National Nuclear Security Administration

Office of Safety, Infrastructure, and Operations

Initial Assessment of Potential Uses of Per- and Polyfluoroalkyl Substances at NNSA Sites

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Safe Operations
Effective Infrastructure
Enterprise Services

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EXECUTIVE SUMMARY

Per- and polyfluoroalkyl substances (PFAS) are a class of fluorinated chemicals used in many industrial processes and found in a range of commercial and consumer products. These chemicals have been detected in humans, wildlife, and the environment, do not break down easily, can lead to adverse health outcomes, and are the subject of increasing state and federal regulations. In 2016, the U.S. Environmental Protection Agency (EPA) designated PFAS as "emerging contaminants" and set a life-time health advisory (LHA) of 70 parts per trillion (ppt) in drinking water for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) combined. In April 2021, EPA identified PFAS as a top priority and established a new EPA Council on PFAS to develop a multi-year PFAS strategy and continue close interagency coordination.

To support the Department of Energy's (DOE) and the National Nuclear Security Administration's (NNSA) initiative to better understand the presence of PFAS at sites across the enterprise and to help position NNSA to proactively respond to evolving PFAS requirements, NNSA Headquarters (HQ) issued a PFAS survey to NNSA sites in February 2021. The PFAS survey requested information on PFAS related to onsite drinking water, potential and known usage of PFAS onsite, sampling efforts and results, and communications with stakeholders or regulators.

This *Initial Assessment of Potential Uses of PFAS at NNSA Sites* summarizes NNSA overall PFAS survey results, provides site-specific survey results, and discusses the current PFAS regulatory environment. The report includes next steps for moving forward consistent with the DOE policy issued on September 16, 2021, "Addressing Per-and Polyfluoroalkyl Substances at the Department of Energy".

Based on the NNSA sites' survey responses, all tested drinking water systems were non-detect for PFAS. In terms of environmental sampling, only one site that completed groundwater sampling measured results greater than the 70 ppt LHA set by the EPA. NNSA sites are compliant with current PFAS sampling and monitoring regulations at the state and federal level. NNSA is committed to the health and safety of its workers, the public, and the environment and will continue to support initiatives to develop and execute an effective PFAS approach.

ACRONYMS

AB	Assembly Bill
AFFF	Aqueous Film-Forming Foam
AU	Office of Environment, Health, Safety and Security
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNS	Consolidated Nuclear Security, LLC
CWA	Clean Water Act
D&D	Deactivation and Decommissioning
DOD	Department of Defense
DOE	Department of Entergy
EM	Office of Environmental Management
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
FM&T	Federal Manufacturing and Technologies
HQ	Headquarters
KAFB	Kirtland Air Force Base
KCNSC	Kansas City National Security Campus
KCNSC-NMO	Kansas City National Security Campus New Mexico Operations
KCP-BFC	Kansas City Plant Bannister Federal Complex
LANL	Los Alamos National Laboratory
LHA	Lifetime Health Advisory
LLNL	Lawrence Livermore National Laboratory
LTS	Long-Term Stewardship
MCL	Maximum Contaminant Level
NDAA	National Defense Authorization Act
NDEP	Nevada Division of Environmental Protection
NMED	New Mexico Environment Department
NNSS	Nevada National Security Site
NPO	NNSA Production Office
N3B	Newport News Nuclear BWXT
PCL	Protective Concentration Levels
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonate
PFHxS	Pefluorohexanesulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonate

PPE	Personal Protective Equipment
PWS	Public Water System
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SNL	Sandia National Laboratories
SRS	Savannah River Site
SRTE	Savannah River Tritium Enterprise
TCEQ	Texas Commission on Environmental Quality
TDEC	Tennessee Department of Environment and Conservation
TRI	Toxic Release Inventory
TRRP	Texas Risk Reduction Program
TTR	Tonopah Test Range
UCMR	Unregulated Contaminant Monitoring Rule
USAF	United States Air Force

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1 INTRODUCTION

Per- and polyfluoroalkyl substances (PFAS) are a class containing thousands of fluorinated chemicals commonly used since the 1940s (EPA 2021a) for non-stick, heat resistant, and waterproof properties (ITRC 2020). Products containing PFAS range from fast food wrappers to weather-resistant clothing, non-stick pans, and stain resistant carpeting. Aqueous film forming foams (AFFF) used in firefighting and firefighting training can contain PFAS chemicals (EPA 2021a) and use of AFFF for training and execution can result in releases to the environment (Hu et al. 2016, Houtz et al. 2013). In industry, PFAS containing materials are used in manufacturing and processing facilities (EPA 2021a). National Nuclear Security Administration (NNSA) facilities may have stored, used or disposed of PFAS containing products historically and may currently have AFFF or other PFAS containing products in active use for fire management or other applications. Therefore, it is important for NNSA to understand past and present practices regarding PFAS and potential impacts across the complex.

Since PFAS do not break down easily, they are persistent in the environment and bioaccumulate in people and wildlife. Significant concentrations of PFAS have been found in lakes (Boulanger et al. 2004), groundwater (Sharma et al. 2016), soils (Baduel et al. 2017), birds (Route et al. 2014), fish (Schuetze et al. 2010), and humans (CDC 2021). Studies have shown that exposure to PFAS can lead to adverse health effects (EPA 2021a).

The U.S. Environmental Protection Agency (EPA) labelled PFAS an “emerging contaminant” and in 2016, announced a drinking water 70 parts per trillion (ppt) combined Lifetime Health Advisory (LHA) for the two most studied PFAS chemicals, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) (EPA 2016a). PFAS regulations have also been developed at the state level (Safer States, 2021). The NNSA is tracking federal and state PFAS regulations to stay updated on the rapidly changing PFAS regulatory environment.

This report presents the results of the PFAS survey issued to NNSA sites in February 2021 and details on current federal PFAS activities and state level PFAS regulations. The report concludes with next steps for moving forward to address PFAS at NNSA sites.

2 PFAS SURVEY AND SUMMARY OF RESULTS

NNSA Headquarters (HQ) issued the PