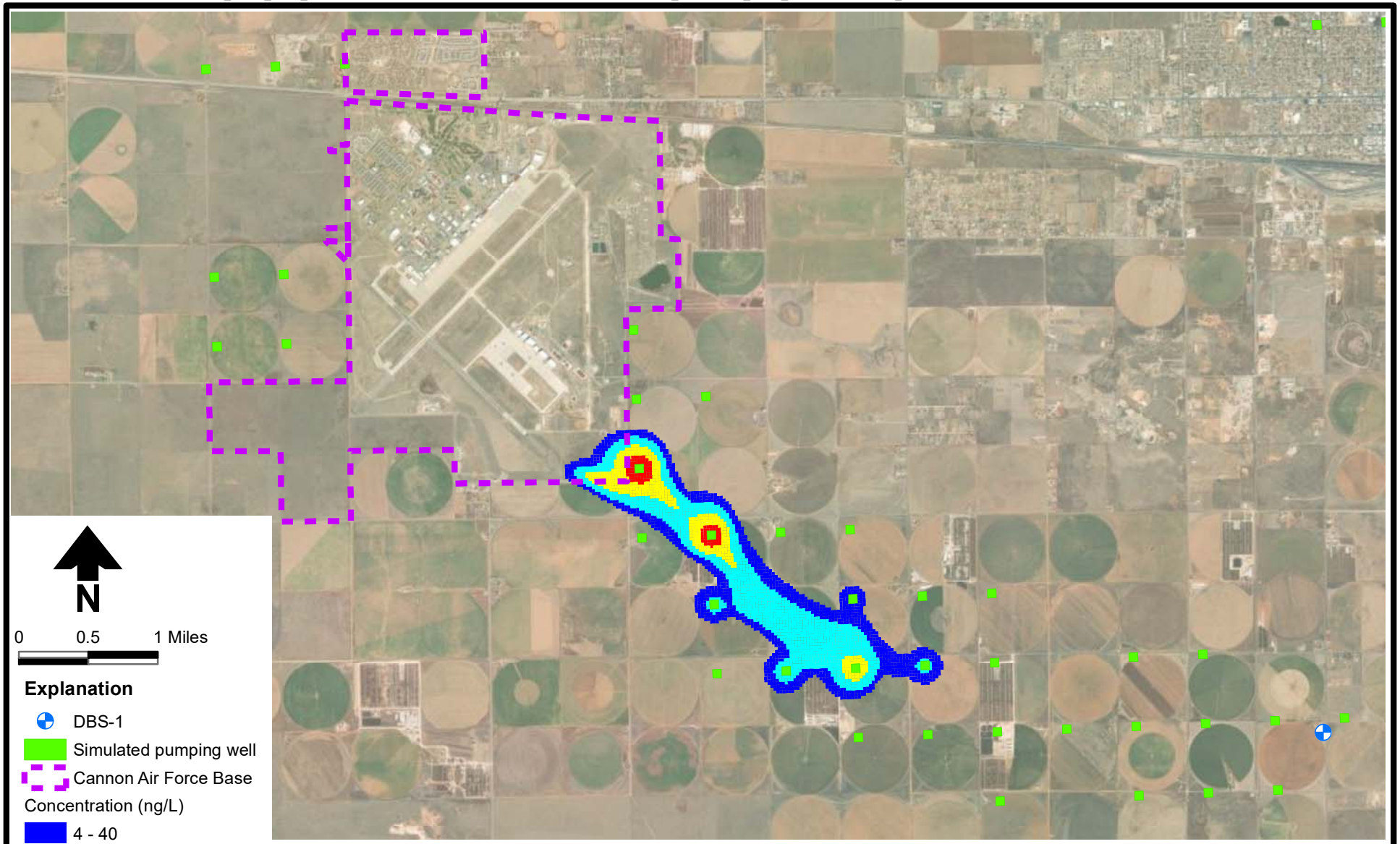
NMED PFAS INVESTIGATION, CANNON AFB

Simulated PFOS Concentrations as of December 2022

DBS&A a Geo-Logic Company

6/30/2023 DB23.1087

\\SS6ABQ\DATAS\PROJECTS\DB21.1060_NMED_PFAS_INVESTIGATIONS\GIS\MXDS\CANNON\MODEL\REPORT\FIGURE14_SIMULATED_PFOA_CONCENTRATIONS_2022.MXD



Source: Google Earth, 2/16/2020

Figure 14

NMED PFAS INVESTIGATION, CANNON AFB

Simulated PFOA Concentrations as of December 2022

DBS&A a Geo-Logic Company

6/30/2023 DB23.1087

Tables

Table 1. PFAS Target Analytes
Page 1 of 2

PFAS Group	No. of Carbons	Acronym(s)	CAS No.	Chemical Name
PFCA	4	PFBA	375-22-4	Perfluorobutanoic acid
PFCA	5	PFPeA	2706-90-3	Perfluoropentanoic acid
PFCA	6	PFHxA	307-24-4	Perfluorohexanoic acid
PFCA	7	PFHpA	375-85-9	Perfluoroheptanoic acid
PFCA	8	PFOA	335-67-1	Perfluorooctanoic acid
PFCA	9	PFNA	375-95-1	Perfluorononanoic acid
PFCA	10	PFDA	335-76-2	Perfluorodecanoic acid
PFCA	11	PFUnA, PFUnDA	2058-94-8	Perfluoroundecanoic acid
PFCA	12	PFDoA, PFDoDA	307-55-1	Perfluorododecanoic acid
PFCA	13	PFTrDA, PFTriA, PFTrA	72629-94-8	Perfluorotridecanoic acid
PFCA	14	PFTeDA, PFTreA, PFTeA	376-06-7	Perfluorotetradecanoic acid
PFSA	4	PFBS	375-73-5	Perfluorobutane sulfonic acid
PFSA	5	PFPeS	2706-91-4	Perfluoropentane sulfonic acid
PFSA	6	PFHxS	355-46-4	Perfluorohexane sulfonic acid
PFSA	7	PFHpS	375-92-8	Perfluoroheptane sulfonic acid
PFSA	8	PFOS	1763-23-1	Perfluorooctane sulfonic acid
PFSA	9	PFNS	68259-12-1	Perfluorononane sulfonic acid
PFSA	10	PFDS	335-77-3	Perfluorodecane sulfonic acid
FOSA	8	PFOSA	754-91-6	Perfluorooctane sulfonamide
FTSA		4:2 FTS, 4:2 FTSA	757124-72-4	4:2 fluorotelomer sulphonic acid
FTSA	8	6:2 FTS, 6:2 FTSA	27619-97-2	6:2 Fluorotelomer sulphonic acid
FTSA	10	8:2 FTS, 8:2 FTSA	39108-34-4	8:2 Fluorotelomer sulphonic acid
FTSA		10:2 FTS	120226-60-0	10:2 Fluorotelomer sulphonic acid
FOSA	8	NMeFOSA	31506-32-8	N-methylperfluorooctanesulfonamide
FOSA	8	NEtFOSA	4151-50-2	N-ethylperfluorooctanesulfonamide
FASAA	11	NMeFOSAA, MeFOSAA	2355-31-9	N-methyl perfluorooctane sulfonamido acetic acid
FASAA	12	NEtFOSAA, NEtFOSA	2991-50-6	N-ethyl perfluorooctane sulfonamido acetic acid
	8	NMeFOSE	24448-09-7	N-methylperfluorooctanesulfonamido ethanol
	8	NEtFOSE	1691.99-2	N-ethylperfluorooctanesulfonamido ethanol
PFECA		HFPO-DA (Gen X)	13252-13-6	Hexafluoropropylene oxide dimer acid
PFECA		PFMPA	377-73-1	Perfluoro-3-methoxypropanoic acid

Notes are provided at the end of the table.

Table 1. PFAS Target Analytes
Page 2 of 2

PFAS Group	No. of Carbons	Acronym(s)	CAS No.	Chemical Name
PFECA		PFMBA	863090-89-5	Perfluoro-4-methoxybutanoic acid
PFECA		NFDHA	151772-58-6	Perfluoro-3,6-dioxaheptanoic acid
PFESA		11Cl-PF3OUdS	763051-92-9	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
PFESA		9Cl-PF3ONS	756426-58-1	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid
PFESA		PFEESA	113507-82-7	Perfluoro(2-ethoxyethane) sulfonic acid
PFEA		ADONA (Gen X)	919005-14-4	Ammonium 4,8-dioxa-3H-perfluorononanoate
		F-53B Major, 9Cl-PF3ONS	756426-58-1	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate
		F-53B Minor, 11Cl-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonate

Sources: ITRC, 2021, Table 4-1; U.S. EPA, 2021b
CAS = Chemical Abstract Service
PFCA = Perfluoroalkyl carboxylic acid
PFSA = Perfluoroalkane sulfonic acid
FOSA = Perfluoroalkane sulfonamide
FTSA = Fluorotelomer sulfonic acid
FASAA = Perfluorooctane sulfonamido acetic acid
PFECA = Perfluoroalkyl ether carboxylic acid
PFESA = Perfluoroalkyl ether sulfonic acid
PFEA = Polyfluoroalkyl ether acid

Table 2. EPA and NMED PFAS Regulatory Levels

PFAS	Concentration (ng/L)						
	2016 EPA Lifetime Drinking Water Health Advisory Levels [a]	2022 EPA Updated Lifetime Drinking Water Health Advisory Levels [b]	2023 EPA Proposed MCL [c]	2023 EPA Proposed MCLG [c]	2019 NMED Preliminary Tap Water Screening Level [d]	2022 NMED Tap Water Cancer Screening Level [e]	2022 NMED Tap Water Noncancer Screening Level [e]
PFOA	70	0.004	4.0	0.0	70	11.1	0.0602
PFOS	70	0.02	4.0	0.0	70	—	0.0602
PFNA	—	—	—[f]	—[f]	—	—	0.0602
PFHxS	—	—	—[f]	—[f]	70	—	0.401
PFBS	—	2,000	—[f]	—[f]	—	—	6.02
HFPO-DA (GenX)	—	10	—[f]	—[f]	—	—	—
Perfluorobutanesulfonate							6.02
Perfluorohexanesulfonate							0.401
Perfluorononanoate							0.0602
Perfluorooctanesulfonate							0.0602
Perfluorooctanoate							0.0602
Potassium perfluorobuttanesulfonate							6.02
Potassium perfluorooctanesulfonate							0.0602

[a] Issued May 2016
[b] Issued June 15, 2022
[c] Issued March 14, 2023
[d] Issued June 19, 2019
[e] Issued June 22, 2022
[f] Combined toxicity of these analytes used to determine if they exceed a Hazard Index of 1.0

EPA = U.S. Environmental Protection Agency
NMED = New Mexico Environment Department
ng/L = Nanograms per liter
MCL = Maximum contaminant level
MCLG = Maximum contaminant level goal
— = Not applicable

Table 3. Frequency of Field Quality Control Samples

Field Quality Control Sample	Frequency for Soil/Aqueous Matrix
Field duplicate	1 per 10 samples
Field blank	1 per day
Equipment blank	1 per day
Matrix spike/matrix spike duplicate [a] (PFAS only)	1 per 20 samples
Temperature blank	1 per cooler

[a] Matrix spike, matrix spike duplicate, and matrix duplicate analyses are technically not field quality control samples; however, they generally require that the field personnel collect additional volume of sample, and are therefore included on this table for reference.

Table 4. Field Parameter Measurements for FY 2023 Off-Base Water Samples

Well	Date	pH (s.u.)	Temperature (°C)	Conductance (µS/cm)	Dissolved oxygen (mg/L)	Oxidation/ Reduction Potential (mV)
COS-35	4/6/2023	6.53	12.31	755	10.00	61.2
COS-36	4/6/2023	7.41	14.12	928	6.78	49.4
DBS-1	4/7/2023	7.69	17.77	1,008	6.64	76.7
COS-37	6/13/2023	7.81	21.2	548	9.43	187.5
COS-38	6/13/2023	8.16	21.9	497.3	6.77	171.9
COS-39 [a]	6/13/2023	8.16	21.9	497.3	6.77	171.9
COS-40 [b]	6/13/2023	—	—	—	—	—
COS-41	6/14/2023	7.87	21.7	724	6.65	183.6
COS-42 [b]	6/14/2023	—	—	—	—	—
DBS-1	6/14/2023	7.77	19.6	972	9.13	136.8
COS-43 [a]	6/14/2023	7.77	19.6	972	9.13	136.8
COS-44	6/14/2023	7.72	23.1	933	6.89	174.7
COS-45	6/14/2023	7.87	20.3	663	8.33	159.5
COS-46	6/14/2023	8.08	21.3	530	7.54	138.4
COS-47	6/15/2023	7.99	22.9	530	8.52	148.6
COS-48 [b]	6/15/2023	—	—	—	—	—
COS-49	6/15/2023	7.65	21.7	806	8.97	158.8
COS-50	6/15/2023	7.82	20.7	717	8.61	159.0

[a] Duplicate sample

[b] Field blank

s.u. = Standard units
µS/cm = Microsiemens per centimeter
mg/L = Milligrams per liter
mV = Millivolt
— = Not applicable

Table 5. PFAS in FY 2023 Off-Base Water Samples

Analyte	Concentration (ng/L)				
	COS-35 4/6/2023	COS-35 (DUP) 4/6/2023	COS-36 4/6/2023	DBS-1 4/6/2023	DBS-1 (DUP) 4/6/2023
PFBA	<1.94	<1.89	7.72 [a]	<1.91	<1.93
PFPeA	<1.94	<1.89	22.8 [a]	<1.91	<1.93
PFHxA	<1.94	<1.89	22.0 [b]	<1.91	<1.93
PFHpA	<1.94	<1.89	3.21 [b]	<1.91	<1.93
PFOA	<1.94	<1.89	<1.91	<1.91	<1.93
PFNA	<1.94	<1.89	<1.91	<1.91	<1.93
PFDA	<1.94	<1.89	<1.91	<1.91	<1.93
PFUnA	<1.94	<1.89	<1.91	<1.91	<1.93
PFDoA	<1.94	<1.89	<1.91	<1.91	<1.93
PFTrDA	<1.94	<1.97	<1.94	<1.92	<1.95
PFTeDA	<1.94	<1.97	<1.94	<1.92	<1.95
PFBS	<1.94	<1.89	6.47 [a]	<1.91	<1.93
PFPeS	<1.94	<1.89	4.42 [a]	<1.91	<1.93
PFHxS	<1.94	<1.89	13.4 [b]	<1.91	<1.93
PFHpS	<1.94	<1.89	<1.91	<1.91	<1.93
PFOS	<1.94	<1.89	<1.91	<1.91	<1.93
4:2 FTS	<1.94	<1.89	<1.91	<1.91	<1.93
6:2 FTS	<1.94	<1.89	<1.91	<1.91	<1.93
8:2 FTS	<1.94	<1.89	<1.91	<1.91	<1.93
NMeFOSAA	<1.94	<1.97	<1.94	<1.92	<1.95
NEtFOSAA	<1.94	<1.97	<1.94	<1.92	<1.95
HFPO-DA	<1.94	<1.89	<1.91	<1.91	<1.93
PFMPA	<1.94	<1.89	<1.91	<1.91	<1.93
PFMBA	<1.94	<1.89	<1.91	<1.91	<1.93
NFDHA	<1.94	<1.89	<1.91	<1.91	<1.93
11Cl-PF3OUdS	<1.94	<1.89	<1.91	<1.91	<1.93
9Cl-PF3ONS	<1.94	<1.89	<1.91	<1.91	<1.93
PFEESA	<1.94	<1.89	<1.91	<1.91	<1.93
ADONA	<1.94	<1.89	<1.91	<1.91	<1.93

Source: Enthalpy Laboratory
Refer to Table 1 for PFAS compound names
Samples were analyzed using U.S. Environmental Protection Agency (EPA) methods 533 and 537.1.
[a] Result using EPA method 533
[b] Result using EPA method 531.7
ng/L = Nanograms per liter

Table 6. Model Calibration Wells
Page 1 of 2

Well No.	Well Name	State Plane Coordinates (feet)	
		X	Y
1	342636103124301	3953023.3	20864672.0
2	342655103114001	3958859.8	20864440.0
3	342615103220701	3905753.0	20863560.0
4	342630103145201	3942305.0	20862416.0
5	342548103193601	3918282.5	20860548.0
6	342519103230101	3900964.5	20857964.0
7	342520103165601	3931548.5	20857482.0
8	342633103155301	3936862.5	20857302.0
9	342457103213901	3907678.3	20855634.0
10	342505103151801	3939429.3	20854334.0
11	342442103213601	3908092.3	20854062.0
12	MW-V	3915483.8	20850006.0
13	342338103203701	3912948.8	20847458.0
14	MW-W	3926692.3	20846698.0
15	MW-E	3924233.3	20844534.0
16	342310103165901	3931183.5	20844194.0
17	MW-Rb	3925731.0	20844184.0
18	342310103160901	3935395.8	20844066.0
19	MW-Fa	3925215.3	20843974.0
20	342323103145601	3941809.8	20843784.0
21	342308103133301	3948381.3	20843606.0
22	MW-Na	3927516.5	20843586.0
23	MW-Ga	3925385.3	20843104.0
24	MW-Pa	3925689.8	20842870.0
25	MW-H	3924912.8	20842610.0
26	MW-Oa	3927138.3	20841798.0
27	342305103111501	3960128.5	20841634.0
28	MW-X	3917598.8	20838218.0
29	342218103182601	3923629.8	20837718.0
30	342219103183101	3923596.3	20837718.0
31	MW-A	3923594.0	20837706.0

Notes are provided at the end of the table.

Table 6. Model Calibration Wells
Page 2 of 2

Well No.	Well Name	State Plane Coordinates (feet)	
		X	Y
32	MW-Ua	3925351.0	20836230.0
33	MW-B	3925308.8	20836018.0
34	342201103180901	3925338.8	20835844.0
35	MW-Ta	3925375.0	20835750.0
36	342200103181001	3925324.8	20835738.0
37	342158103180601	3925294.8	20835638.0
38	MW-D	3924113.0	20835490.0
39	MW-Sa	3925263.0	20835444.0
40	MW-Ca	3924776.3	20835424.0
41	342157103181601	3924777.8	20835418.0
42	342140103190501	3920114.5	20833968.0
43	342126103164501	3932135.3	20833564.0
44	342121103142301	3944059.5	20832940.0
45	342137103121901	3954757.8	20832680.0
46	342036103220001	3905483.5	20829126.0
47	342034103175101	3926489.3	20828504.0
48	342033103155801	3936000.5	20828138.0
49	342031103123301	3953017.0	20827570.0
50	342031103111301	3959701.5	20827348.0
51	342006103134201	3946393.0	20825164.0
52	341941103121901	3954040.0	20822378.0
53	341935103145601	3940912.5	20820738.0

Table 7. Contaminant Transport Parameters and Sources for PFOS and PFOA

Symbol	Parameter	Calculation	Value (PFOS)	Value (PFOA)	Units	Source
Input Parameters						
n	Total porosity		0.42	0.42		
ne	Effective porosity		0.35	0.35		Fetter, 2001
foc	Fraction organic carbon content	—	0.001	0.001	—	
x_t	Longitudinal flow field distance	—	3	3	miles	Estimated
			4,828	4,828	meters	
α_{rh}	Ratio, longitudinal and transverse dispersivity	—	10	10	—	Aziz et al., 2000
ρ_s	Particle density	—	2.65	2.65	g/cm^3	Fetter, 2001
K_{oc}	Organic carbon partition coefficient	—	631	97	cm^3/g	IRTC Table 4-1, 25th percentile
	Decay constant	—	0	0	1/day	Assumed
t	Time of continuous source	—	53	53	years	Assumed
			19,358	19,358	days	
Calculated Parameters						
ρ_b	Bulk density	$\rho_b = (1-n) * \rho_s$	1.54	1.54	g/cm^3	Fetter, 2001
R	Retardation coefficient	$R = 1 + ((K_{oc}*f_{oc}*\rho_b) / n)$	3.31	1.35	—	Fetter, 2001
α_x	Longitudinal dispersivity	$\alpha_x = 1.15 * (Log(x_t))^{3.013}$	192	192	feet	Xu and Eckstein (1995); Al-Suwaiyan (1996) Eq 12b
α_y	Transverse dispersivity	$\alpha_y = \alpha_x / \alpha_{rh}$	19.2	19.2	feet	Calculated based on dispersivity ratios

g/cm^3 = Grams per cubic centimeter
cm^3/g = Cubic centimeters per gram

Appendix A

April 2023 Laboratory Report for DBS&A Sampling

DBS&A
a Geo-Logic Company

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

May 10, 2023

John Bunch
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX: (505) 822-8877

RE: Cannon AFB OrderNo.: 2304376

Dear John Bunch:

Hall Environmental Analysis Laboratory received 6 sample(s) on 4/10/2023 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

May 08, 2023

Enthalpy Analytical - El Dorado Hills
Work Order No. 2304086

Mr. Andy Freeman
Hall Environmental Analytical Laboratory
4901 Hawkins NE
Albuquerque, NM 87109

Dear Mr. Freeman,

Enclosed are the results for the sample set received at Enthalpy Analytical - EDH on April 11, 2023 under your Project Name '2304376'.

Enthalpy Analytical - EDH is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at james.fox@enthalpy.com.

Thank you for choosing Enthalpy Analytical - EDH as part of your analytical support team.

Sincerely,

For

Jamie Fox
Senior Program Manager

Enthalpy Analytical -EDH certifies that the report herein meets all the requirements set forth by NELAP for those applicable test methods. Results relate only to the samples as received by the laboratory. This report should not be reproduced except in full without the written approval of Enthalpy Analytical -EDH .

Enthalpy Analytical - EDH Work Order No. 2304086
Case Narrative

Sample Condition on Receipt:

Six groundwater samples were received and stored securely in accordance with Enthalpy Analytical - EDH standard operating procedures and EPA methodology. The samples were received in good condition and within the recommended temperature requirements.

Analytical Notes:

EPA Method 537.1

The samples were extracted and analyzed for a selected list of PFAS using EPA Method 537.1.

Holding Times

The samples were extracted and analyzed within the method hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria.

Two Laboratory Fortified Blanks (LFB/LFBD) and a Laboratory Reagent Blank (LRB) were extracted and analyzed with the preparation batch. No analytes were detected in the LRB above the method required limits. The LFB/LFBD recoveries were within the method acceptance criteria.

The surrogate recoveries for all QC and field samples were within the acceptance criteria.

EPA Method 533

The samples were extracted and analyzed for a selected list of PFAS using EPA Method 533. The results for PFHxS, PFOA and PFOS include both linear and branched isomers. Results for all other analytes include the linear isomers only.

Holding Times

The samples were extracted and analyzed within the hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the acceptance criteria.

Two Laboratory Fortified Blanks (LFB/LFBD) and a Laboratory Reagent Blank (LRB) were extracted and analyzed with the preparation batch. No analytes were detected in the LRB above the method required limits. The LFB/LFBD recoveries were within the method acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

QC Anomalies

LabNumber	SampleName	Analysis	Analyte	Flag	%Rec
2304086-01	COS-35	EPA Method 533	13C2-4:2 FTS	H	151

H = Recovery was outside laboratory acceptance criteria.

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Sample Inventory Report

Sample ID	Client Sample ID	Sampled	Received	Components/Containers
2304086-01	COS-35	06-Apr-23 11:12	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2304086-02	COS-35 DUP	06-Apr-23 11:12	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2304086-03	COS-36	06-Apr-23 11:25	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2304086-04	FB-1	07-Apr-23 15:08	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2304086-05	DBS-1	07-Apr-23 15:25	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2304086-06	DBS-1D	07-Apr-23 15:25	11-Apr-23 08:56	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL

ANALYTICAL RESULTS

Sample ID: LRB **EPA Method 537.1**

Client Data
Name: Hall Environmental Analytical Laboratory Matrix: Aqueous
Project: 2304376

Laboratory Data
Lab Sample: B23D189-BLK1 Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFHxA	307-24-4	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFHpA	375-85-9	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFHxS	355-46-4	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFOA	335-67-1	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFNA	375-95-1	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFOS	1763-23-1	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFDA	335-76-2	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
MeFOSAA	2355-31-9	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
EtFOSAA	2991-50-6	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFUnA	2058-94-8	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFDoA	307-55-1	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFTrDA	72629-94-8	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
PFTeDA	376-06-7	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
HFPO-DA	13252-13-6	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
ADONA	919005-14-4	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
9Cl-PF3ONS	756426-58-1	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
11Cl-PF3OUdS	763051-92-9	ND	2.00		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFHxA	SURR	104	70 - 130		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
13C2-PFDA	SURR	107	70 - 130		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
d5-EtFOSAA	SURR	82.2	70 - 130		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1
13C3-HFPO-DA	SURR	109	70 - 130		B23D189	19-Apr-23	0.250 L	25-Apr-23 15:24	1

RL - Reporting limit

Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: LFBD **EPA Method 537.1**

Name:	Hall Environmental Analytical Laboratory	Lab Sample:	B23D189-BS1/B23D189-BSD1
Project:	2304376	QC Batch:	B23D189
Matrix:	Aqueous	Samp Size:	0.250/0.250 L
		Date Extracted:	19-Apr-23
		Column:	BEH C18

Analyte	CAS Number	LFB (ng/L)	LFB Spike	LFB % Rec	LFB Quals	LFBD (ng/L)	LFBD Spike	LFBD % Rec	RPD	LFBD Quals	%Rec Limits	RPD Limits	LFB Analyzed	LFB Dil	LFBD Analyzed	LFBD Dil
PFBS	375-73-5	62.1	70.8	87.7		70.7	70.8	99.9	13.0		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFHxA	307-24-4	81.8	80.0	102		75.8	80.0	94.7	7.67		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFHpA	375-85-9	82.1	80.0	103		78.7	80.0	98.4	4.16		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFHxS	355-46-4	66.0	72.8	90.7		76.9	72.8	106	15.2		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFOA	335-67-1	79.9	80.0	99.9		74.4	80.0	92.9	7.16		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFNA	375-95-1	75.1	80.0	93.8		75.2	80.0	94.0	0.163		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFOS	1763-23-1	65.2	74.0	88.0		82.8	74.0	112	23.8		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFDA	335-76-2	82.1	80.0	103		77.4	80.0	96.7	5.91		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
MeFOSAA	2355-31-9	74.2	80.0	92.8		78.2	80.0	97.8	5.19		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
EtFOSAA	2991-50-6	68.3	80.0	85.4		76.3	80.0	95.4	11.1		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFUnA	2058-94-8	88.7	80.0	111		78.6	80.0	98.3	12.1		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFDoA	307-55-1	76.1	80.0	95.1		67.2	80.0	83.9	12.5		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFTrDA	72629-94-8	73.8	80.0	92.2		70.9	80.0	88.6	3.98		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
PFTeDA	376-06-7	66.6	80.0	83.3		60.9	80.0	76.1	8.96		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
HFPO-DA	13252-13-6	85.7	80.0	107		76.5	80.0	95.6	11.5		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
ADONA	919005-14-4	79.6	75.6	105		73.3	75.6	96.9	8.27		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
9Cl-PF3ONS	756426-58-1	64.7	74.4	87.0		78.6	74.4	106	19.4		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1
11Cl-PF3OUdS	763051-92-9	69.2	75.2	92.1		78.1	75.2	104	12.1		70-130	30	25-Apr-23 15:35	1	25-Apr-23 15:47	1

Labeled Standards	Type	LFB % Rec	LFB Quals	LFBD % Rec	LFBD Quals	Limits	LFB Analyzed	LFB Dil	LFBD Analyzed	LFBD Dil
13C2-PFHxA	SURR	108		105		70 - 130	25-Apr-23 15:35	1	25-Apr-23 15:47	1
13C2-PFDA	SURR	110		101		70 - 130	25-Apr-23 15:35	1	25-Apr-23 15:47	1
d5-EtFOSAA	SURR	89.1		92.7		70 - 130	25-Apr-23 15:35	1	25-Apr-23 15:47	1
13C3-HFPO-DA	SURR	108		102		70 - 130	25-Apr-23 15:35	1	25-Apr-23 15:47	1

Sample ID: COS-35 **EPA Method 537.1**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: Groundwater
Date Collected: 06-Apr-23 11:12

Laboratory Data

Lab Sample: 2304086-01
Date Received: 11-Apr-23 08:56
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFHxA	307-24-4	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFHpA	375-85-9	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFHxS	355-46-4	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFOA	335-67-1	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFNA	375-95-1	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFOS	1763-23-1	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFDA	335-76-2	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
MeFOSAA	2355-31-9	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
EtFOSAA	2991-50-6	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFUnA	2058-94-8	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFDoA	307-55-1	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFTrDA	72629-94-8	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
PFTeDA	376-06-7	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
HFPO-DA	13252-13-6	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
ADONA	919005-14-4	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
9Cl-PF3ONS	756426-58-1	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
11Cl-PF3OUdS	763051-92-9	ND	1.94		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFHxA	SURR	111	70 - 130		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
13C2-PFDA	SURR	118	70 - 130		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
d5-EtFOSAA	SURR	87.8	70 - 130		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1
13C3-HFPO-DA	SURR	115	70 - 130		B23D189	19-Apr-23	0.258 L	25-Apr-23 15:58	1

RL - Reporting limit

Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: COS-35 DUP **EPA Method 537.1**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-002v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:B2

Laboratory Data

Lab Sample: 2304086-02
Date Receined: BB-v pr-23 08:56
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu S	375-73-5	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PF1 xv	307-24-4	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PF1 pv	375-85-9	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PF1 xS	355-46-4	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFOv	335-67-B	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFNv	375-95-B	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFOS	B763-23-B	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFDv	335-76-2	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
MeFOSv v	2355-3B-9	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
HtFOSv v	299B-50-6	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFUEv	2058-94-8	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFDov	307-55-B	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFTrDv	72629-94-8	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
PFTeDv	376-06-7	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
1 FPO-Dv	B3252-B3-6	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
v DONv	9B9005-B4-4	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
9Cl-PF3ONS	756426-58-B	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
BBCl-PF3OUdS	76305B-92-9	ND	B.97		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C2-PF1 xv	SURR	BBB	70 - B30		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
B3C2-PFDv	SURR	B09	70 - B30		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
d5-HtFOSv v	SURR	B0B	70 - B30		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B
B3C3-1 FPO-Dv	SURR	BB4	70 - B30		u 23DB89	B9-v pr-23	0.254 L	25-v pr-23 B6:09	B

RL - ReportiEg limit

Resylts reported to RL.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: COS-36 **EPA Method 537.1**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-003v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:2R

Laboratory Data

Lab Sample: 2304086-03
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu S	37R-73-R	R.6R	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PF1 xv	307-24-4	22.0	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PF1 pv	37R-8R-9	3.2B	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PF1 xS	3RR-46-4	B3.4	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFOv	33R-67-B	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFNv	37R-9R-B	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFOS	B763-23-B	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFDv	33R-76-2	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
MeFOSv v	23RR-3B-9	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
HtFOSv v	299B-R0-6	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFUEv	20R8-94-8	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFDov	307-RR-B	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFTrDv	72629-94-8	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
PFTeDv	376-06-7	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
1 FPO-Dv	B32R2-B3-6	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
v DONv	9B900R-B4-4	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
9Cl-PF3ONS	7R6426-R8-B	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
BBCl-PF3OUdS	7630RB-92-9	ND	B.94		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C2-PF1 xv	SU5 5	BBB	70 - B30		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
B3C2-PFDv	SU5 5	BB2	70 - B30		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
dR-HtFOSv v	SU5 5	89.7	70 - B30		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B
B3C3-1 FPO-Dv	SU5 5	BBB	70 - B30		u 23DB89	B9-v pr-23	0.2R8 L	2R-v pr-23 B6:20	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: FB-1

EPA Method 537.1

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-004v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:08

Laboratory Data

Lab Sample: 2304086-04
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu S	37R-73-R	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PF1 xv	307-24-4	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PF1 pv	37R-8R-9	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PF1 xS	3RR-46-4	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFOv	33R-67-B	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFNv	37R-9R-B	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFOS	B763-23-B	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFDv	33R-76-2	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
MeFOSv v	23RR-3B-9	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
HtFOSv v	299B-R0-6	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFUEv	20R8-94-8	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFDov	307-RR-B	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFTrDv	72629-94-8	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
PFTeDv	376-06-7	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
1 FPO-Dv	B32R2-B3-6	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
v DONv	9B900R-B4-4	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
9Cl-PF3ONS	7R6426-R8-B	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
BBCl-PF3OUdS	7630RB-92-9	ND	2.0B		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C2-PF1 xv	SU5 5	BB2	70 - B30		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
B3C2-PFDv	SU5 5	BB3	70 - B30		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
dR-HtFOSv v	SU5 5	94.7	70 - B30		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B
B3C3-1 FPO-Dv	SU5 5	BBB	70 - B30		u 23DB89	B9-v pr-23	0.249 L	2R-v pr-23 B6:3B	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: DBS-1 **EPA Method 537.1**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: wroundRater
Date Collected: 07-Apr-23 G1:21

Laboratory Data

Lab Sample: 2304086-01
Date 5 eceived: GG-Apr-23 08:16
Column: BEH CG8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	371-73-1	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFHxA	307-24-4	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFHpA	371-81-9	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFHxS	311-46-4	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFOA	331-67-G	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFNA	371-91-G	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFOS	G763-23-G	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFDA	331-76-2	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
MeFOSAA	2311-3G-9	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
EtFOSAA	299G-10-6	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFUnA	2018-94-8	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFDoA	307-11-G	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFTrDA	72629-94-8	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
PFTeDA	376-06-7	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
HFPO-DA	G3212-G3-6	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
ADONA	9G9001-G4-4	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
9Cl-PF3ONS	716426-18-G	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
GGCl-PF3OUdS	76301G-92-9	ND	G92		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
G3C2-PFHxA	SU5 5	GG2	70 - G30		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
G3C2-PFDA	SU5 5	GG6	70 - G30		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
d1-EtFOSAA	SU5 5	93.1	70 - G30		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G
G3C3-HFPO-DA	SU5 5	GGG	70 - G30		B23DG89	G9-Apr-23	0.26GL	21-Apr-23 G6:42	G

5 L - 5 eporting limit

5 esults reported to 5 L.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: DBS-1D

EPA Method 537.1

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-006v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:2R

Laboratory Data

Lab Sample: 2304086-06
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu S	37R-73-R	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PF1 xv	307-24-4	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PF1 pv	37R-8R-9	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PF1 xS	3RR-46-4	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFOv	33R-67-B	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFNv	37R-9R-B	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFOS	B763-23-B	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFDv	33R-76-2	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
MeFOSv v	23RR-3B-9	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
HtFOSv v	299B-R0-6	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFUEv	20R8-94-8	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFDov	307-RR-B	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFTrDv	72629-94-8	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
PFTeDv	376-06-7	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
1 FPO-Dv	B32R2-B3-6	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
v DONv	9B900R-B4-4	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
9Cl-PF3ONS	7R6426-R8-B	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
BBCl-PF3OUdS	7630RB-92-9	ND	B.9R		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C2-PF1 xv	SU5 5	B03	70 - B30		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
B3C2-PFDv	SU5 5	BBB	70 - B30		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
dR-HtFOSv v	SU5 5	92.3	70 - B30		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B
B3C3-1 FPO-Dv	SU5 5	B03	70 - B30		u 23DB89	B9-v pr-23	0.2R7 L	2R-v pr-23 B6:R3	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: LRB **EPA Method 533**

Client Data
Name: Hall Environmental Analytical Laboratory Matrix: Aqueous
Project: 2304376

Laboratory Data
Lab Sample: B23D176-BLK1 Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFMPA	377-73-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFPeA	2706-90-3	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFBS	375-73-5	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFMBA	863090-89-5	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFEESA	113507-82-7	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
NFDHA	151772-58-6	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
4:2 FTS	757124-72-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFHxA	307-24-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFPeS	2706-91-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
HFPO-DA	13252-13-6	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFHpA	375-85-9	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFHxS	355-46-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
ADONA	919005-14-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
6:2 FTS	27619-97-2	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFOA	335-67-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFHpS	375-92-8	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFNA	375-95-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFOS	1763-23-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
9Cl-PF3ONS	756426-58-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
8:2 FTS	39108-34-4	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFDA	335-76-2	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFUnA	2058-94-8	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
11Cl-PF3OUdS	763051-92-9	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
PFDoA	307-55-1	ND	2.00		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C4-PFBA	IS	116	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C5-PFPeA	IS	116	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C3-PFBS	IS	117	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C2-4:2 FTS	IS	123	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C5-PFHxA	IS	118	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C3-HFPO-DA	IS	122	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C4-PFHpA	IS	128	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C3-PFHxS	IS	101	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C2-6:2 FTS	IS	117	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C8-PFOA	IS	113	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C9-PFNA	IS	113	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C8-PFOS	IS	121	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1

Sample ID: LRB **EPA Method 533**

Client Data

Name: Hall Environmental Analytical Laboratory Matrix: Aqueous

Project: 2304376

Laboratory Data

Lab Sample: B23D176-BLK1 Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-8:2 FTS	IS	126	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C6-PFDA	IS	104	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C7-PFUnA	IS	104	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1
13C2-PFDoA	IS	97.4	50 - 150		B23D176	20-Apr-23	0.250 L	01-May-23 13:59	1

RL - Reporting limit

Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: LFBD **EPA Method 533**

Name:	Hall Environmental Analytical Laboratory	Lab Sample:	B23D176-BS1/B23D176-BSD1
Project:	2304376	QC Batch:	B23D176
Matrix:	Aqueous	Samp Size:	0.250/0.250 L
		Date Extracted:	20-Apr-23
		Column:	BEH C18

Analyte	CAS Number	LFB (ng/L)	LFB Spike	LFB % Rec	LFB Quals	LFBD (ng/L)	LFBD Spike	LFBD % Rec	RPD	LFBD Quals	%Rec Limits	RPD Limits	LFB Analyzed	LFB Dil	LFBD Analyzed	LFBD Dil
PFBA	375-22-4	3.13	4.00	78.3		3.22	4.00	80.6	2.84		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFMPA	377-73-1	3.69	4.00	92.3		3.86	4.00	96.5	4.45		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFPeA	2706-90-3	3.94	4.00	98.4		4.18	4.00	104	5.95		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFBS	375-73-5	3.16	3.55	89.1		3.00	3.55	84.4	5.38		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFMBA	863090-89-5	3.58	4.00	89.6		3.65	4.00	91.4	1.96		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFEESA	113507-82-7	3.03	3.57	85.0		2.70	3.57	75.7	11.6		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
NFDHA	151772-58-6	3.98	4.00	99.6		3.15	4.00	78.7	23.4		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
4:2 FTS	757124-72-4	3.48	3.74	92.9		3.39	3.74	90.4	2.70		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFHxA	307-24-4	3.69	4.00	92.3		3.72	4.00	92.9	0.624		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFPeS	2706-91-4	4.19	3.76	111		3.32	3.76	88.2	23.2		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
HFPO-DA	13252-13-6	3.60	4.00	90.0		4.25	4.00	106	16.5		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFHpA	375-85-9	3.48	4.00	87.1		3.87	4.00	96.7	10.5		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFHxS	355-46-4	4.31	3.65	118		3.24	3.65	88.9	28.3		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
ADONA	919005-14-4	3.23	3.78	85.6		3.48	3.78	92.3	7.54		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
6:2 FTS	27619-97-2	3.74	3.81	98.2		3.87	3.81	102	3.46		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFOA	335-67-1	3.77	4.00	94.3		3.96	4.00	98.9	4.79		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFHpS	375-92-8	3.42	3.81	89.9		3.12	3.81	82.1	9.15		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFNA	375-95-1	3.58	4.00	89.4		3.71	4.00	92.7	3.62		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFOS	1763-23-1	3.74	3.71	101		3.29	3.71	88.5	12.9		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
9Cl-PF3ONS	756426-58-1	3.36	3.74	89.8		2.98	3.74	79.5	12.2		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
8:2 FTS	39108-34-4	3.41	3.84	88.7		3.55	3.84	92.5	4.13		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFDA	335-76-2	3.41	4.00	85.1		3.42	4.00	85.6	0.552		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFUnA	2058-94-8	3.45	4.00	86.3		3.38	4.00	84.5	2.08		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
11Cl-PF3OUdS	763051-92-9	3.26	3.78	86.4		3.57	3.78	94.5	8.86		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1
PFDoA	307-55-1	3.76	4.00	94.0		3.88	4.00	96.9	3.14		50-150	50	01-May-23 14:10	1	01-May-23 14:21	1

Labeled Standards	Type	LFB % Rec	LFB Quals	LFBD % Rec	LFBD Quals	Limits	LFB Analyzed	LFB Dil	LFBD Analyzed	LFBD Dil
13C4-PFBA	IS	117		113		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C5-PFPeA	IS	124		114		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C3-PFBS	IS	119		136		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C2-4:2 FTS	IS	126		140		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C5-PFHxA	IS	120		112		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C3-HFPO-DA	IS	117		115		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1

Sample ID: LFBD **EPA Method 533**

Name:	Hall Environmental Analytical Laboratory	Lab Sample:	B23D176-BS1/B23D176-BSD1	Date Extracted:	20-Apr-23
Project:	2304376	QC Batch:	B23D176	Column:	BEH C18
Matrix:	Aqueous	Samp Size:	0.250/0.250 L		

Labeled Standards	Type	LFB % Rec	LFB Quals	LFBD % Rec	LFBD Quals	Limits	LFB Analyzed	LFB Dil	LFBD Analyzed	LFBD Dil
13C4-PFHpA	IS	117		113		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C3-PFHxS	IS	85.0		116		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C2-6:2 FTS	IS	115		119		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C8-PFOA	IS	108		107		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C9-PFNA	IS	101		102		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C8-PFOS	IS	113		120		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C2-8:2 FTS	IS	118		126		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C6-PFDA	IS	104		103		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C7-PFUnA	IS	105		101		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1
13C2-PFDoA	IS	105		99.1		50 - 150	01-May-23 14:10	1	01-May-23 14:21	1

Sample ID: COS-35 **EPA Method 533**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: Groundwater
Date Collected: 06-Apr-23 11:12

Laboratory Data

Lab Sample: 2304086-01
Date Received: 11-Apr-23 08:56
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFMPA	377-73-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFPeA	2706-90-3	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFBS	375-73-5	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFMBA	863090-89-5	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFEESA	113507-82-7	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
NFDHA	151772-58-6	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
4:2 FTS	757124-72-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFHxA	307-24-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFPeS	2706-91-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
HFPO-DA	13252-13-6	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFHpA	375-85-9	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFHxS	355-46-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
ADONA	919005-14-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
6:2 FTS	27619-97-2	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFOA	335-67-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFHpS	375-92-8	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFNA	375-95-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFOS	1763-23-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
9Cl-PF3ONS	756426-58-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
8:2 FTS	39108-34-4	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFDA	335-76-2	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFUnA	2058-94-8	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
11Cl-PF3OUdS	763051-92-9	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
PFDoA	307-55-1	ND	1.94		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C4-PFBA	IS	116	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C5-PFPeA	IS	114	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C3-PFBS	IS	133	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C2-4:2 FTS	IS	151	50 - 150	H	B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C5-PFHxA	IS	110	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C3-HFPO-DA	IS	101	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C4-PFHpA	IS	108	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C3-PFHxS	IS	128	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C2-6:2 FTS	IS	121	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C8-PFOA	IS	106	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C9-PFNA	IS	92.3	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1

Sample ID: COS-35 **EPA Method 533**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: Groundwater
Date Collected: 06-Apr-23 11:12

Laboratory Data

Lab Sample: 2304086-01
Date Received: 11-Apr-23 08:56
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C8-PFOS	IS	118	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C2-8:2 FTS	IS	129	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C6-PFDA	IS	98.4	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C7-PFUnA	IS	93.9	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1
13C2-PFDoA	IS	95.1	50 - 150		B23D176	20-Apr-23	0.257 L	28-Apr-23 16:58	1

RL - Reporting limit

Results reported to RL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: COS-35 DUP

EPA Method 533

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-002v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:B2

Laboratory Data

Lab Sample: 2304086-02
Date Receined: BB-v pr-23 08:56
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu v	375-22-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFMPv	377-73-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFPev	2706-90-3	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFu S	375-73-5	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFMu v	863090-89-5	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFHHSv	BB3507-82-7	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
NFD1 v	B5B772-58-6	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
4:2 FTS	757B24-72-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PF1 xv	307-24-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFPeS	2706-9B-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
1 FPO-Dv	B3252-B3-6	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PF1 pv	375-85-9	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PF1 xS	355-46-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
v DONv	9B9005-B4-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
6:2 FTS	276B9-97-2	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFOv	335-67-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PF1 pS	375-92-8	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFNv	375-95-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFOS	B763-23-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
9Cl-PF3ONS	756426-58-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
8:2 FTS	39B08-34-4	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFDv	335-76-2	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFUEv	2058-94-8	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
BBCl-PF3OUdS	76305B-92-9	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
PFDov	307-55-B	ND	B.89		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C4-PFu v	IS	BB8	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C5-PFPev	IS	BB6	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C3-PFu S	IS	B22	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C2-4:2 FTS	IS	B28	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C5-PF1 xv	IS	BB4	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C3-1 FPO-Dv	IS	B07	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C4-PF1 pv	IS	BB3	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C3-PF1 xS	IS	BB8	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C2-6:2 FTS	IS	B42	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C8-PFOv	IS	B07	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C9-PFNv	IS	B08	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B

Sample ID: COS-35 DUP **EPA Method 533**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-002v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:B2

Laboratory Data

Lab Sample: 2304086-02
Date Receined: BB-v pr-23 08:56
ColymE: u H1 CB8

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C8-PFOS	IS	BB9	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C2-8:2 FTS	IS	B26	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C6-PFDv	IS	B03	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C7-PFUEv	IS	B02	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B
B3C2-PFDov	IS	B03	50 - B50		u 23DB76	20-v pr-23	0.264 L	28-v pr-23 B7:09	B

RL - ReportiEg limit

Resylts reported to RL.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: COS-36 **EPA Method 533**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-003v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:2R

Laboratory Data

Lab Sample: 2304086-03
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu v	37R-22-4	7.72	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFMPv	377-73-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFPev	2706-90-3	22.8	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFu S	37R-73-R	6.47	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFMu v	863090-89-R	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFHHSv	BB3R07-82-7	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
NFD1 v	BRB772-R8-6	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
4:2 FTS	7R7B24-72-4	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PF1 xv	307-24-4	B8.0	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFPeS	2706-9B-4	4.42	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
1 FPO-Dv	B32R2-B3-6	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PF1 pv	37R-8R-9	2.72	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PF1 xS	3RR-46-4	B2.3	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
v DONv	9B900R-B4-4	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
6:2 FTS	276B9-97-2	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFOv	33R-67-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PF1 pS	37R-92-8	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFNv	37R-9R-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFOS	B763-23-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
9Cl-PF3ONS	7R6426-R8-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
8:2 FTS	39B08-34-4	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFDv	33R-76-2	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFUEv	20R8-94-8	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
BBCl-PF3OUdS	7630RB-92-9	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
PFDov	307-RR-B	ND	B.9B		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C4-PFu v	IS	BB6	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3CR-PFPev	IS	BB7	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C3-PFu S	IS	BB6	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C2-4:2 FTS	IS	B32	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3CR-PF1 xv	IS	B20	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C3-1 FPO-Dv	IS	BB0	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C4-PF1 pv	IS	BB6	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C3-PF1 xS	IS	92.9	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C2-6:2 FTS	IS	B39	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C8-PFOv	IS	BBB	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B
B3C9-PFNv	IS	BB3	R0 - BR0		u 23DB76	20-v pr-23	0.26BL	28-v pr-23 B7:20	B

Sample ID: COS-36 **EPA Method 533**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-003v
Matrix: GroyEdwater
Date Collected: 06-v pr-23 BB:2R

Laboratory Data

Lab Sample: 2304086-03
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C8-PFOS	IS	BB9	R0 - BR0		u 23DB76	20-v pr-23	0.26B L	28-v pr-23 B7:20	B
B3C2-8:2 FTS	IS	B22	R0 - BR0		u 23DB76	20-v pr-23	0.26B L	28-v pr-23 B7:20	B
B3C6-PFDv	IS	B0B	R0 - BR0		u 23DB76	20-v pr-23	0.26B L	28-v pr-23 B7:20	B
B3C7-PFUEv	IS	B08	R0 - BR0		u 23DB76	20-v pr-23	0.26B L	28-v pr-23 B7:20	B
B3C2-PFDov	IS	B04	R0 - BR0		u 23DB76	20-v pr-23	0.26B L	28-v pr-23 B7:20	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: FB-1

EPA Method 533

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-004v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:08

Laboratory Data

Lab Sample: 2304086-04
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu v	37R-22-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFMPv	377-73-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFPev	2706-90-3	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFu S	37R-73-R	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFMu v	863090-89-R	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFHHSv	BB3R07-82-7	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
NFD1 v	BRB772-R8-6	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
4:2 FTS	7R7B24-72-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PF1 xv	307-24-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFPeS	2706-9B-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
1 FPO-Dv	B32R2-B3-6	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PF1 pv	37R-8R-9	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PF1 xS	3RR-46-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
v DONv	9B900R-B4-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
6:2 FTS	276B9-97-2	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFOv	33R-67-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PF1 pS	37R-92-8	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFNv	37R-9R-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFOS	B763-23-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
9Cl-PF3ONS	7R6426-R8-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
8:2 FTS	39B08-34-4	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFDv	33R-76-2	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFUEv	20R8-94-8	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
BBCl-PF3OUdS	7630RB-92-9	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
PFDov	307-RR-B	ND	2.29		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C4-PFu v	IS	BB9	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3CR-PFPev	IS	BB8	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C3-PFu S	IS	B46	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C2-4:2 FTS	IS	B24	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3CR-PF1 xv	IS	BBR	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C3-1 FPO-Dv	IS	B08	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C4-PF1 pv	IS	B08	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C3-PF1 xS	IS	BBB	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C2-6:2 FTS	IS	B38	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C8-PFOv	IS	B07	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C9-PFNv	IS	99.2	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B

Sample ID: FB-1 **EPA Method 533**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-004v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:08

Laboratory Data

Lab Sample: 2304086-04
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C8-PFOS	IS	9R.B	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C2-8:2 FTS	IS	B28	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C6-PFDv	IS	B09	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C7-PFUEv	IS	B07	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B
B3C2-PFDov	IS	B09	R0 - BR0		u 23DB76	20-v pr-23	0.2B8 L	28-v pr-23 B7:3B	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

Sample ID: DBS-1 **EPA Method 533**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: wroundRater
Date Collected: 07-Apr-23 G1:21

Laboratory Data

Lab Sample: 2304086-01
Date 5 eceived: GG-Apr-23 08:16
Column: BEH CG8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	371-22-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFMPA	377-73-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFPeA	2706-90-3	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFBS	371-73-1	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFMBA	863090-89-1	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFEESA	GG3107-82-7	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
NFDHA	G1G772-18-6	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
4:2 FTS	717G24-72-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFHxA	307-24-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFPeS	2706-9G-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
HFPO-DA	G3212-G3-6	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFHpA	371-81-9	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFHxS	311-46-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
ADONA	9G9001-G4-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
6:2 FTS	276G9-97-2	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFOA	331-67-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFHpS	371-92-8	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFNA	371-91-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFOS	G763-23-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
9Cl-PF3ONS	716426-18-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
8:2 FTS	39G08-34-4	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFDA	331-76-2	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFUnA	2018-94-8	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
GGCl-PF3OUdS	76301G-92-9	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
PFDoA	307-11-G	ND	G9G		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
G3C4-PFBA	IS	GG3	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C1-PFPeA	IS	GGG	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C3-PFBS	IS	G0G	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C2-4:2 FTS	IS	G20	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C1-PFHxA	IS	G01	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C3-HFPO-DA	IS	91.6	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C4-PFHpA	IS	G02	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C3-PFHxS	IS	GG1	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C2-6:2 FTS	IS	GG8	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C8-PFOA	IS	99.8	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
G3C9-PFNA	IS	G0G	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G

Sample ID: DBS-1 **EPA Method 533**

Client Data

Name: Hall Environmental Analytical Laboratory
Project: 2304376
Location: 2304376-001A
Matrix: wroundRater
Date Collected: 07-Apr-23 G1:21

Laboratory Data

Lab Sample: 2304086-01
Date 5 eceived: GG-Apr-23 08:16
Column: BEH CG8

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
GBC8-PFOS	IS	G07	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
GBC2-8:2 FTS	IS	G2G	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
GBC6-PFDA	IS	83.6	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
GBC7-PFUnA	IS	88.1	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G
GBC2-PFDoA	IS	89.G	10 - G10		B23DG76	20-Apr-23	0.262 L	28-Apr-23 G7:42	G

5 L - 5 eporting limit

5 esults reported to 5 L.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: DBS-1D **EPA Method 533**

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-006v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:2R

Laboratory Data

Lab Sample: 2304086-06
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Analyte	CAS Number	Conc. (ng/L)	RL	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFu v	37R-22-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFMPv	377-73-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFPev	2706-90-3	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFu S	37R-73-R	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFMu v	863090-89-R	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFHHSv	BB3R07-82-7	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
NFD1 v	BRB772-R8-6	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
4:2 FTS	7R7B24-72-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PF1 xv	307-24-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFPeS	2706-9B-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
1 FPO-Dv	B32R2-B3-6	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PF1 pv	37R-8R-9	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PF1 xS	3RR-46-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
v DONv	9B900R-B4-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
6:2 FTS	276B9-97-2	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFOv	33R-67-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PF1 pS	37R-92-8	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFNv	37R-9R-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFOS	B763-23-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
9Cl-PF3ONS	7R6426-R8-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
8:2 FTS	39B08-34-4	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFDv	33R-76-2	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFUEv	20R8-94-8	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
BBCl-PF3OUdS	7630RB-92-9	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
PFDov	307-RR-B	ND	B.93		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C4-PFu v	IS	9R.B	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3CR-PFPev	IS	94.8	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C3-PFu S	IS	9R.4	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C2-4:2 FTS	IS	B02	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3CR-PF1 xv	IS	82.0	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C3-1 FPO-Dv	IS	7R.2	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C4-PF1 pv	IS	77.6	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C3-PF1 xS	IS	8R.R	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C2-6:2 FTS	IS	93.2	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C8-PFOv	IS	66.6	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C9-PFNv	IS	60.7	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B

Sample ID: DBS-1D

EPA Method 533

Client Data

Name: 1 all HEniroEmeEtal v EalAtical LaboratorA
Project: 2304376
LocatioE: 2304376-006v
Matrix: GroyEdwater
Date Collected: 07-v pr-23 BR:2R

Laboratory Data

Lab Sample: 2304086-06
Date 5 eceined: BB-v pr-23 08:R6
ColymE: u H1 CB8

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
B3C8-PFOS	IS	89.2	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C2-8:2 FTS	IS	88.4	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C6-PFDv	IS	64.B	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C7-PFUEv	IS	76.9	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B
B3C2-PFDov	IS	80.4	R0 - BR0		u 23DB76	20-v pr-23	0.2R9 L	28-v pr-23 B7:R4	B

5 L - 5 eportiEg limit

5 esylts reported to 5 L.

WheE reported, PF1 xS, PFOv , PFOS, MeFOSv v aEd HtFOSv v iEclyde both liEear aEd braEched isomers. OElAthe liEear isomer is reported for all other aEalAtes.

DATA QUALIFIERS & ABBREVIATIONS

B	This compound was also detected in the method blank
Conc.	Concentration
CRS	Cleanup Recovery Standard
D	Dilution
DL	Detection Limit
E	The associated compound concentration exceeded the calibration range of the instrument
H	Recovery and/or RPD was outside laboratory acceptance limits
I	Chemical Interference
IS	Internal Standard
J	The amount detected is below the Reporting Limit/LOQ
LOD	Limit of Detection
LOQ	Limit of Quantitation
M	Estimated Maximum Possible Concentration (CA Region 2 projects only)
MDL	Method Detection Limit
NA	Not applicable
ND	Not Detected
OPR	Ongoing Precision and Recovery sample
P	The reported concentration may include contribution from chlorinated diphenyl ether(s).
Q	The ion transition ratio is outside of the acceptance criteria.
RL	Reporting Limit
RL	For 537.1, the reported RLs are the MRLs.
TEQ	Toxic Equivalency, sum of the toxic equivalency factors (TEF) multiplied by the sample concentrations.
TEQMax	TEQ calculation that uses the detection limit as the concentration for non-detects
TEQMin	TEQ calculation that uses zero as the concentration for non-detects
TEQRisk	TEQ calculation that uses ½ the detection limit as the concentration for non-detects
U	Not Detected (specific projects only)
*	See Cover Letter

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

Enthalpy Analytical - EDH Certifications

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	21-023-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025	3091.01
Florida Department of Health	E87777
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2020018
Michigan Department of Environmental Quality	9932
Minnesota Department of Health	2211390
Nevada Division of Environmental Protection	CA00413
New Hampshire Environmental Accreditation Program	207721
New Jersey Department of Environmental Protection	CA003
New York Department of Health	11411
Ohio Environmental Protection Agency	87778
Oregon Laboratory Accreditation Program	4042-021
Texas Commission on Environmental Quality	T104704189-22-13
Vermont Department of Health	VT-4042
Virginia Department of General Services	11276
Washington Department of Ecology	C584
Wisconsin Department of Natural Resources	998036160

Current certificates and lists of licensed parameters can be found at Enthalpy.com/Resources/Accreditations.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

CHAIN OF CUSTODY RECORD

PAGE: 1 OF: 1

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975
FAX: 505-345-4107
Website: www.hallenvironmental.com

2304086 2.8°C

SUB CONTRATOR: Vista Analytical Labor	COMPANY: Vista Analytical Laboratory	PHONE: (916) 673-1520	FAX:
ADDRESS: 1104 Windfield Way		ACCOUNT #:	EMAIL:
CITY, STATE, ZIP: El Dorado Hills, CA 95762			

ITEM	SAMPLE	CLIENT SAMPLE ID	BOTTLE TYPE	MATRIX	COLLECTION DATE	# CONTAINERS	ANALYTICAL COMMENTS
1	2304376-001A	COS-35	250HDPE	Groundwater	4/6/2023 11:12:00 AM	2	24 Compound PFAS Testing EPA Method 533
2	2304376-001B	COS-35	250HDPE	Groundwater	4/6/2023 11:12:00 AM	2	24 Compound PFAS Testing EPA Method 537
3	2304376-002A	COS-35 Dup	250HDPE	Groundwater	4/6/2023 11:12:00 AM	2	24 Compound PFAS Testing EPA Method 533
4	2304376-002B	COS-35 Dup	250HDPE	Groundwater	4/6/2023 11:12:00 AM	2	24 Compound PFAS Testing EPA Method 537
5	2304376-003A	COS-36	250HDPE	Groundwater	4/6/2023 11:25:00 AM	2	24 Compound PFAS Testing EPA Method 533
6	2304376-003B	COS-36	250HDPE	Groundwater	4/6/2023 11:25:00 AM	2	24 Compound PFAS Testing EPA Method 537
7	2304376-004A	FB-1	250HDPE	Groundwater	4/7/2023 3:08:00 PM	2	24 Compound PFAS Testing EPA Method 533
8	2304376-004B	FB-1	250HDPE	Groundwater	4/7/2023 3:08:00 PM	2	24 Compound PFAS Testing EPA Method 537
9	2304376-005A	DBS-1	250HDPE	Groundwater	4/7/2023 3:25:00 PM	2	24 Compound PFAS Testing EPA Method 533
10	2304376-005B	DBS-1	250HDPE	Groundwater	4/7/2023 3:25:00 PM	2	24 Compound PFAS Testing EPA Method 537
11	2304376-006A	DBS-1D	250HDPE	Groundwater	4/7/2023 3:25:00 PM	2	24 Compound PFAS Testing EPA Method 533
12	2304376-006B	DBS-1D	250HDPE	Groundwater	4/7/2023 3:25:00 PM	2	24 Compound PFAS Testing EPA Method 537

SPECIAL INSTRUCTIONS / COMMENTS:

Please include the LAB ID and the CLIENT SAMPLE ID on all final reports. Please e-mail results to lab@hallenvironmental.com. Please return all coolers and blue ice. Thank you.

Relinquished By:	Date: 4/10/2023	Time: 11:20 AM	Received By: Karen Arita	Date: 04/11/23	Time: 08:54
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

TAT: Standard ☑ RUSH Next BD ☐ 2nd BD ☐ 3rd BD ☐

REPORT TRANSMITTAL DESIRED:
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY
Temp of samples ____ °C Attempt to Cool ? ____
Comments: ____

Sample Log-In Checklist

ENTHALPY ANALYTICAL

Page # 1 of 1

Work Order #: 2304086 **TAT** STD

Samples Arrival:	**Date/Time** 04/11/23 01:56		**Initials:** KZ		**Location:** WR-2 **Shelf/Rack:** NR		
Delivered By:	(FedEx)	UPS	On Trac	GLS	DHL	Hand Delivered	Other
Preservation:	Ice		(Blue Ice)		Techni Ice	Dry Ice	None
Temp °C: 2.9 (uncorrected) **Temp °C:** 2.8 (corrected)	**Probe used: Y / (N)**				**Thermometer ID:** IR-3		

	YES	NO	NA
Shipping Container(s) Intact?	✓		
Shipping Custody Seals Intact?	✓		
Airbill ✓ Trk # 7718 0567 7958	✓		
Shipping Documentation Present?	✓		
Shipping Container: Enthalpy / (Client) / Retain / (Return) / Dispose			
Chain of Custody / Sample Documentation Present?	✓		
Chain of Custody / Sample Documentation Complete?	✓		
Holding Time Acceptable?	✓		

Logged In:	**Date/Time** 04/12/23 12:38	**Initials:** KZ	**Location:** R-13, WR-2 **Shelf/Rack:** A-2, F-6	
COC Anomaly/Sample Acceptance Form completed?			✓	✓

Comments:

CoC/Label Reconciliation Report WO# 2304086

LabNumber	CoC Sample ID	SampleAlias	Sample Date/Time	Container	BaseMatrix	Sample Comments
2304086-01	A COS-35	2304376-001A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-01	B COS-35	2304376-001A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-01	C COS-35	2304376-001A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-01	D COS-35	2304376-001A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-02	A COS-35 DUP	2304376-002A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-02	B COS-35 DUP	2304376-002A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-02	C COS-35 DUP	2304376-002A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-02	D COS-35 DUP	2304376-002A	06-Apr-23 11:12	HDPE Bottle, 250 mL	Aqueous	
2304086-03	A COS-36	2304376-003A	06-Apr-23 11:25	HDPE Bottle, 250 mL	Aqueous	
2304086-03	B COS-36	2304376-003A	06-Apr-23 11:25	HDPE Bottle, 250 mL	Aqueous	
2304086-03	C COS-36	2304376-003A	06-Apr-23 11:25	HDPE Bottle, 250 mL	Aqueous	
2304086-03	D COS-36	2304376-003A	06-Apr-23 11:25	HDPE Bottle, 250 mL	Aqueous	
2304086-04	A FB-1	2304376-004A	07-Apr-23 15:08	HDPE Bottle, 250 mL	Aqueous	
2304086-04	B FB-1	2304376-004A	07-Apr-23 15:08	HDPE Bottle, 250 mL	Aqueous	
2304086-04	C FB-1	2304376-004A	07-Apr-23 15:08	HDPE Bottle, 250 mL	Aqueous	
2304086-04	D FB-1	2304376-004A	07-Apr-23 15:08	HDPE Bottle, 250 mL	Aqueous	
2304086-05	A DBS-1	2304376-005A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-05	B DBS-1	2304376-005A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-05	C DBS-1	2304376-005A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-05	D DBS-1	2304376-005A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-06	A DBS-1D	2304376-006A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-06	B DBS-1D	2304376-006A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-06	C DBS-1D	2304376-006A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	
2304086-06	D DBS-1D	2304376-006A	07-Apr-23 15:25	HDPE Bottle, 250 mL	Aqueous	

Checkmarks indicate that information on the COC reconciled with the sample label.
Any discrepancies are noted in the following columns.

	Yes	No	NA
Sample Container Intact?	✓		
Sample Custody Seals Intact?			✓
Adequate Sample Volume?	✓		
Container Type Appropriate for Analysis(es)	✓		

Comments: A) ESS trizma label
C) Sample Aliq on sample label listed "B"

Preservation Documented: Na2S2O3 Trizma (A) NH4CH3CO2 (B) AAJ None Other

Verifed by/Date: YR 04/13/23
BAC 04/13/23

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: Daniel B. Stephens & Assoc.

Work Order Number: 2304376

RcptNo: 1

Received By: Kasandra Jimena Garcia 4/10/2023 9:48:00 AM

Completed By: Kasandra Jimena Garcia 4/10/2023 10:58:02 AM

Reviewed By: 4-10-23

Chain of Custody

1. Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2. How was the sample delivered?	Client		

Log In

3. Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
4. Were all samples received at a temperature of >0° C to 6.0°C	Yes ☑	No ☐	NA ☐
5. Sample(s) in proper container(s)?	Yes ☑	No ☐	
6. Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
7. Are samples (except VOA and ONG) properly preserved?	Yes ☑	No ☐	
8. Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
9. Received at least 1 vial with headspace <1/4" for AQ VOA?	Yes ☐	No ☐	NA ☑
10. Were any sample containers received broken?	Yes ☐	No ☑	
11. Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes ☑	No ☐	
12. Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
13. Is it clear what analyses were requested?	Yes ☑	No ☐	
14. Were all holding times able to be met? (If no, notify customer for authorization.)	Yes ☑	No ☐	

# of preserved bottles checked for pH: _____ (<2 or >12 unless noted)

Adjusted? _____

Checked by: JN 4/10/23

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

16. Additional remarks:

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.8	Good	Not Present	Morty		

Chain-of-Custody Record

Client: DB50A

Mailing Address: 6020 Academy NE Suite 100
Albuquerque, NM 87109

Phone #: 505-822-7400

email or Fax#: jbunch@geologic.com

QA/QC Package:
☒ Standard ☒ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other

☐ EDD (Type)

Turn-Around Time:
☒ Standard ☐ Rush

Project Name: CANNON AFB

Project #: DB20.1060.00

Project Manager: JOHN BUNCH

Sampler: J. Fisher

On Ice: ☒ Yes ☐ No

# of Coolers: 1 Marty

Cooler Temp(including CF): 2.1 -0.2 = 1.8 (°C)

HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com
4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Name	Container Type and #	Preservative Type	HEAL No.	BTEX / MTBE / TMB's (8021)	TPH:8015D(GRO / DRO / MRO)	8081 Pesticides/8082 PCB's	EDB (Method 504.1)	PAHs by 8310 or 8270SIMS	RCRA 8 Metals	Cl, F, Br, NO_3, NO_2, PO_4, SO_4	8260 (VOA)	8270 (Semi-VOA)	Total Coliform (Present/Absent)	PFAS 533	PFAS 537.1
4/6/23	1112	GW	COS-35	4-250ml	2-Ammonium Acetate 2-TRIS	001											X	X
"	1112		COS-35 DUP			002											X	X
"	1125		COS-36			003											X	X
4/7/23	1508		FB-1			004											X	X
	1525		DBS-1			005											X	X
	1525		DBS-1D			006											X	X

Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time
4/10/23	0948	[signature] / DB50A	[signature]	GSO	4-10-23	9:48
Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time

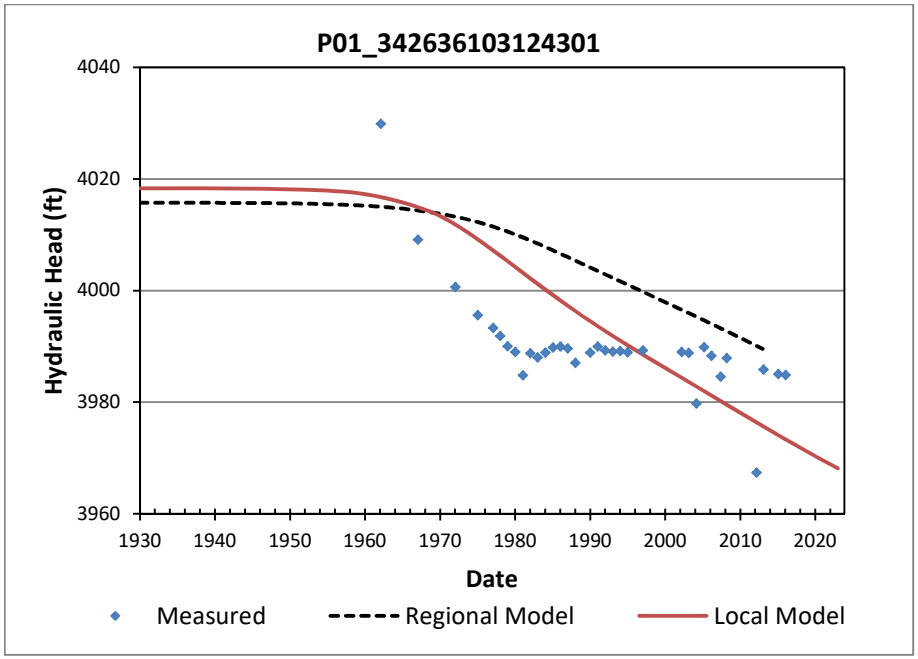
Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix B

Model Calibration Results

DBS&A
a Geo-Logic Company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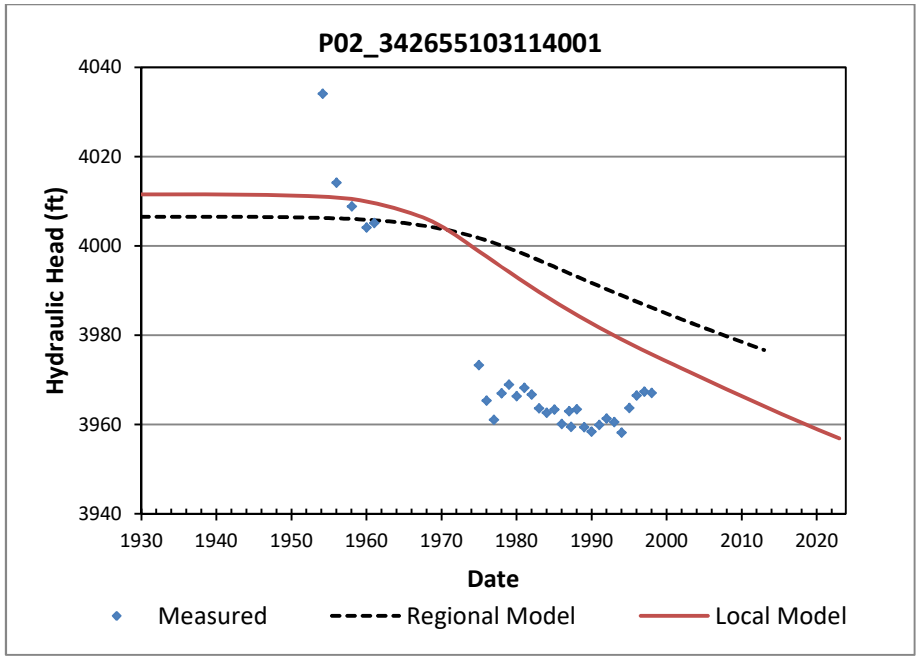
Hydraulic Head (ft)
4040
4020
4000
3980
3960
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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4020
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3980
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2000
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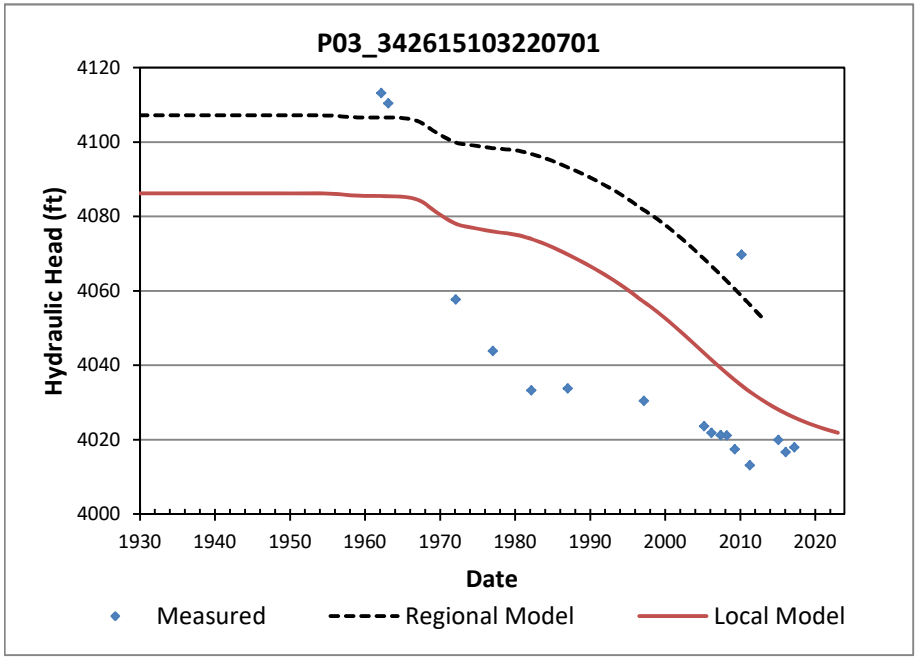
2020
Date
Measured
Regional Model
Local Model


P03_342615103220701
Hydraulic Head (ft)
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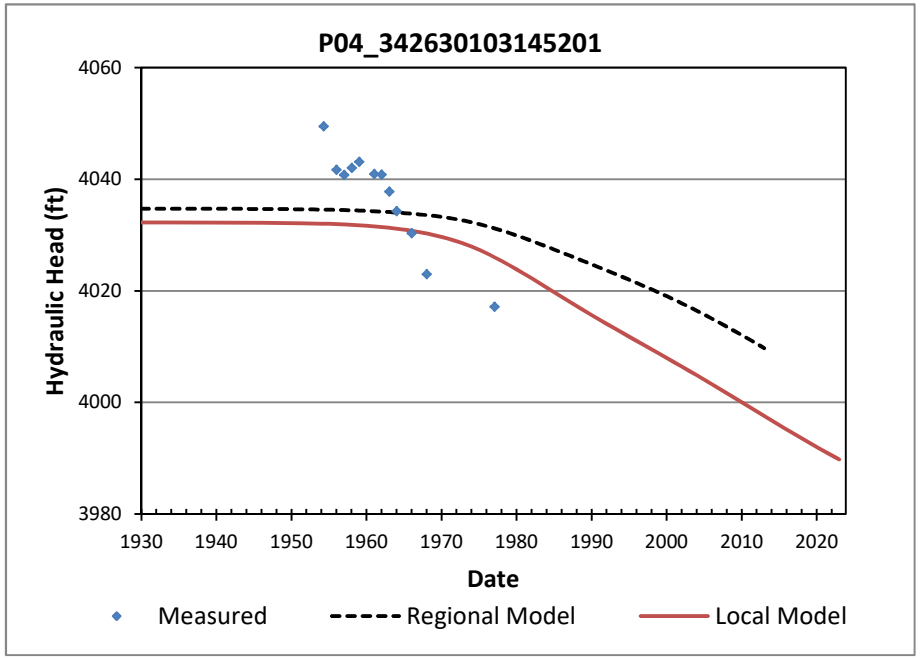
4100
4080
4060
4040
4020
4000
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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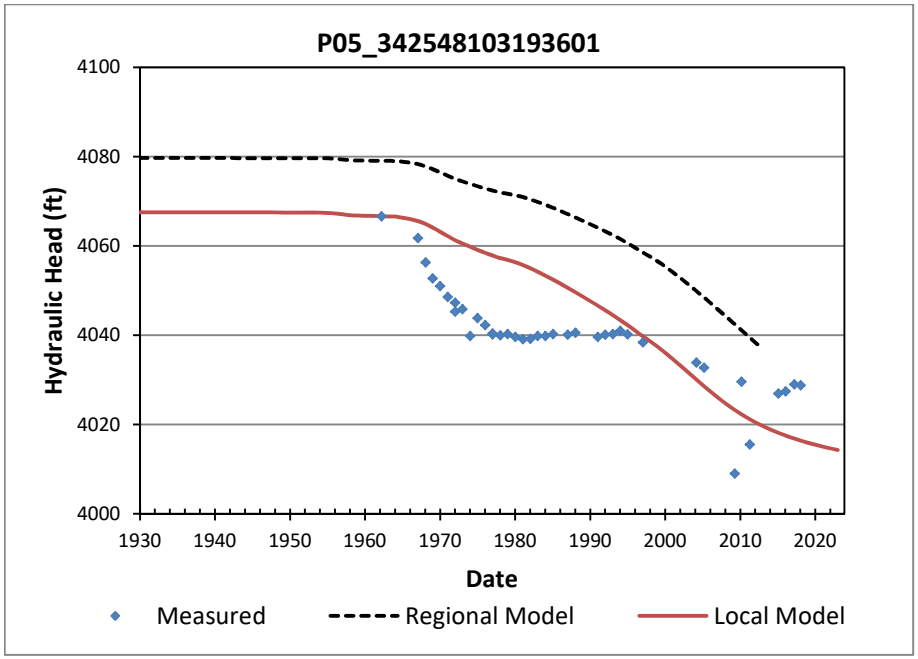
2010
2020
Date
Measured
Regional Model
Local Model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4080
4060
4040
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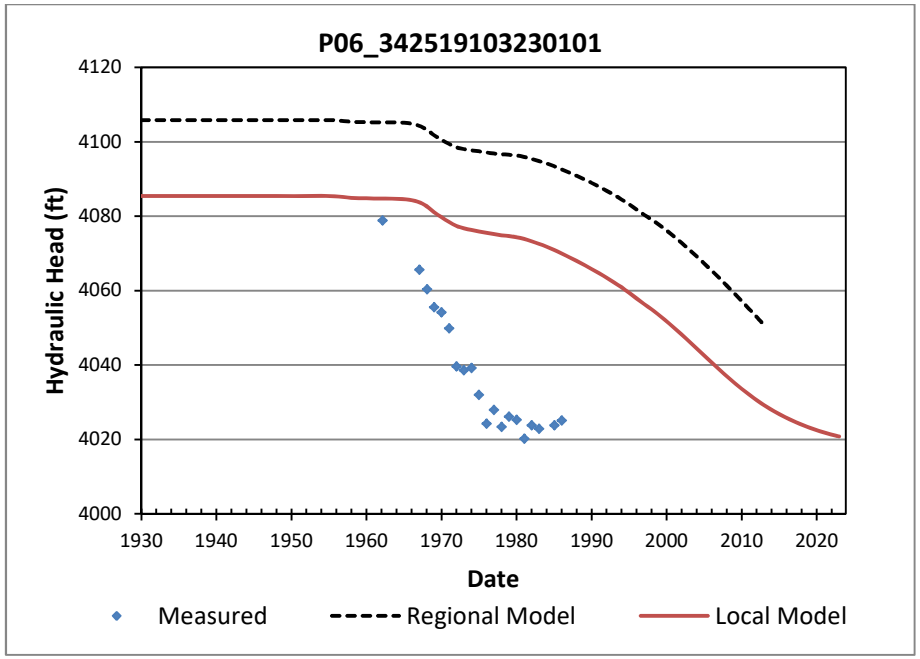
4000
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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Hydraulic Head (ft)
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4100
4080
4060
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4000
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1970
1980
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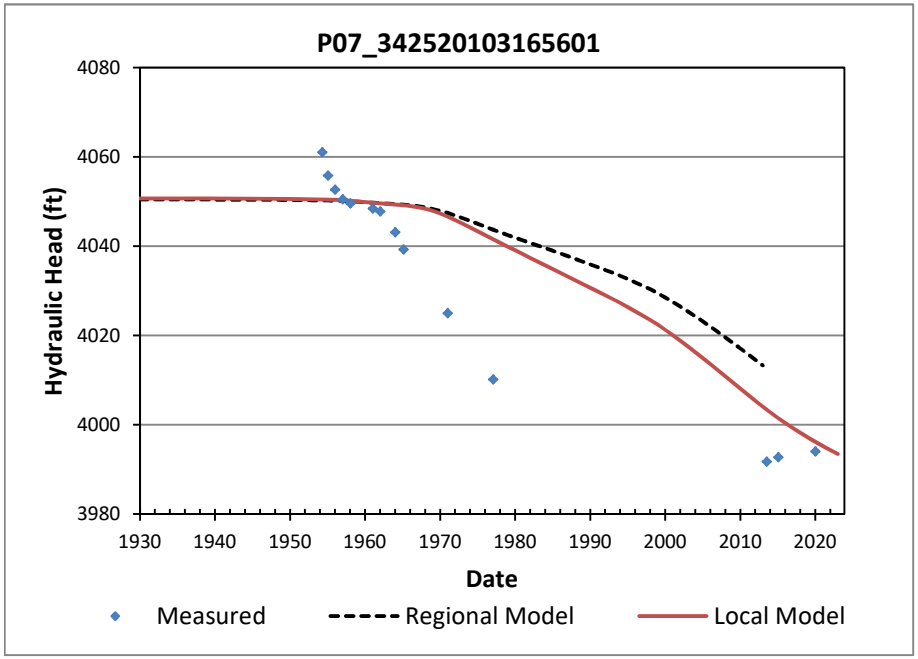
2010
2020
Date
Measured
Regional Model
Local Model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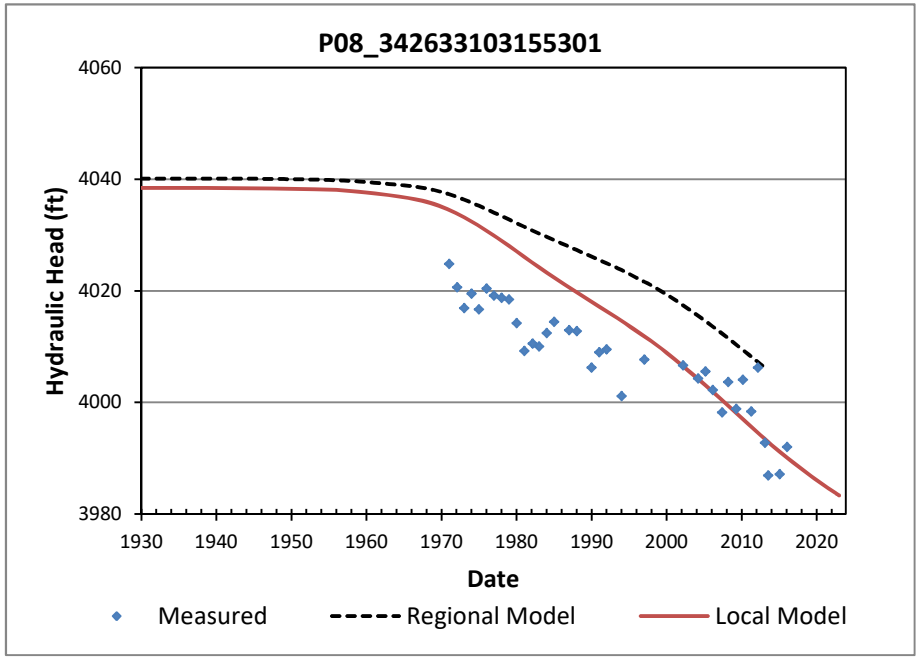
2000
2010
2020
Date
Measured
Regional Model
Local Model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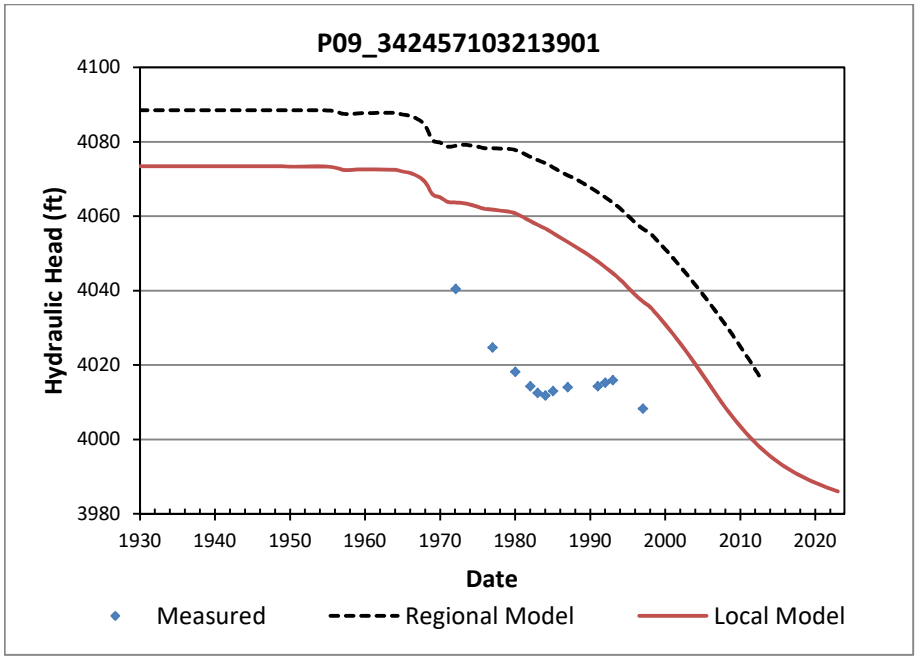
Date
Measured
Regional Model
Local Model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4080
4060
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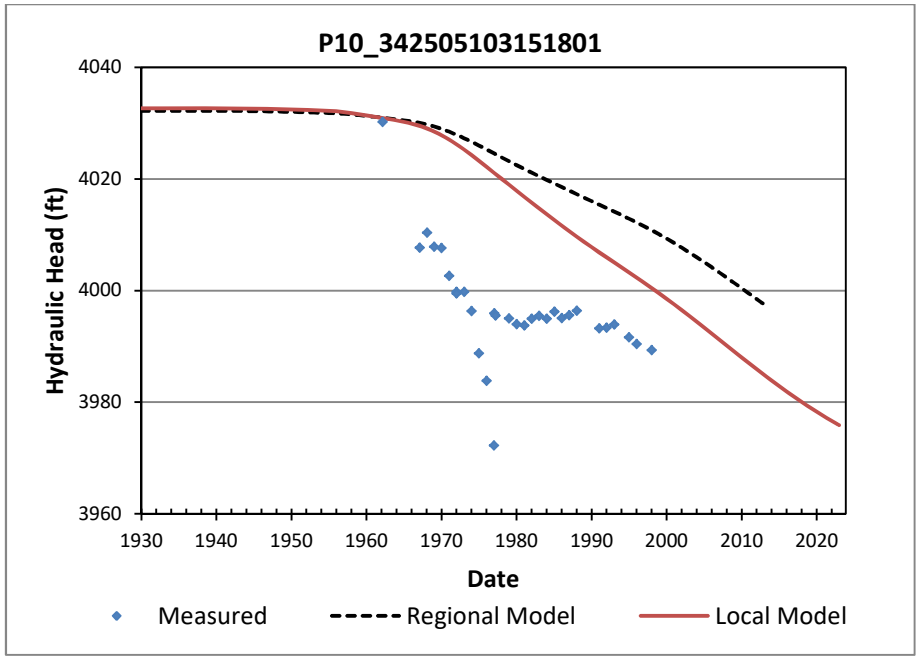
Date
Measured
Regional Model
Local Model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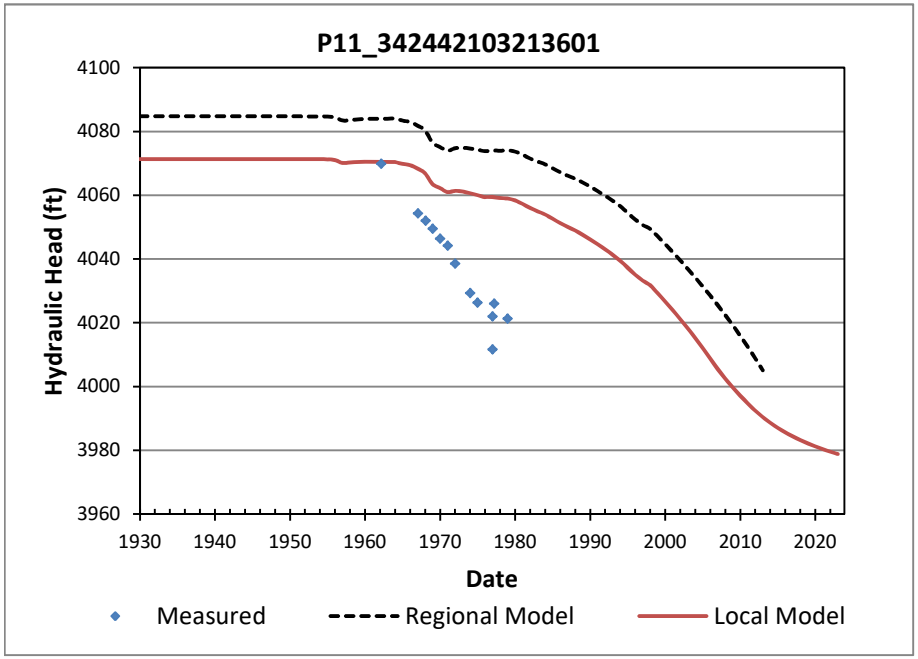
Date
Measured
Regional Model
Local Model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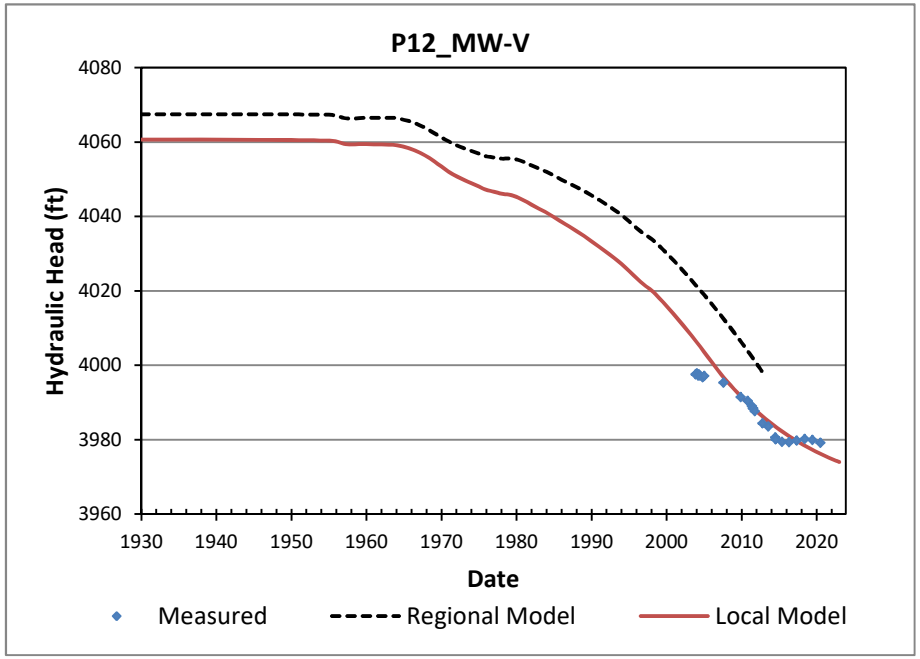
2020
Date
Measured
Regional Model
Local Model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4040
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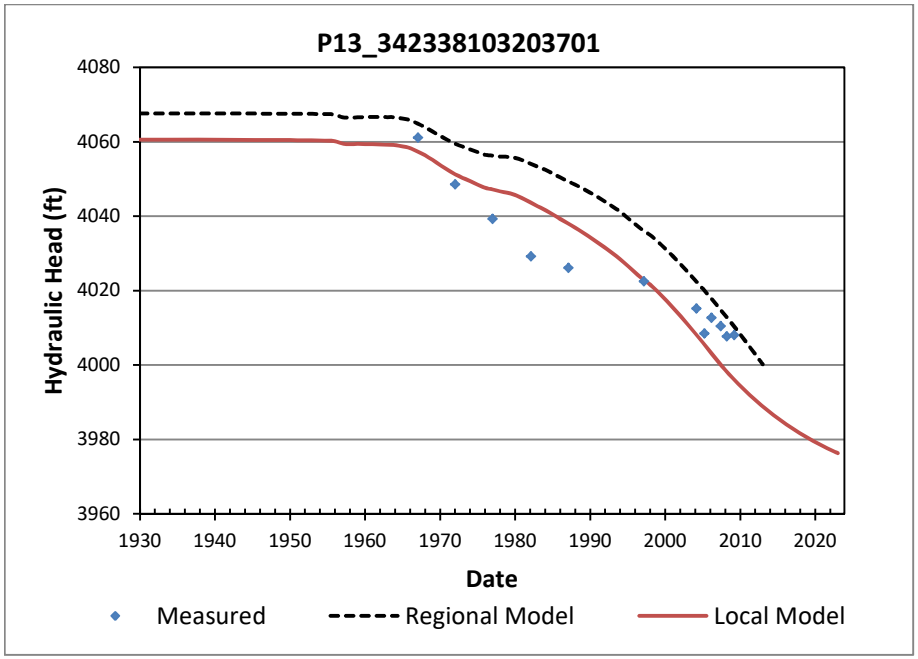
Date
Measured
Regional Model
Local Model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Hydraulic Head (ft)
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4060
4040
4020
4000
3980
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1940
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1960
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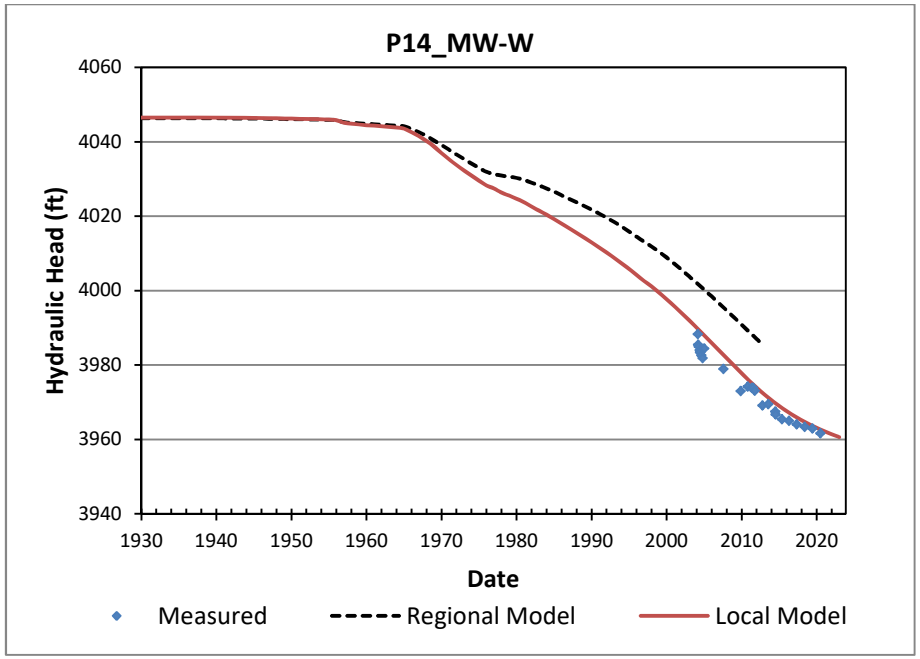
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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4040
4020
4000
3980
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3940
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1940
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1970
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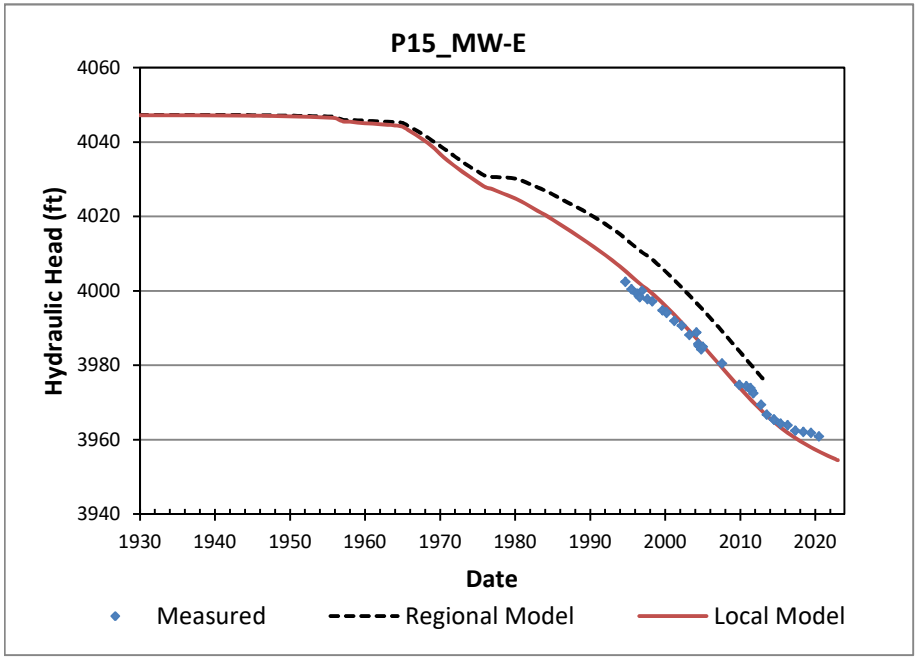
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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Hydraulic Head (ft)
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4040
4020
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1940
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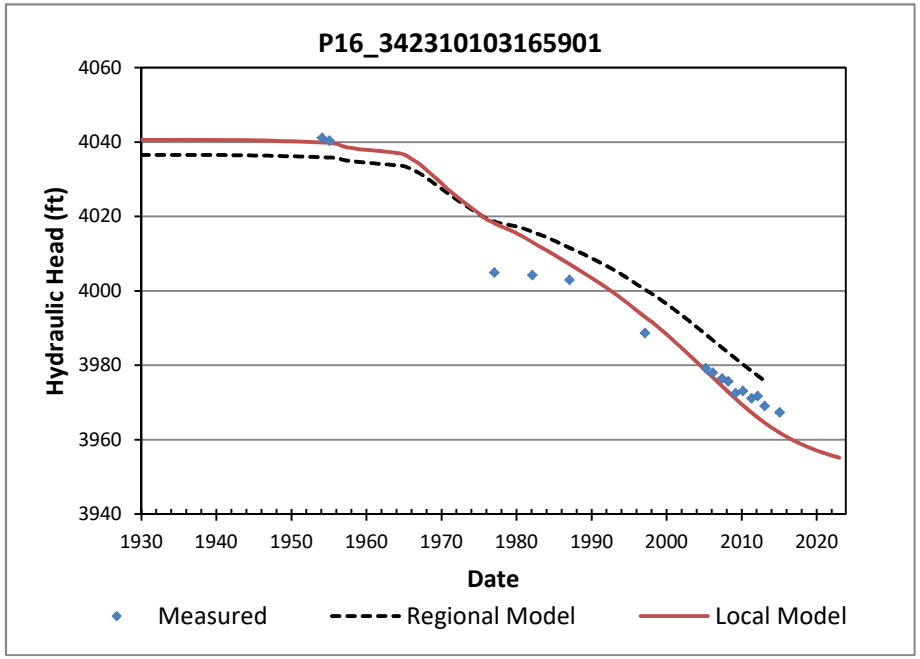
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model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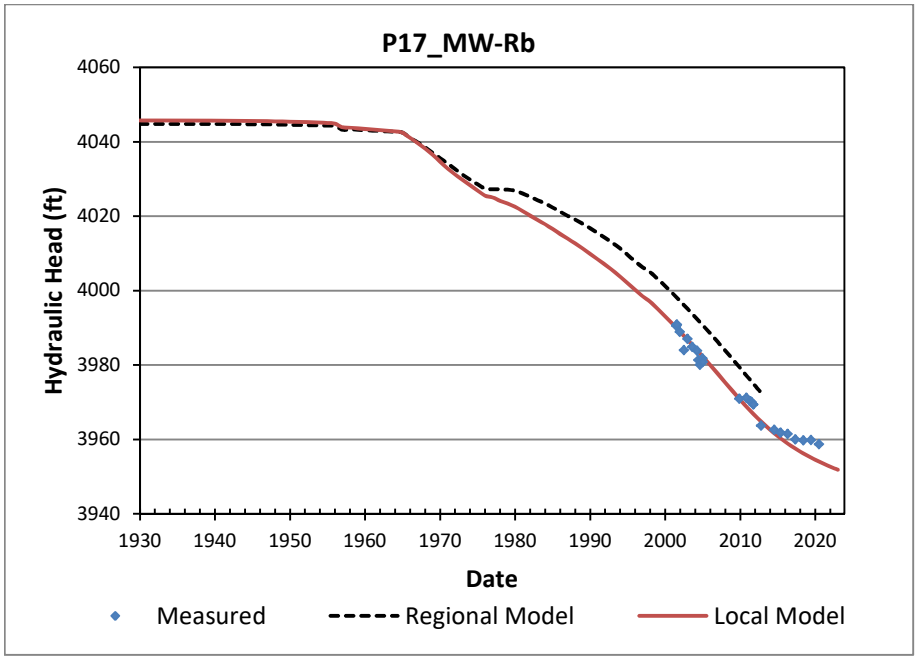
4040
4020
4000
3980
3960
3940
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P17_MW-Rb
Hydraulic Head (ft)
4060
4040
4020
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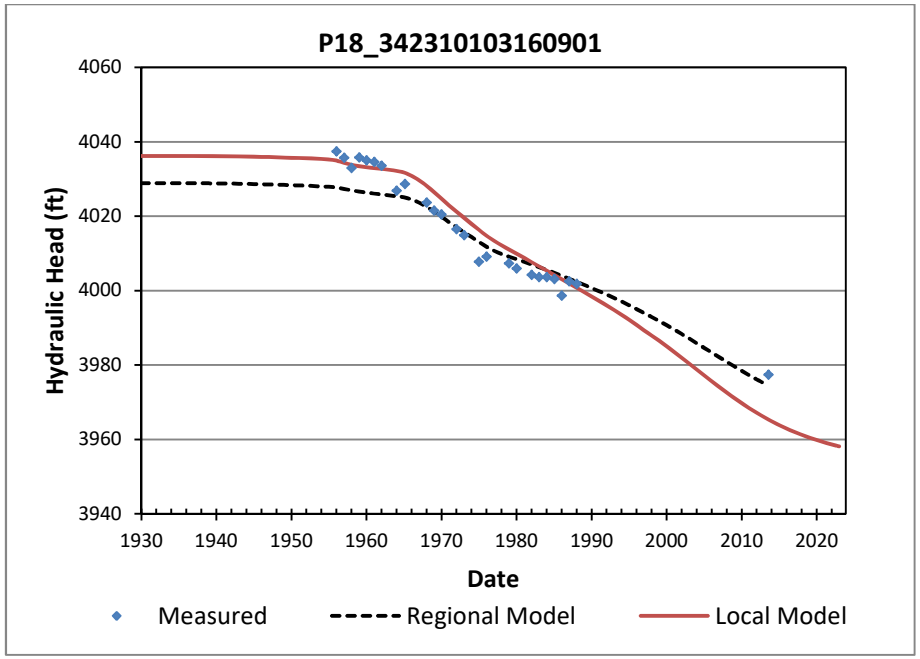
2010
2020
Date
Measured
Regional Model
Local Model


P18_342310103160901
Hydraulic Head (ft)
4060
4040
4020
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3980
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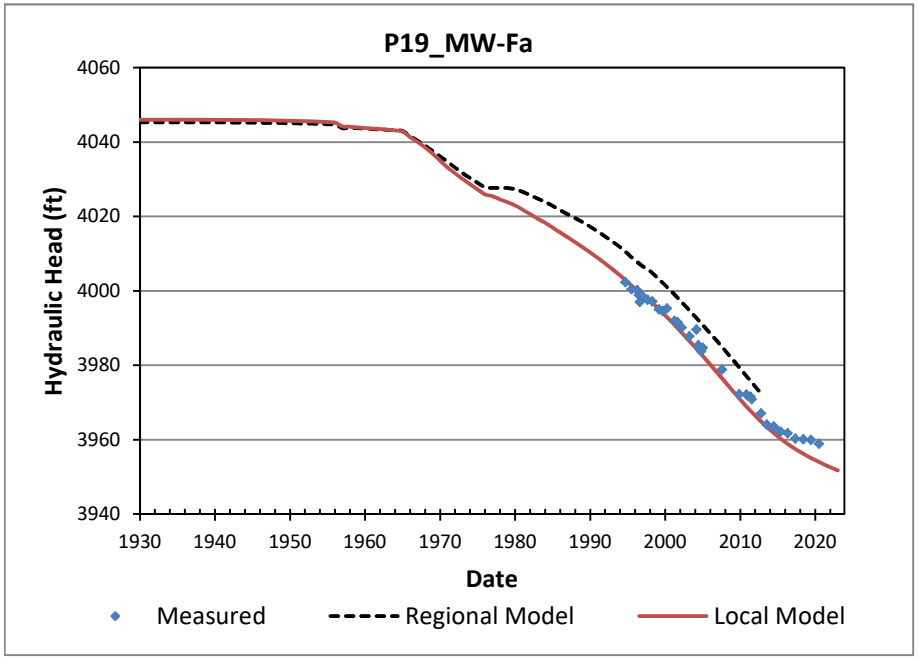
2010
2020
Date
Measured
Regional Model
Local Model


P19_MW-Fa
Hydraulic Head (ft)
4060
4040
4020
4000
3980
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3940
1930
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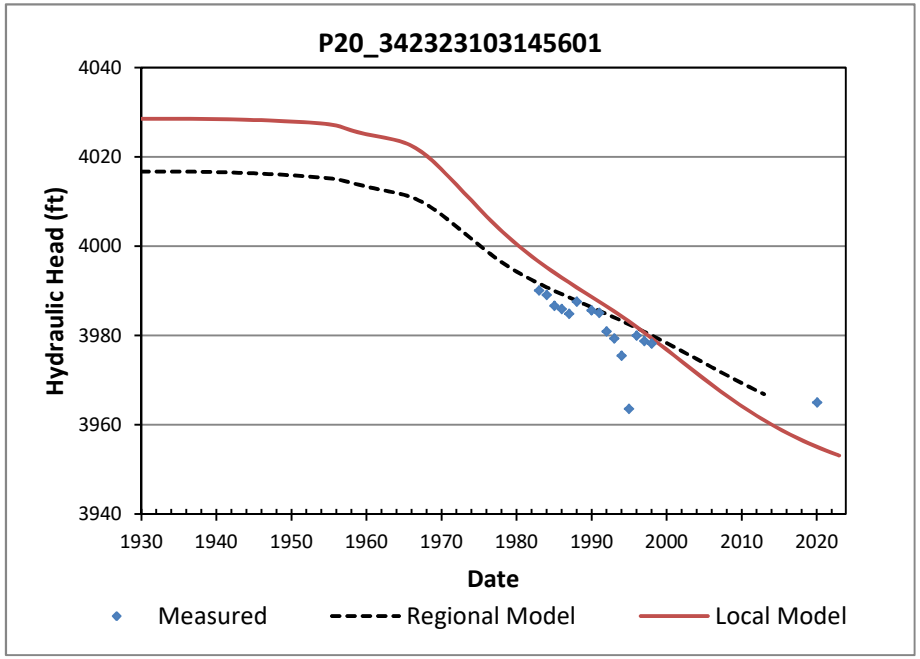
2010
2020
Date
Measured
Regional Model
Local Model


P20_342323103145601
Hydraulic Head (ft)
4040
4020
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3980
3960
3940
1930
1940
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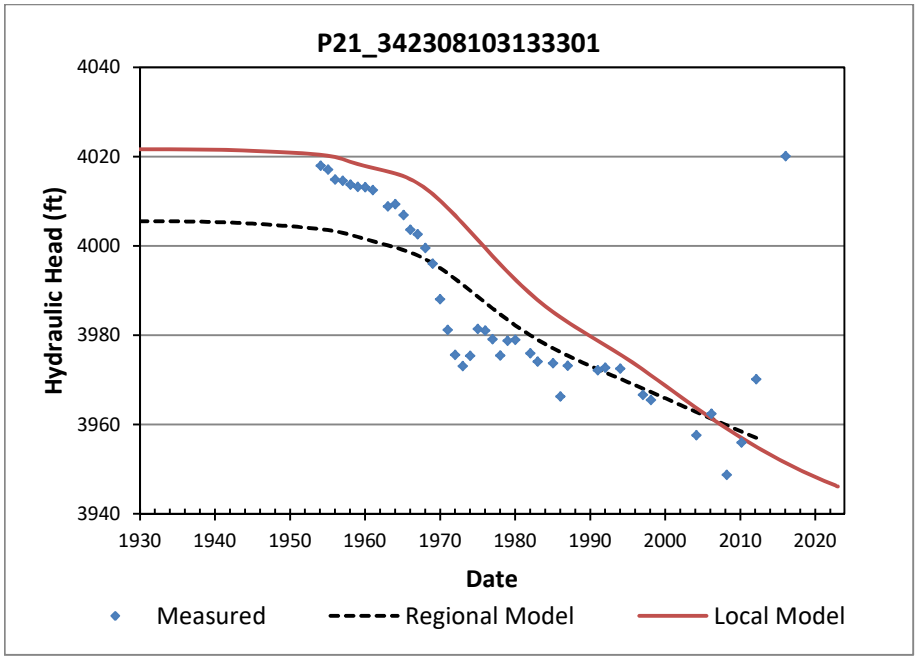
2020
Date
Measured
Regional Model
Local Model


P21_342308103133301
Hydraulic Head (ft)
4040
4020
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3980
3960
3940
1930
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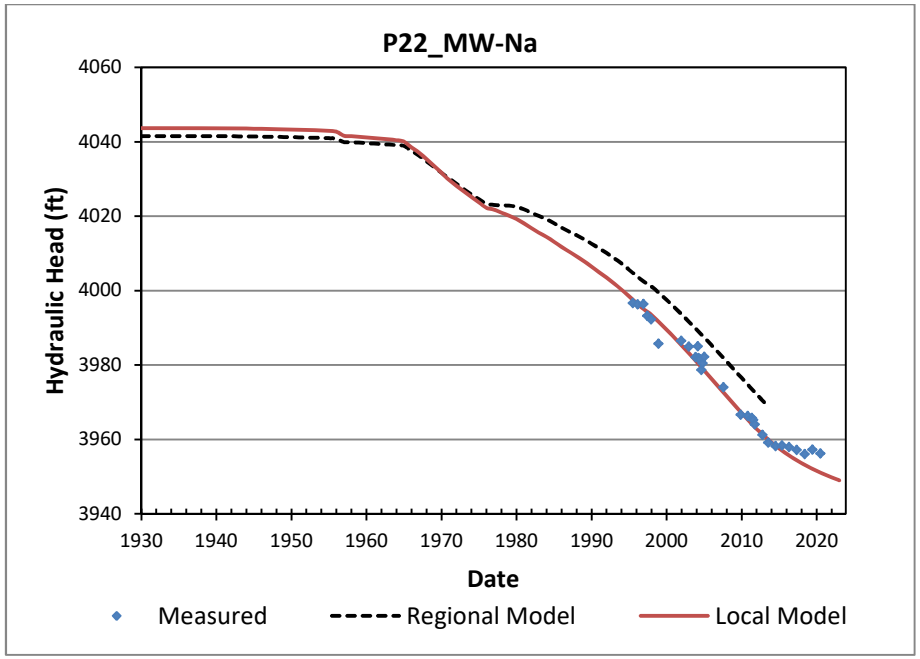
2000
2010
2020
Date
Measured
Regional Model
Local Model


P22_MW-Na
Hydraulic Head (ft)
4060
4040
4020
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3980
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3940
1930
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1980
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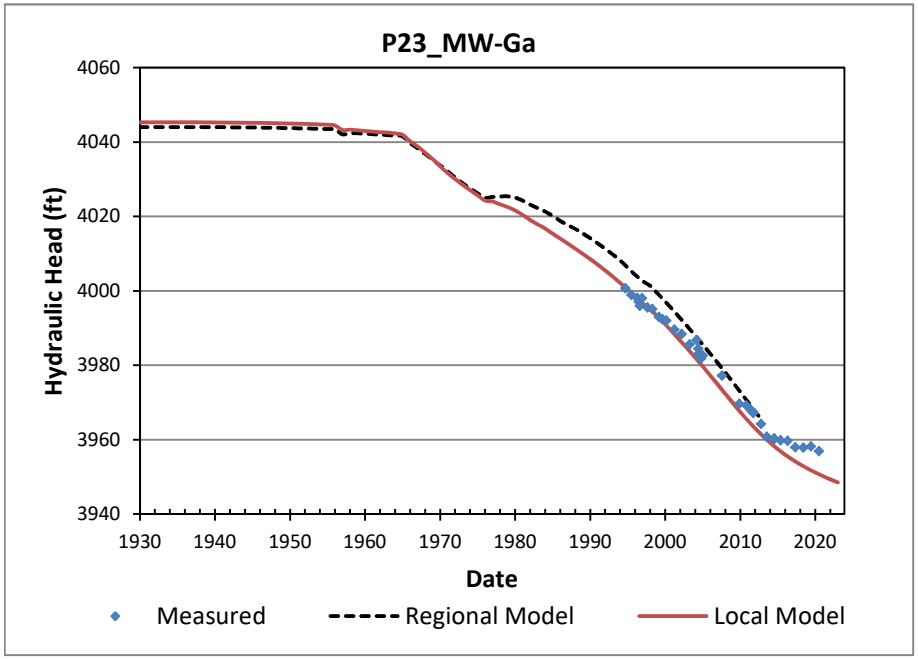
2000
2010
2020
Date
Measured
Regional Model
Local Model


P23_MW-Ga
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
3940
1930
1940
1950
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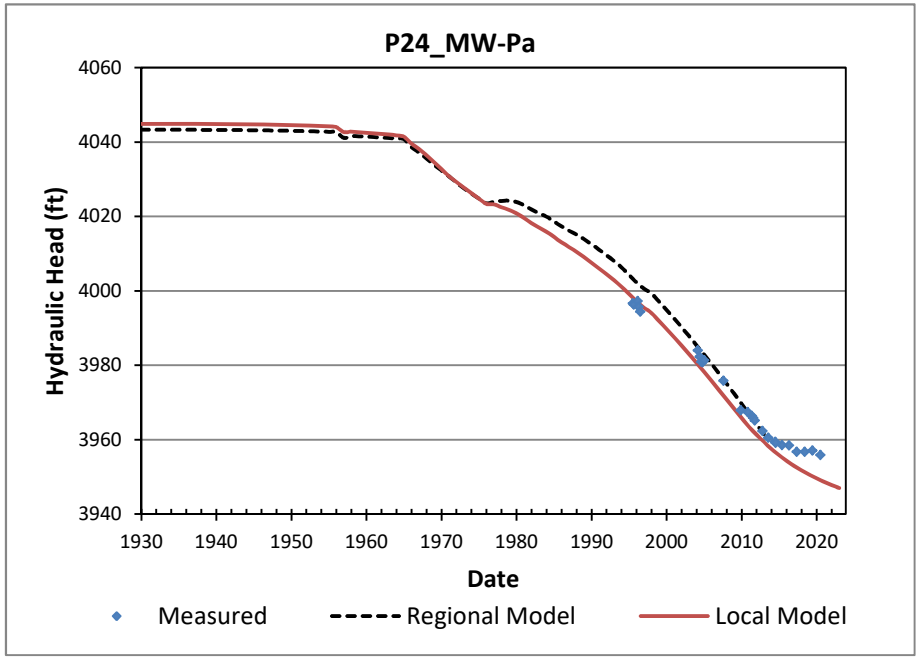
2010
2020
Date
Measured
Regional Model
Local Model


P24_MW-Pa
Hydraulic Head (ft)
4060
4040
4020
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3980
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1930
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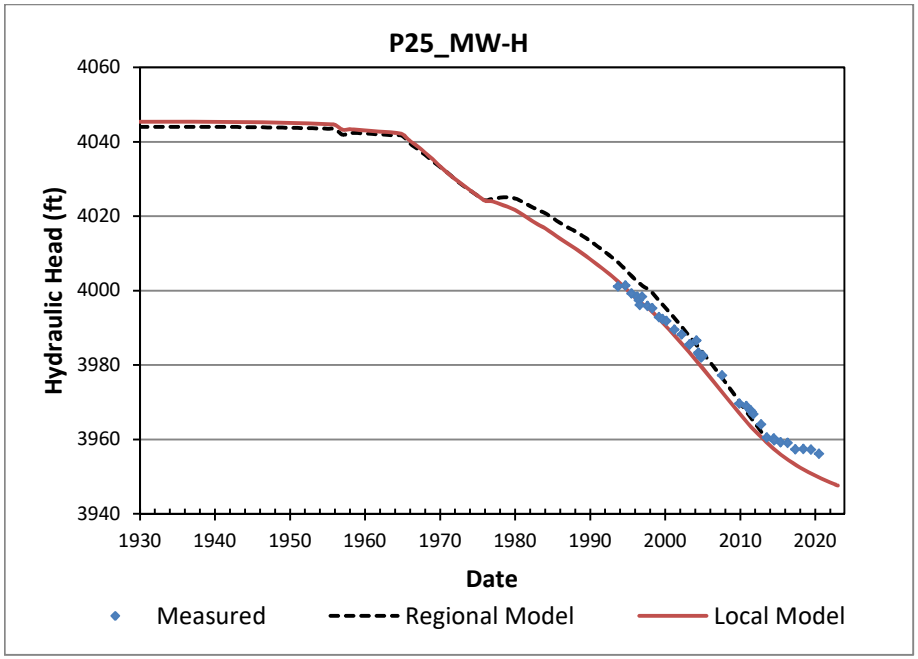
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P25_MW-H
Hydraulic Head (ft)
4060
4040
4020
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3980
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1930
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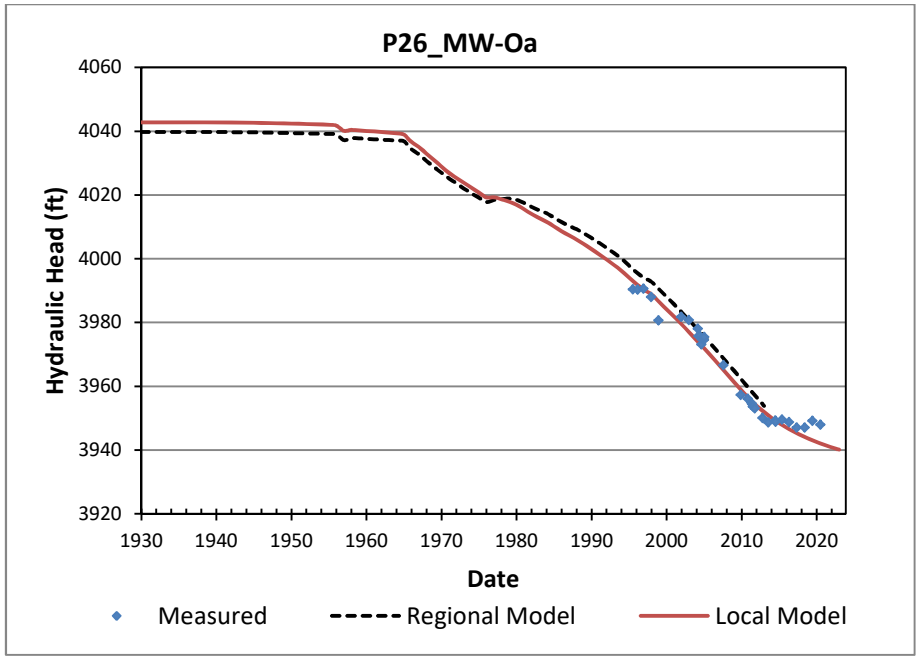
2010
2020
Date
Measured
Regional Model
Local Model


P26_MW-Oa
Hydraulic Head (ft)
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4040
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4000
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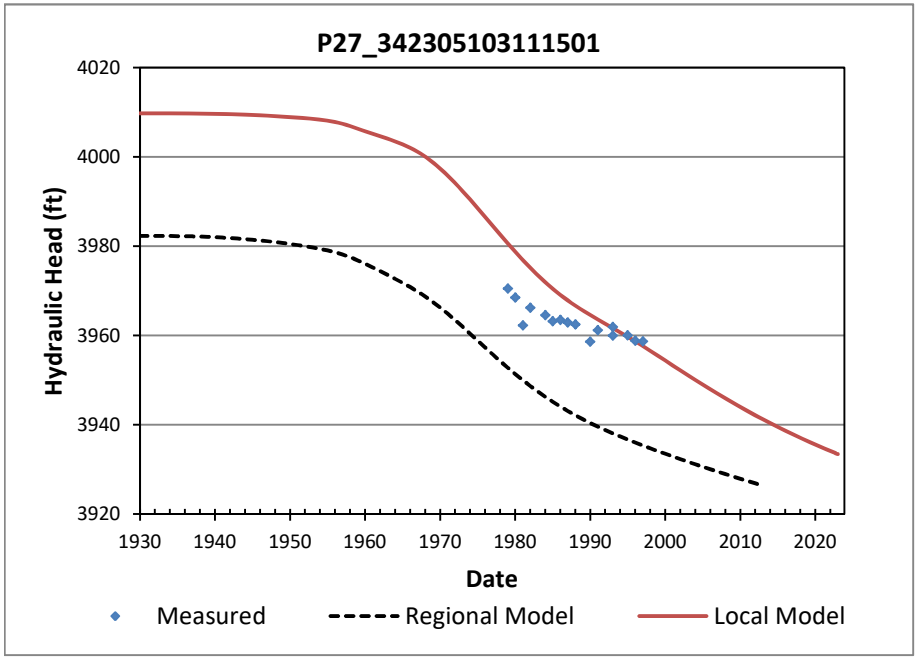
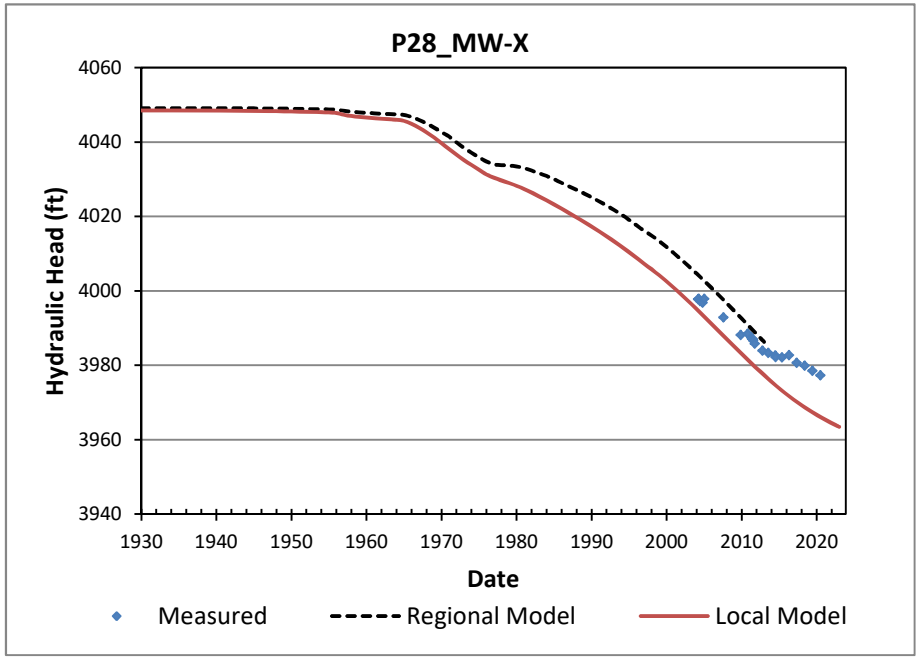
2010
2020
Date
Measured
Regional Model
Local Model


P27_342305103111501
Hydraulic Head (ft)
4020
4000
3980
3960
3940
3920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P28_MW-X
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
3940
1930
1940
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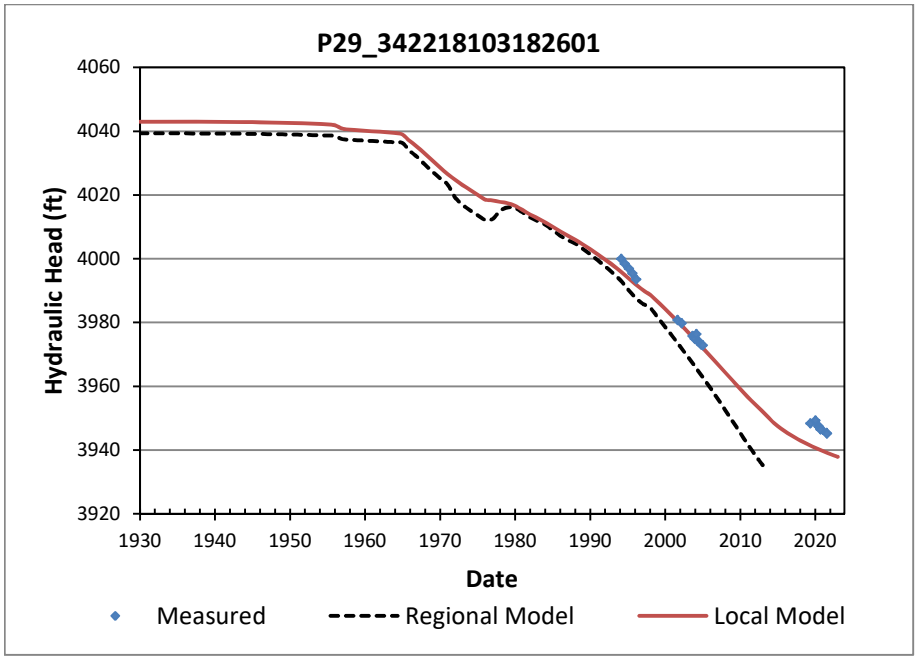
2010
2020
Date
Measured
Regional Model
Local Model


P29_342218103182601
Hydraulic Head (ft)
4060
4040
4020
4000
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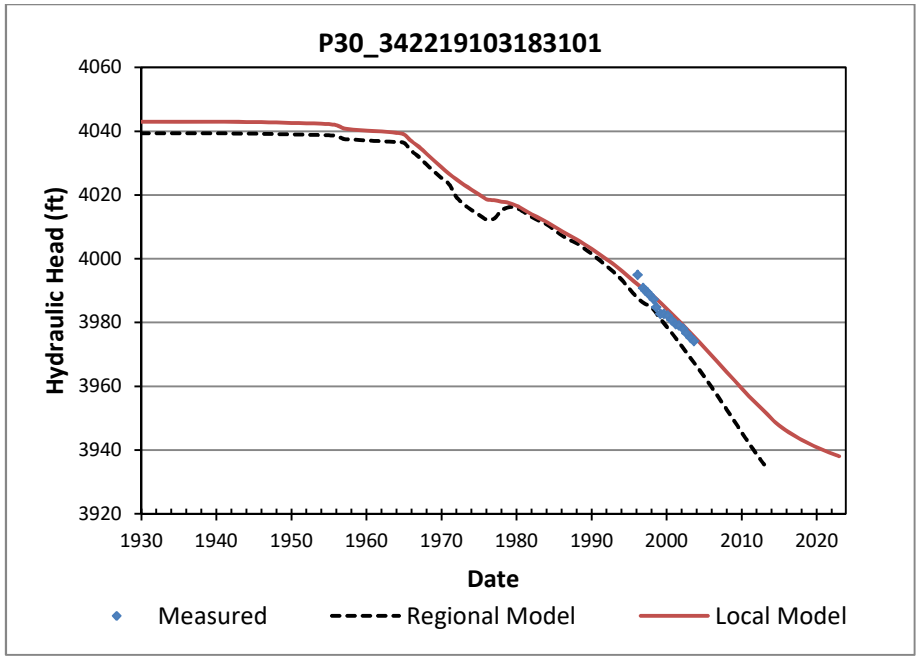
2020
Date
Measured
Regional Model
Local Model


P30_342219103183101
Hydraulic Head (ft)
4060
4040
4020
4000
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3960
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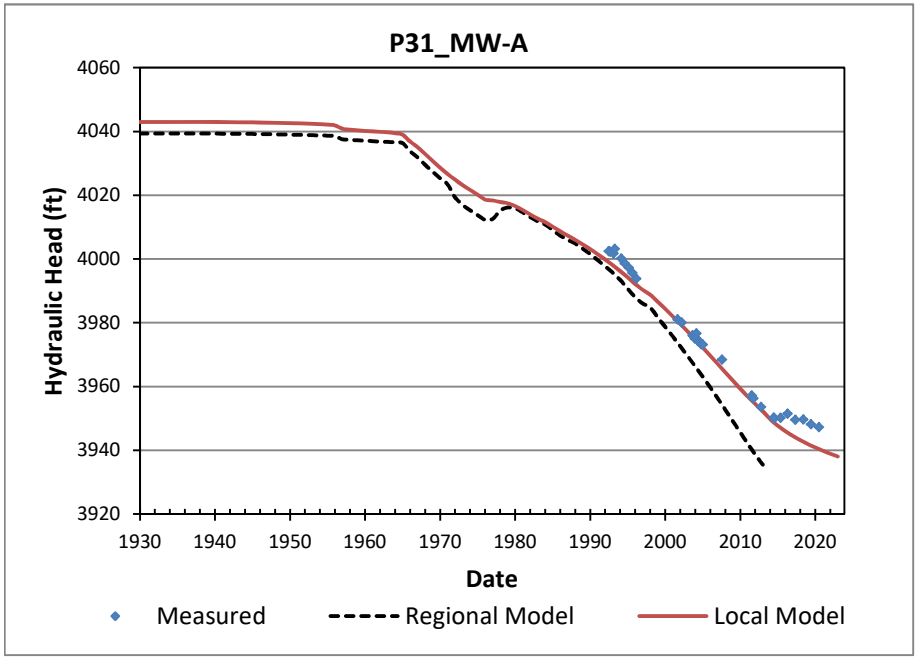
2000
2010
2020
Date
Measured
Regional Model
Local Model


P31_MW-A
Hydraulic Head (ft)
4060
4040
4020
4000
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3960
3940
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1930
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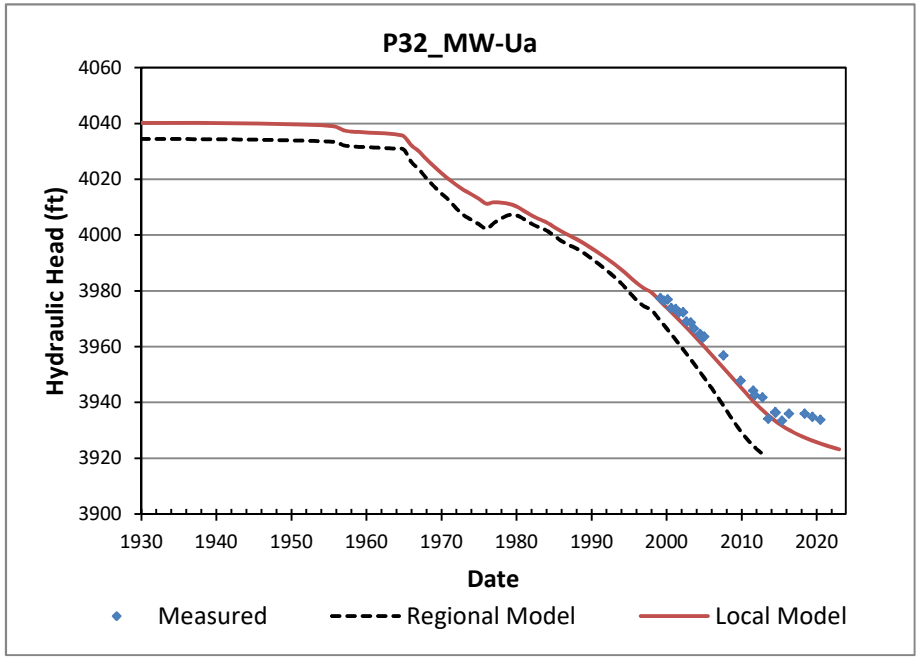
2010
2020
Date
Measured
Regional Model
Local Model


P32_MW-Ua
Hydraulic Head (ft)
4060
4040
4020
4000
3980
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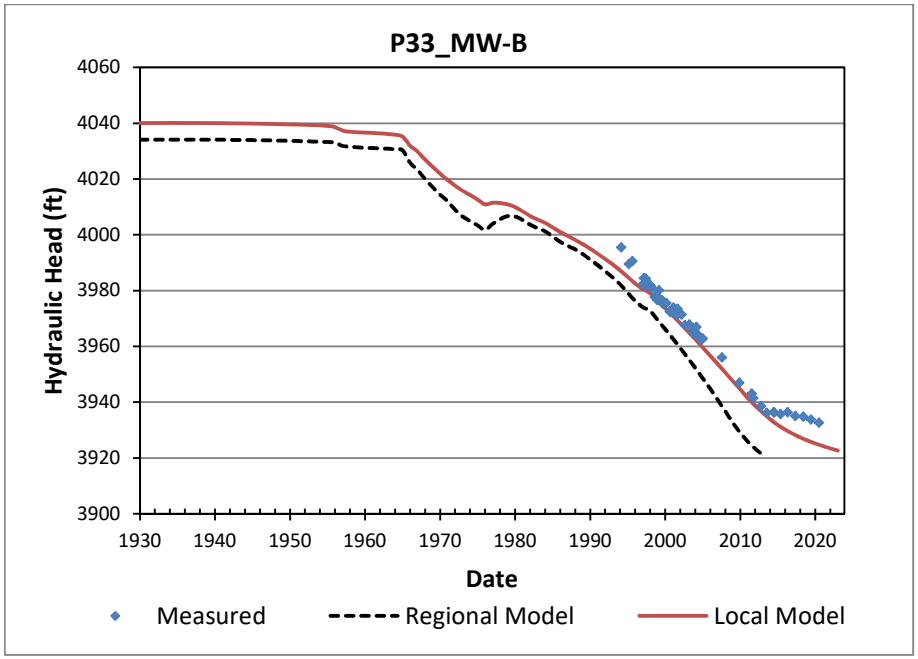
Date
Measured
Regional Model
Local Model


P33_MW-B
Hydraulic Head (ft)
4060
4040
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4000
3980
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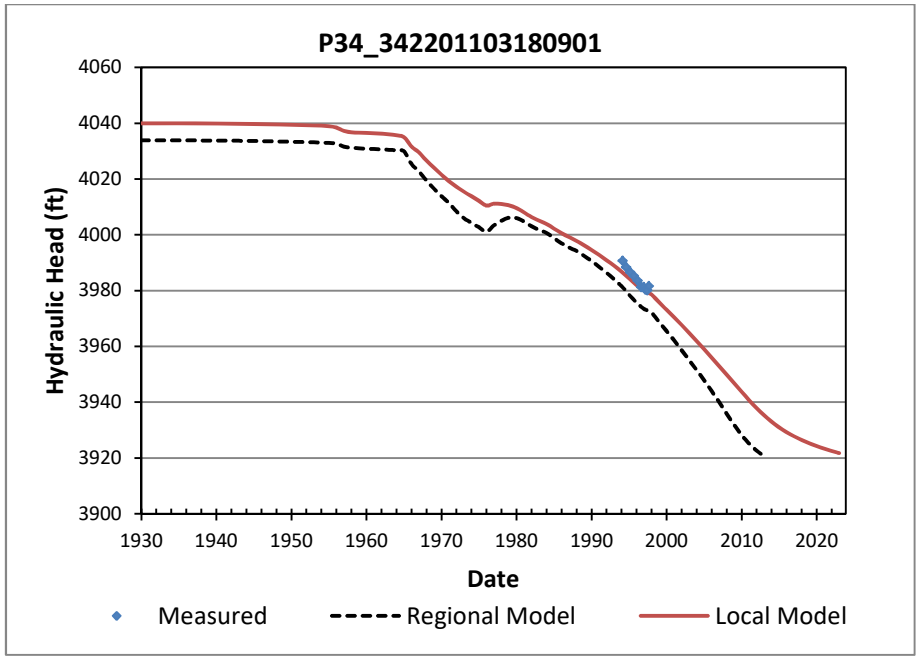
2000
2010
2020
Date
Measured
Regional Model
Local Model


P34_342201103180901
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
3940
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1980
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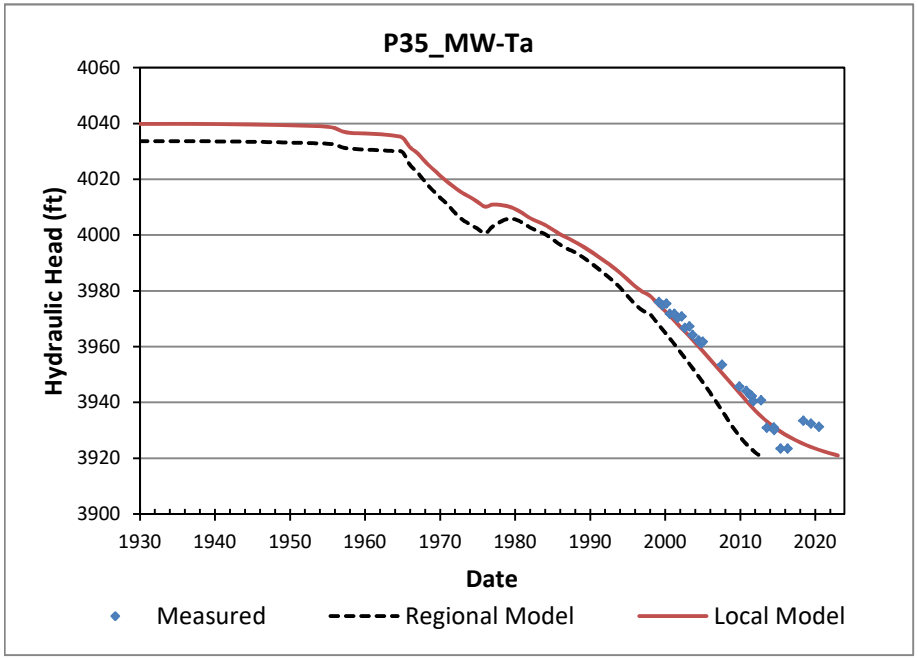
2000
2010
2020
Date
Measured
Regional Model
Local Model


P35_MW-Ta
Hydraulic Head (ft)
4060
4040
4020
4000
3980
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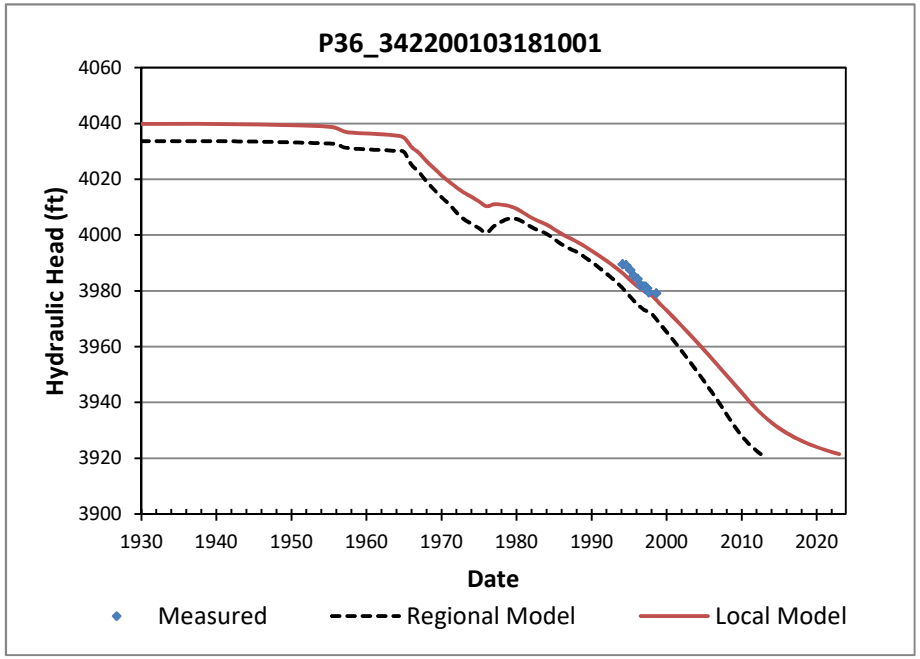
2010
2020
Date
Measured
Regional Model
Local Model


P36_342200103181001
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
3940
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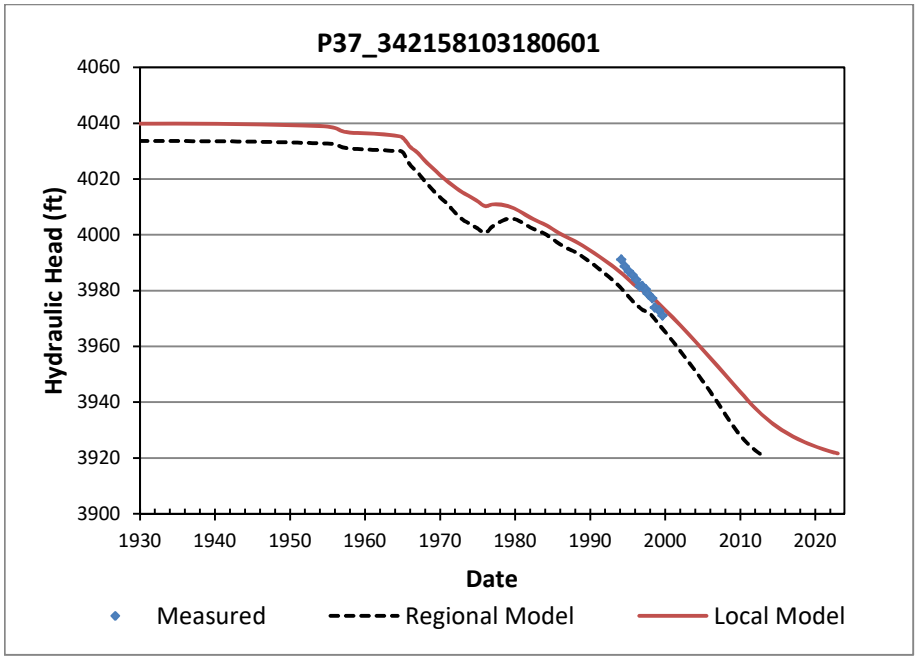
2020
Date
Measured
Regional Model
Local Model


P37_342158103180601
Hydraulic Head (ft)
4060
4040
4020
4000
3980
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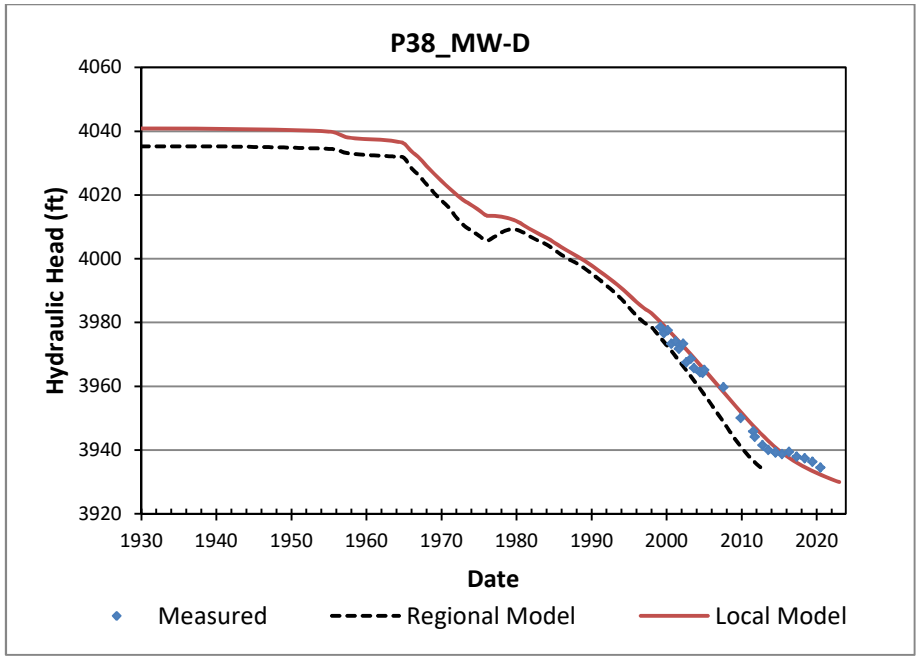
2020
Date
Measured
Regional Model
Local Model


P38_MW-D
Hydraulic Head (ft)
4060
4040
4020
4000
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3940
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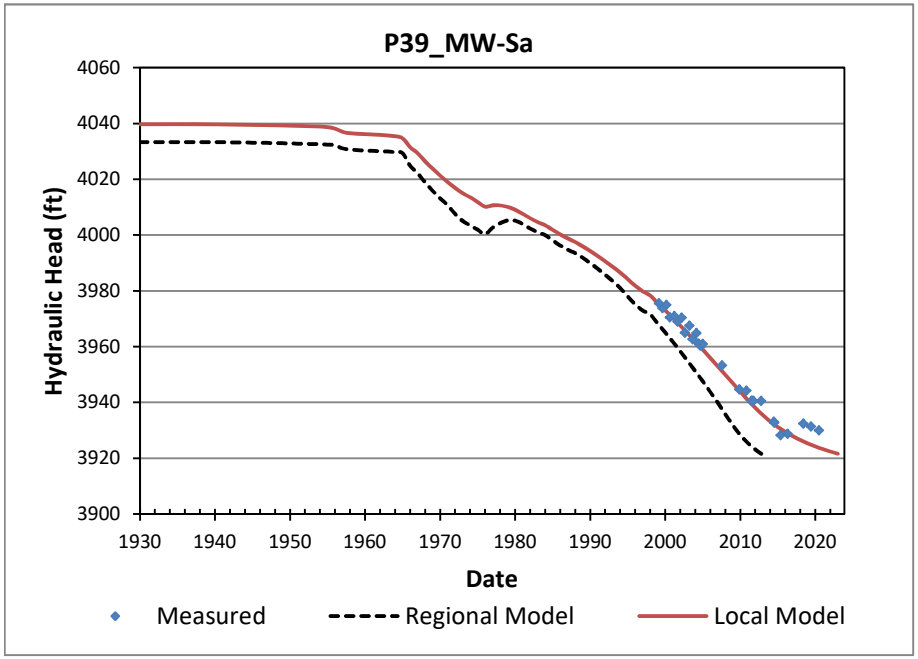
2000
2010
2020
Date
Measured
Regional Model
Local Model


P39_MW-Sa
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
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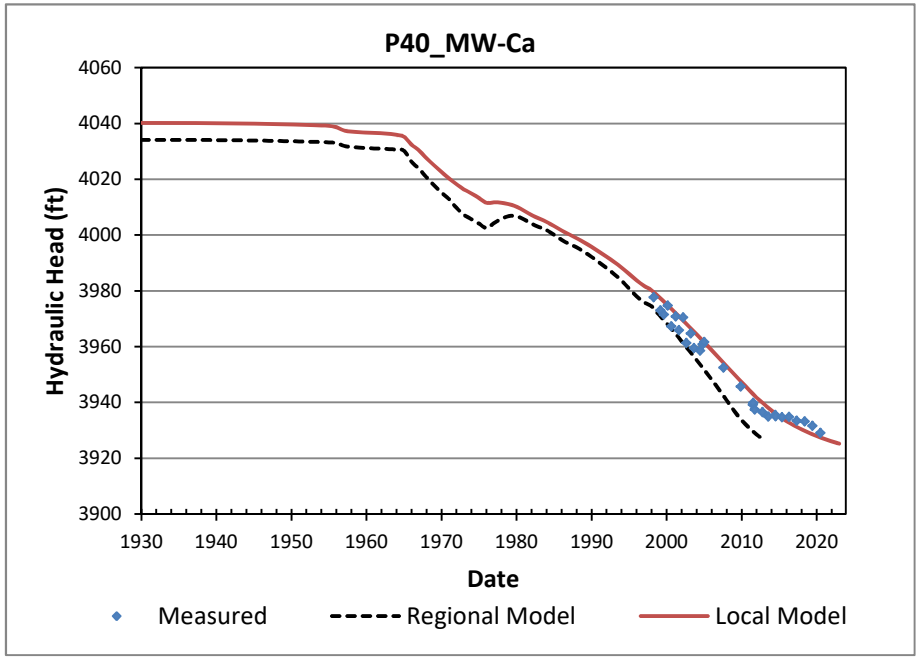
2020
Date
Measured
Regional Model
Local Model


P40_MW-Ca
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
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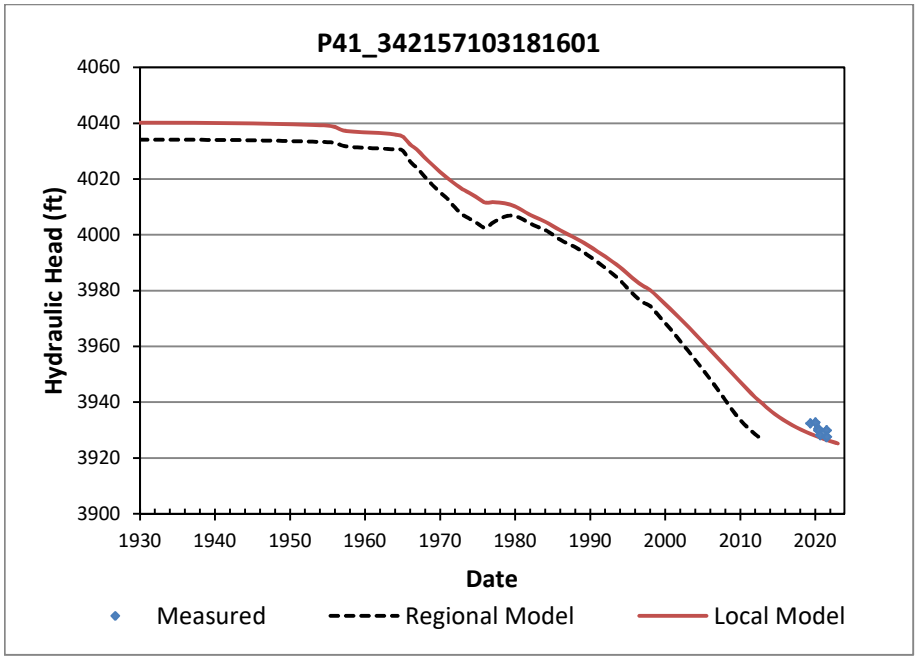
2010
2020
Date
Measured
Regional Model
Local Model


P41_342157103181601
Hydraulic Head (ft)
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4040
4020
4000
3980
3960
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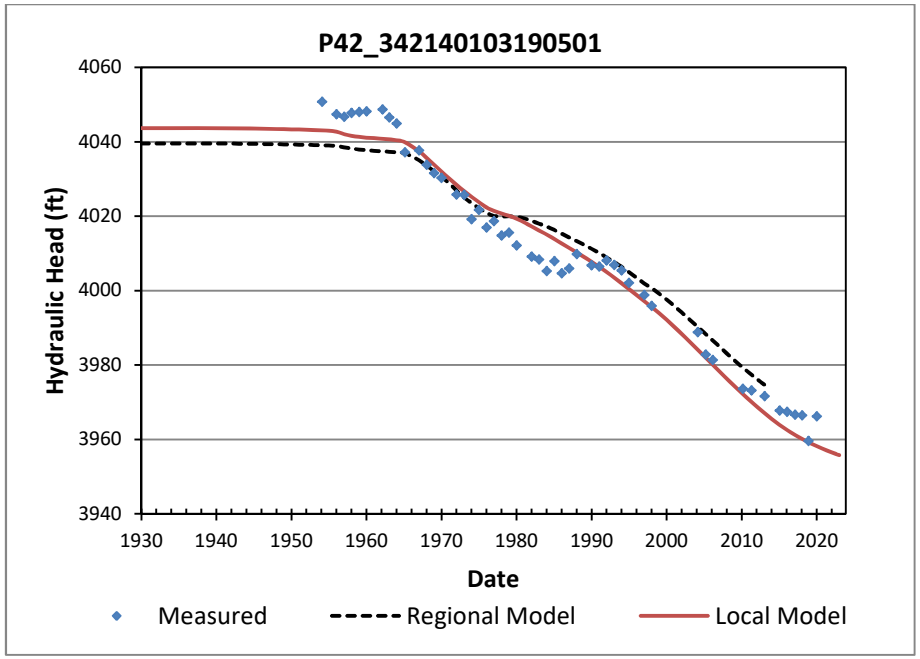
2010
2020
Date
Measured
Regional Model
Local Model


P42_342140103190501
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
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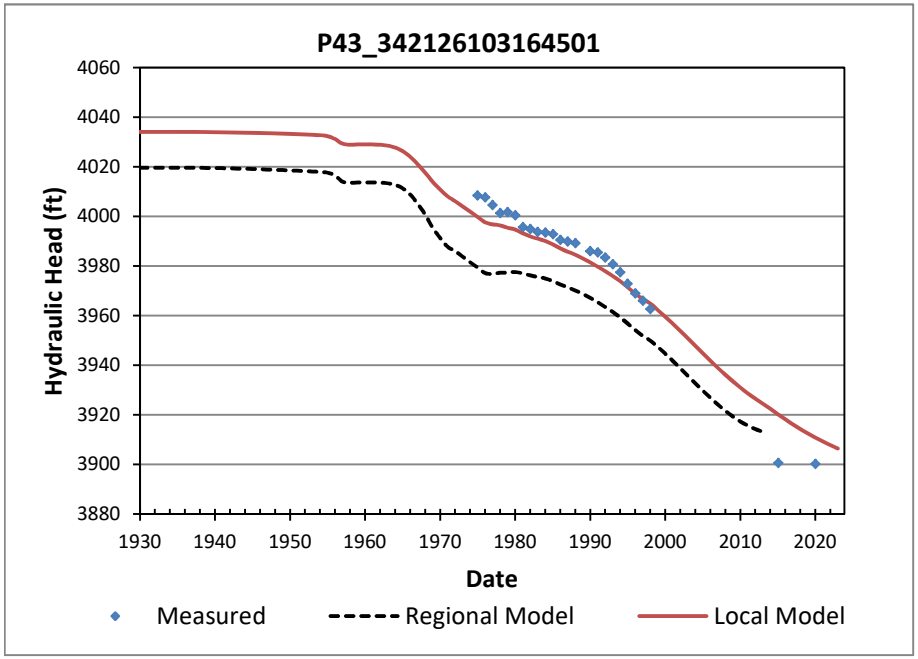
2010
2020
Date
Measured
Regional Model
Local Model


P43_342126103164501
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
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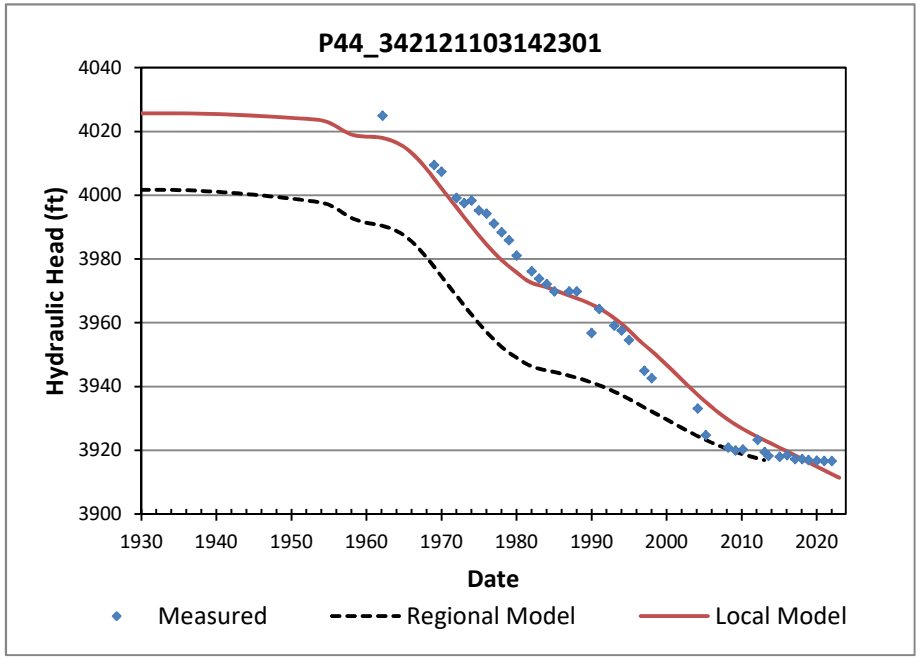
2010
2020
Date
Measured
Regional Model
Local Model


P44_342121103142301
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
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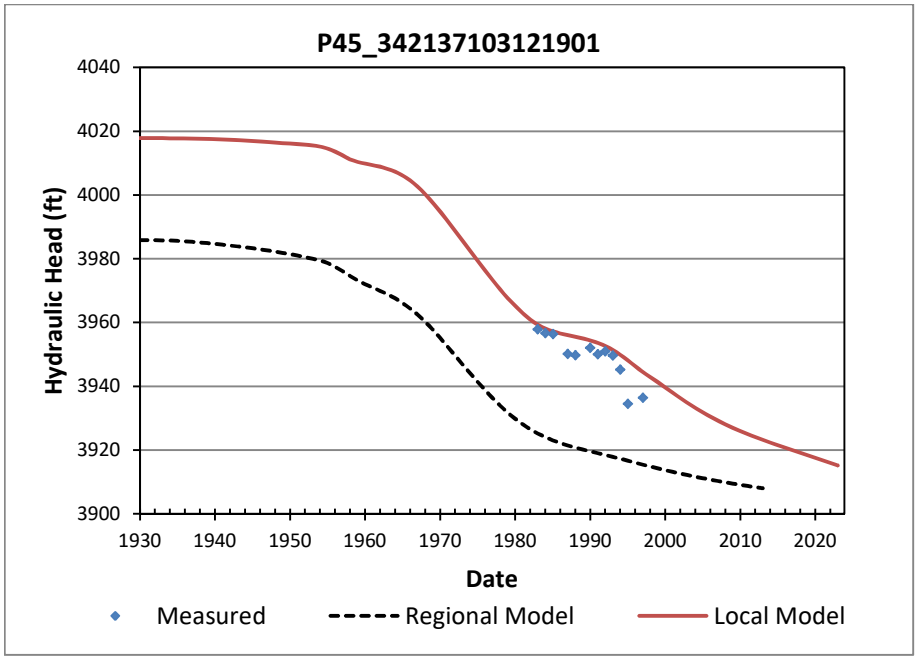
2020
Date
Measured
Regional Model
Local Model


P45_342137103121901
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
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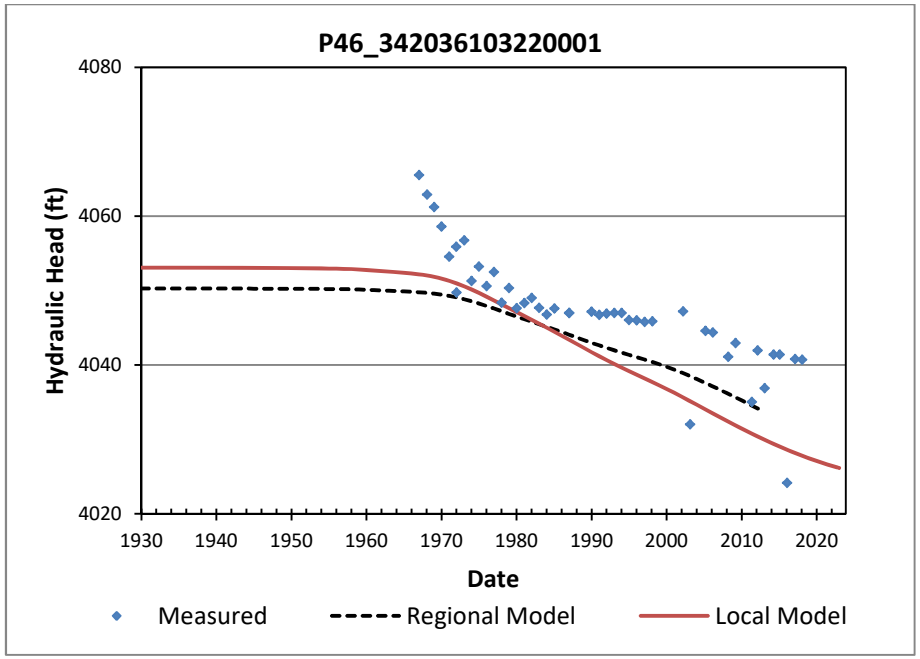
2020
Date
Measured
Regional Model
Local Model


P46_342036103220001
Hydraulic Head (ft)
4080
4060
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1930
1940
1950
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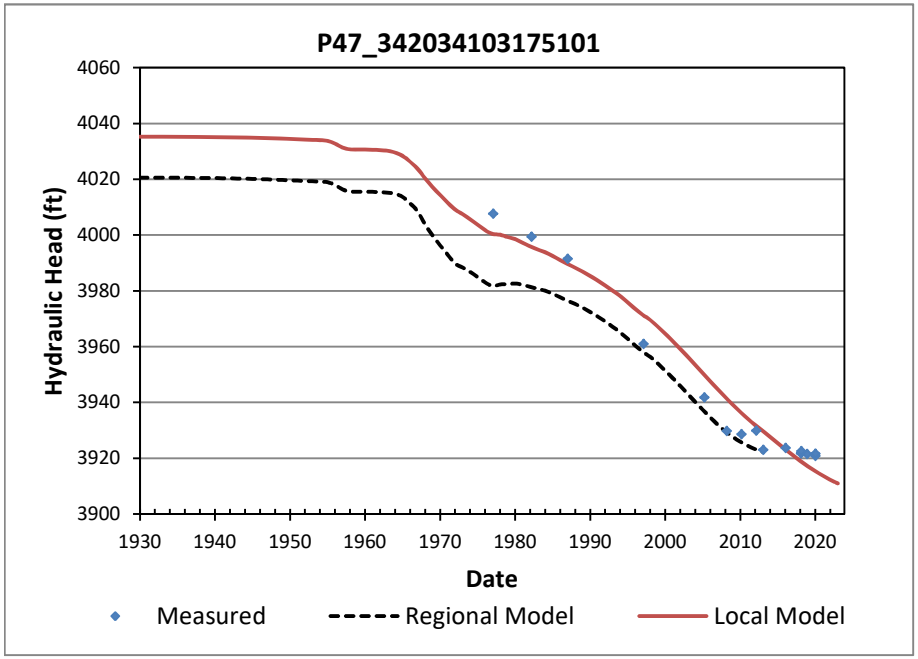
2020
Date
Measured
Regional Model
Local Model


P47_342034103175101
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
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3920
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1930
1940
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1960
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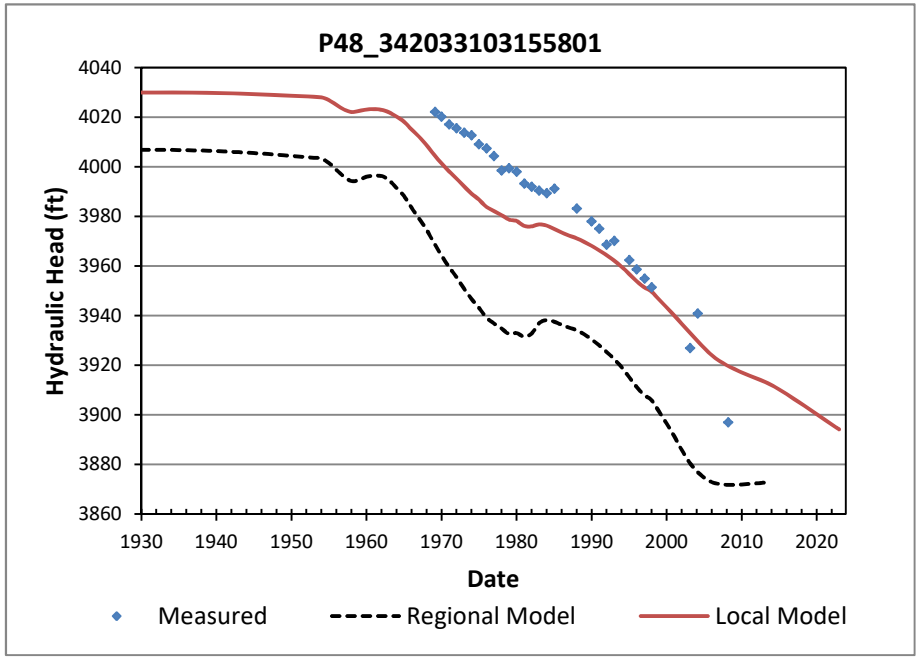
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P48_342033103155801
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
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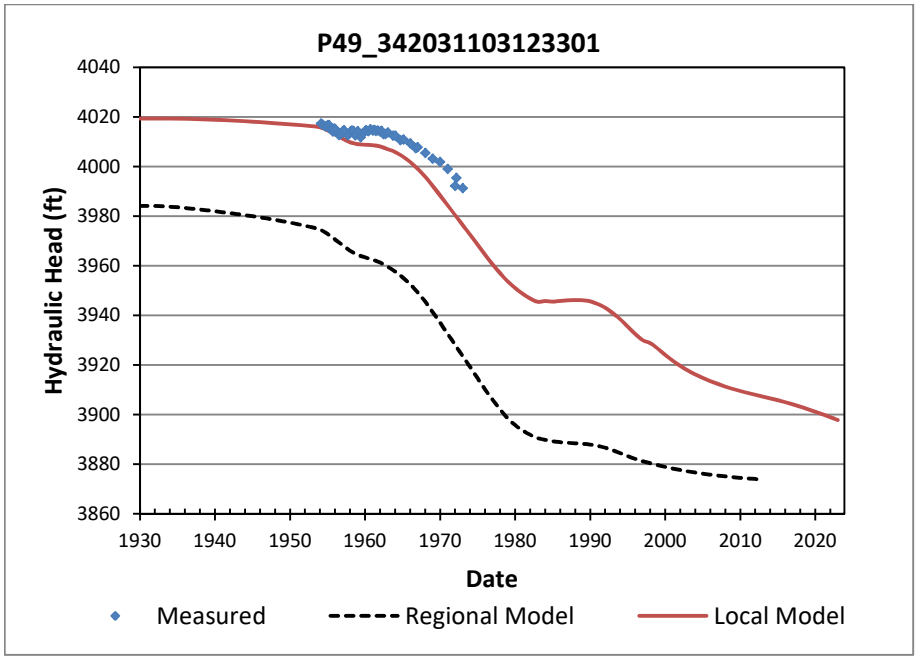
2010
2020
Date
Measured
Regional Model
Local Model


P49_342031103123301
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
3900
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1960
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1980
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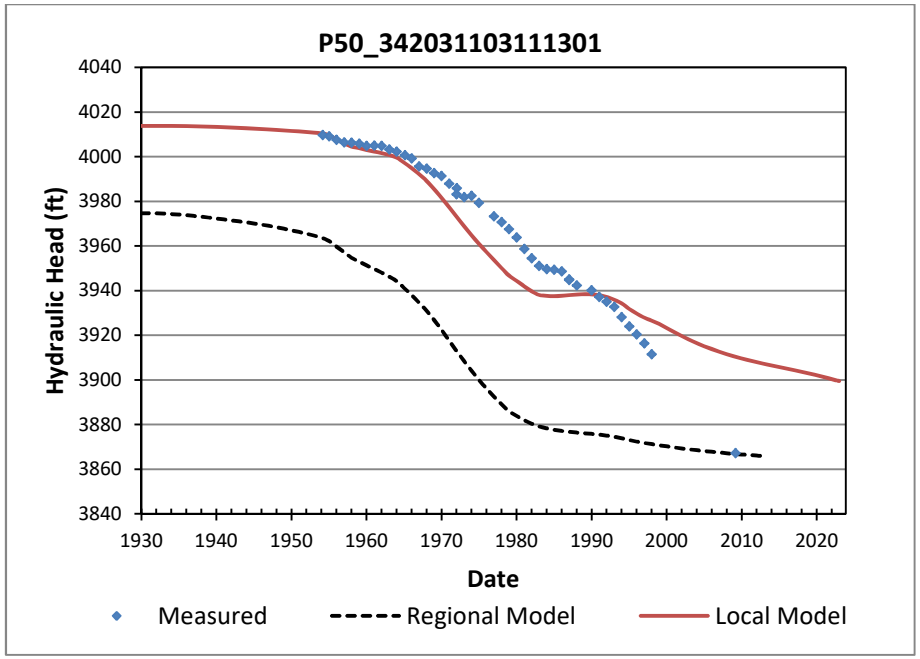
2000
2010
2020
Date
Measured
Regional Model
Local Model


P50_342031103111301
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
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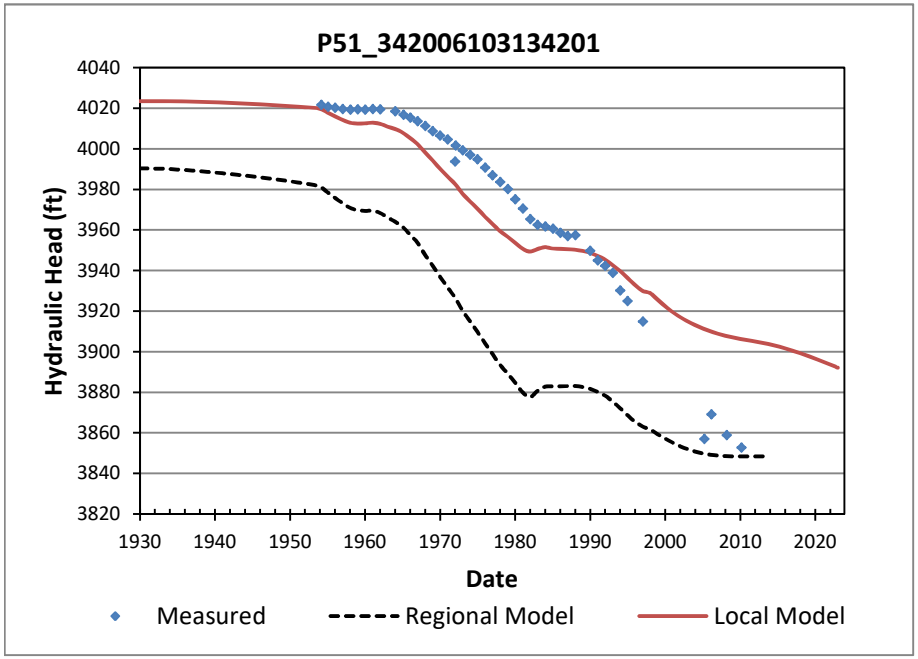
2020
Date
Measured
Regional Model
Local Model


P51_342006103134201
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
3900
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2010
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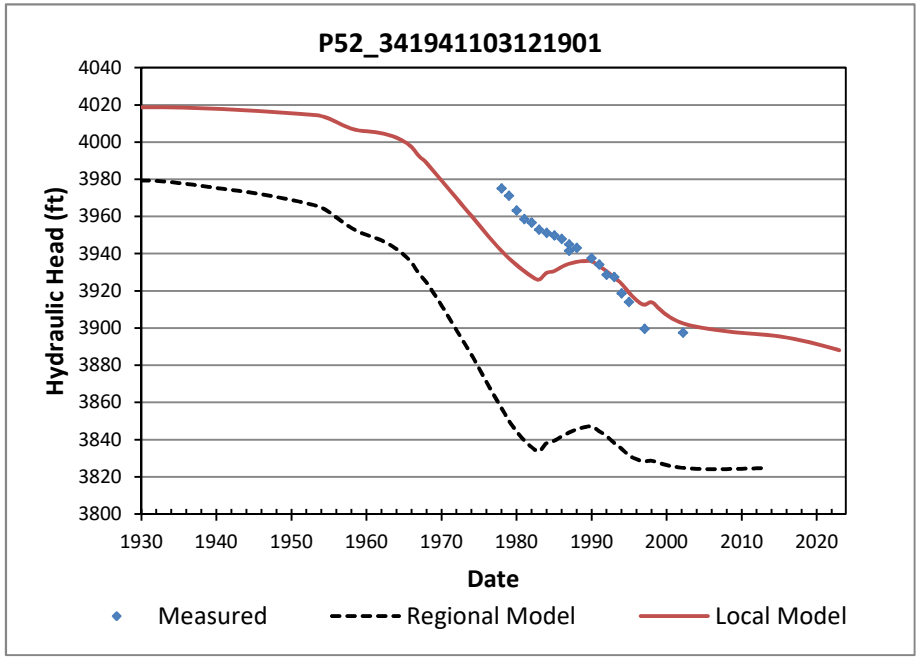
Date
Measured
Regional Model
Local Model


P52_341941103121901
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
3900
3880
3860
3840
3820
3800
1930
1940
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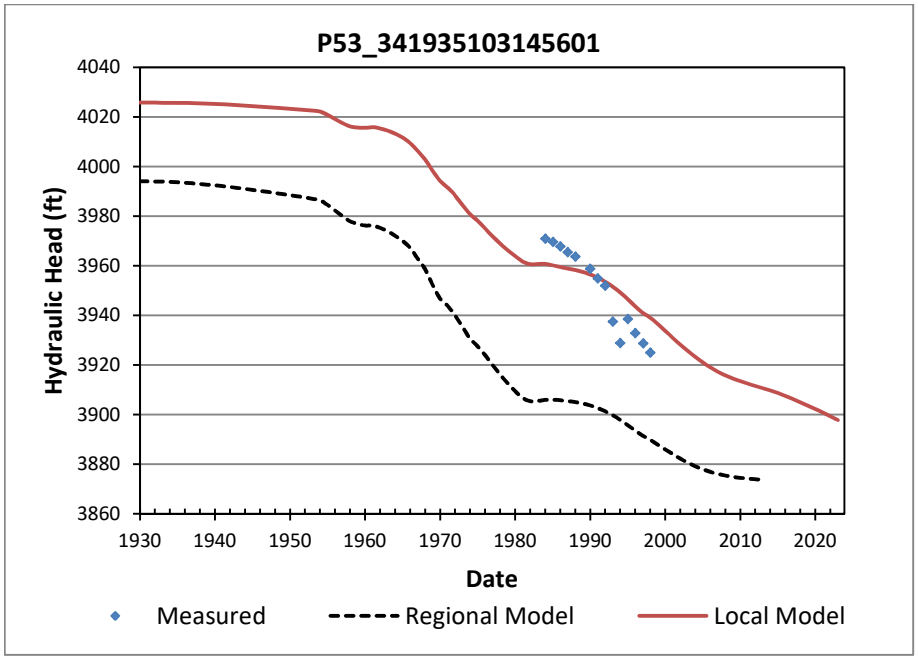
2020
Date
Measured
Regional Model
Local Model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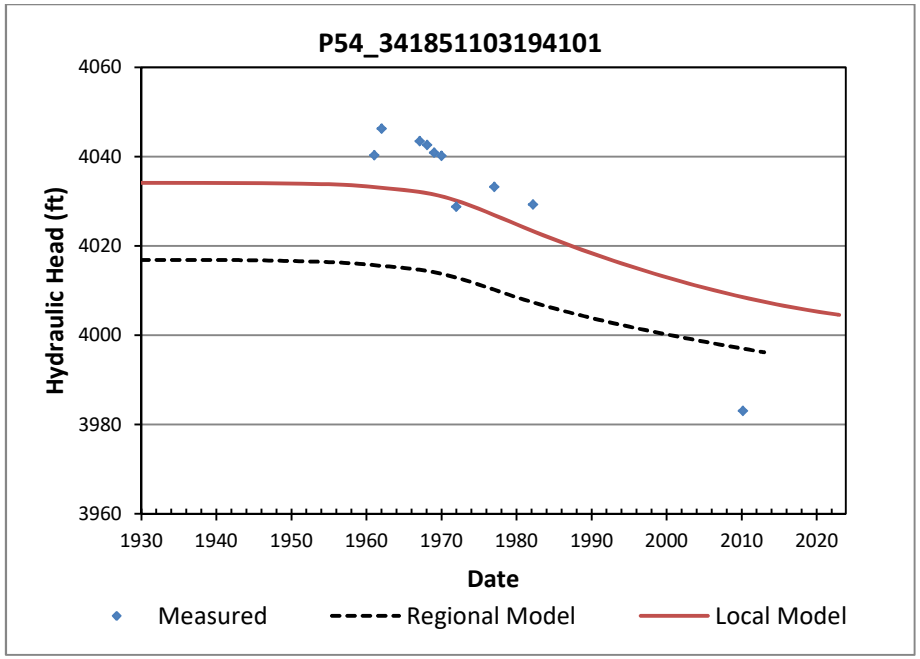
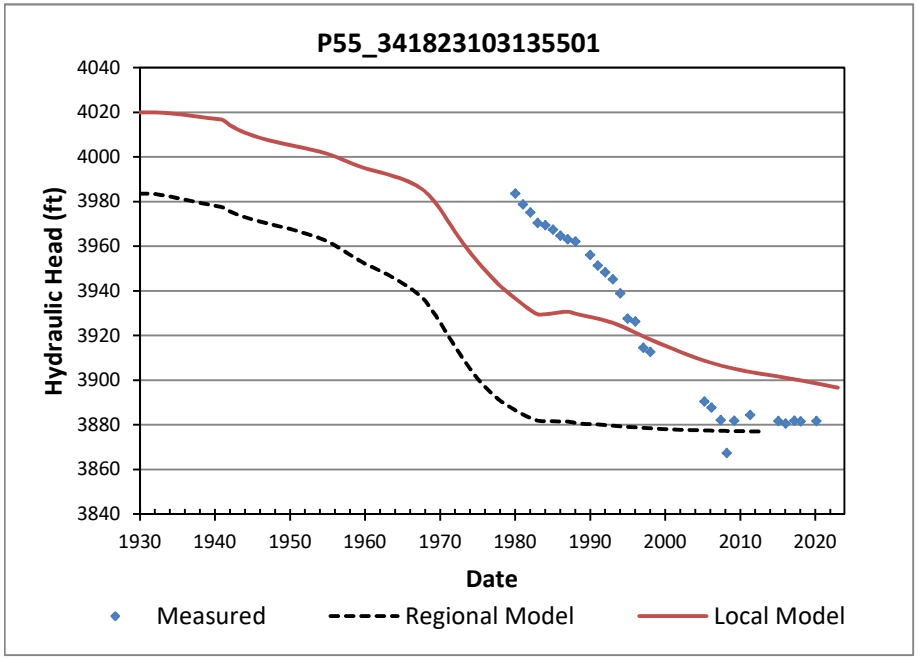
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
3900
3880
3860
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P54_341851103194101
Hydraulic Head (ft)
4060
4040
4020
4000
3980
3960
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model


P55_341823103135501
Hydraulic Head (ft)
4040
4020
4000
3980
3960
3940
3920
3900
3880
3860
3840
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Date
Measured
Regional Model
Local Model

Appendix C

Cannon AFB
RI Monitor Well
Locations and Logs

DBS&A
a Geo-Logic Company

Aerial Photograph: ESRI et al.

Explanation

(Monitor well

(Proposed monitor well

Cannon AFB Boundary

S:\PROJECTS\DB23.1087 NMED PFAS FY2023\GIS\ARCGIS PRO\CAFB MONITORING WELLS\CAFB MONITORING WELLS.APRX

DBS&A
a Geo-Logic Company

5/9/2023 DB23.1087

NMED PFAS INVESTIGATION, CANNON AFB

New CAFB Monitor Wells

Figure C-1

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

OSE DIV JUL 15 2022 PM 8:05

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S)
CC-2625-POD2-MON	POD 2	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environmental Solutions LLC	225-333-0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	TX	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	24	10	N
	LONGITUDE	103	19	33	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND

* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
5/26/22	6/22/22	343	350	228

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 228

DATE STATIC MEASURED: 6/19/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: SONIC

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	323	8"	Schedule 80 PVC Blank	Threaded	4"	.237	
323	343	8"	Schedule 80 PVC Slotted Screen	Threaded	4"	.237	.010
343	350	8"	N/A				

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	20	8"	Portland Cement Grout	4.80	Tremie
20	314	8"	Cement Bentonite Grout	70.57	Tremie
314	319	8"	Bentonite Chips 3/8"	1.20	Tremie
319	350	8"	Silica Sand 20 x 40	6.72	Tremie

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. POD2	TRN NO. 710373	
LOCATION 02N.34E.13.3.1.2		WELL TAG ID NO. —	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	44	44	Fine Silty Sands	Y N	
44	196	152	Fine Grain Sands	Y N	
196	284	88	Fine sands	Y N	
284	286	2	Clay	Y N	
286	330	44	Fine Sands	✓ Y N	
330	350	20	Course Sands & Gravels	Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

OSE DII JUL 18 2022 PM 3:05

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. LaFlame — SIGNATURE OF DRILLER / PRINT SIGNEE NAME

7/12/22 — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. POD2	TRN NO. 710373	
LOCATION D2N. 34E. 13. 3, 1, 2		WELL TAG ID NO. —	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

OSE DIT JUL 18 2022 AM8:05

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD3-MON	POD 3	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environmental Solutions LLC	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	TX	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	23	55	N
	LONGITUDE	103	19	17	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND

* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHJIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
6/23/22	6/29/22	348	350	333

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 333

DATE STATIC MEASURED: 6/27/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: SONIC

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	328	8"	Schedule 80 PVC Blank	Threaded	4"	.237	
328	348	8"	Schedule 80 PVC Slotted Screen	Threaded	4"	.237	.010
348	350	8"	N/A				

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	20	8"	Portland Cement Grout	4.80	Tremie
20	319	8"	Cement Bentonite Grout	71.77	Tremie
319	324	8"	Bentonite Chips 3/8"	1.20	Tremie
324	350	8"	Silica Sand 20 x 40	6.24	Tremie

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-02625	POD NO. POD3	TRN NO. 710373	
LOCATION 02N.34E.13.2.4.1		WELL TAG ID NO.	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	26	26	Clay with Sand	Y N	
26	66	40	Coarse Sand	Y N	
66	236	170	Coarse Grain Sands	Y N	
236	254	18	Sands	Y N	
254	310	56	Sands	Y N	
310	320	10	Clay with Sands	Y N	
320	350	30	Coarse Grain Sands	✓ Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

OSE DFT JUL 18 2022 AM8:05

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. LaFlare — SIGNATURE OF DRILLER / PRINT SIGNEE NAME

7/12/22 — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-02625	POD NO. POD3	TRN NO. 710373	
LOCATION 02N. 34E. 13. 2. 4. 1		WELL TAG ID NO. —	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD1-MON	POD 1	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environment Solutions LLC	225.333.0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	AZ	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	23	9	N
	LONGITUDE	102	17	48	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHJIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
4/23/22	5/1/22	286	294	271

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 271

DATE STATIC MEASURED: 4/29/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: SONIC

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	266	8"	Schedule 40 PVC Blank	Threaded	4"	.237	
266	286	8"	Schedule 40 PVC Slotted Screen	Threaded	4"	.237	.010
286	294	8"	N/A				

OSE DIT MAY 19 2022 PM 2:20

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	55	8"	Portland Cement Grout	13.20	Tremie
55	258	8"	Cement Bentonite Grout	48.72	Tremie
258	264	8"	Bentonite Chips 3/8"	1.44	Tremie
264	288	8"	Silica Sand 20 x 40	5.76	Tremie

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 1	TRN NO. 710373	
LOCATION 025.35E.20 141		WELL TAG ID NO. —	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	40	40	Hand Dry Clay	Y ✓ N	
40	56	16	Fine Dry Sands	Y ✓ N	
56	136	80	Tight Silty Sands	Y ✓ N	
136	226	90	Fine Compact Silty Sands	Y ✓ N	
226	294	68	Fine Compact Silty Sands	✓ Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

OSE DII MAY 19 2022 PM2:20

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. LaFlare.

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 1	TRN NO. 710373	
LOCATION 025.35E.20 141		WELL TAG ID NO. —	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD6-MON	POD 6	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environmental Solutions LLC	225-333-0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Dr.	San Antonio	TX	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	22	11	N
	LONGITUDE	103	18	33	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
7/1/22	7/21/22	355	356	330

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 330

DATE STATIC MEASURED: 7/19/22

DRILLING FLUID: ☐ AIR ☑ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: SONIC

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	325	8"	Schedule 80 PVC Blank	Threaded	4"	.237	
325	355	8"	Schedule 80 PVC Slotted Screen	Threaded	4"	.237	.010
355	356	8"	N/A				

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	20	8"	Portland Cement Grout	4.80	Tremie
20	316	8"	Cement Bentonite Grout	71.05	Tremie
316	321	8"	Bentonite Chips 3/8"	1.20	Tremie
321	356	8"	Silica Sand 20 x 40	10.80	Tremie

OSE DII OCT 3 2022 PM4:37

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-02625 POD6	POD NO. 6	TRN NO. 710373	
LOCATION 02N.35E.30.3.3.2		WELL TAG ID NO. NA	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	66	66	Brown Fly Sand	Y ✓ N	
66	126	60	Brown Fine Sand	Y ✓ N	
126	205	79	Brown Fine Cemented Silts & Sands	Y ✓ N	
205	225	20	Brown Cemented Sands & Cobbles	Y ✓ N	
225	346	121	Brown Sand Stone	✓ Y N	
346	356	10	Brown Silt Stone	✓ Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST: TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

OSE DII OCT 3 2022 PM4:37

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. LeBlanc — Richard LeBlanc — 9/27/22

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-02625	POD NO. 6	TRN NO. 710373	
LOCATION 02N.35E.30.3.3.2		WELL TAG ID NO. NA	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD12-MON	POD12	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environmental Solutions LLC	225.333.0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	TX	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	21	57	N
	LONGITUDE	103	18	59	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHJIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
3/10/22	4/5/22	330	355	315

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 315

DATE STATIC MEASURED: 4/4/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: Sonic

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	200	10	Schedule 40 PVC Blank	Threaded	4"	.237	
200	310	8	Schedule 40 PVC Blank	Threaded	4"	.237	
310	330	8	Schedule 40 PVC Slotted Screen	Threaded	4"	.237	.010
330	355	8	N/A				
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3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	20	10	Portland Cement Grout	8.75	Tremie
20	200	10	Cement Bentonite Grout	78.75	Tremie
200	301	8	Cement Bentonite Grout	24.24	Tremie
301	306	8	Bentonite Chips 3/8"	1.20	Tremie
306	332	8	Silica Sand 20 x 40	6.24	Tremie

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 12	TRN NO. 710373
LOCATION 02N.35E.30 413	WELL TAG ID NO.	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	77	77	Brown Fly Sand	Y ✓ N	
77	146	69	Brown Fine Sand	Y ✓ N	
146	206	60	Brown Fine Cemented Silts & Sands	Y ✓ N	
206	216	10	Brown Cemented Sands & Cobbles	Y ✓ N	
216	228	12	Brown Sand Stone	Y ✓ N	
228	330	102	Brown Sand Stone	✓ Y N	
330	340	10	Brown Silt Stone	✓ Y N	
340	355	15	Red Beds	✓ Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

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METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. LaFlare

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 12	TRN NO. 710373	
LOCATION 02N.35E.30 413		WELL TAG ID NO. —	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD13-MON	POD 13	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environment Solutions LLC	225.333.0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	AZ	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	21	57	N
	LONGITUDE	103	18	50	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND

* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHJIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
4/6/22	4/21/22	332	343	317

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 317

DATE STATIC MEASURED: 4/19/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: Sonic

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	312	8"	Schedule 40 PVC Blank	Threaded	4"	.237	
312	332	8"	Schedule 40 PVC Slotted Screen	Threaded	4"	.237	.010
332	342	8"	N/A				

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3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	50	8"	Portland Cement Grout	16.66	Tremie
50	303	8"	Cement Bentonite Grout	60.72	Tremie
303	308	8"	Bentonite Chips 3/8"	1.20	Tremie
308	323	8"	Silica Sand 20 x 40	3.60	Tremie

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 13	TRN NO. 710373	
LOCATION 02N.35E.30 323		WELL TAG ID NO. —	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	26	26	Fine Silty Sands	Y ✓N	
26	60	34	Hard Dry Clay	Y ✓N	
60	90	30	Sand Stone	Y ✓N	
90	176	86	Fine Silty Powder	Y ✓N	
176	295	119	Fine Silty Powder	Y ✓N	
295	335	40	Coarse Sand	✓Y N	
335	342	7	Clay Gravel Conglomerate	✓Y N	
342	343	1	Red Bed	✓Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

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METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. L[illegible]

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO. CC-2625	POD NO. 13	TRN NO. 710373	
LOCATION 02N.35E.30 323		WELL TAG ID NO. —	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
CC-2625-POD7-MON	~~POD 7~~	CC-2625

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Bristol Environmental Solutions LLC	225-333-0999

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
12025 Starcrest Drive	San Antonio	TX	78247

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	34	21	57	N
	LONGITUDE	103	18	37	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND

* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

Curry County

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1458	Richard LeBlanc	Yellow Jacket Drilling Services LLC

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
5/10/22	5/23/22	341	346	306

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 306

DATE STATIC MEASURED: 5/20/22

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: SONIC

CHECK HERE IF PITLESS ADAPTER IS INSTALLED ☐

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	311	8"	Schedule 40 PVC Blank	Threaded	4"	.237	
311	341	8"	Schedule 40 PVC Slotted Screen	Threaded	4"	.237	.010
341	346	8"	N/A				

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	20	8"	Portland Cement Grout	4.80	Tremie
20	295	8"	Cement Bentonite Grout	66	Tremie
295	302	8"	Bentonite Chips 3/8"	1.68	Tremie
302	346	8"	Silica Sand 20x40	10.56	Tremie

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FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO.	CC-2625	POD NO.	POD7	TRN NO.	710373
LOCATION	2N 35E 30	3.1.4		WELL TAG ID NO.	NA

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES **(attach supplemental sheets to fully describe all units)**	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	10	10	Silty Sand	Y N	
10	55	45	Hard Dry Clay	Y N	
55	185	130	Fine Sands	Y N	
185	206	120	Sands & Gravel	Y N	
206	236	30	Cemented Sand & Gravel	Y N	
236	265	29	Fine Sands	Y N	
265	326	61	Fine Sands with Layer of Clay	✓ Y N	
326	346	20	Sands Fine Grade	Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☑ OTHER – SPECIFY: N/A

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Well to be drilled for this permit application will be used for monitoring purposes related to Cannon Air Force Base. A small amount of water (on the order of a few gallons) will be purged from a well prior to sampling using low flow/low stress techniques.

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PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Christopher Hill

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

R. Lattanzi — SIGNATURE OF DRILLER / PRINT SIGNEE NAME

5/27/22 — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 01/28/2022)

FILE NO.	CC-2625	POD NO.	POD7	TRN NO.	710373	
LOCATION	2N 35E 30	3.1.4		WELL TAG ID NO.	NA	PAGE 2 OF 2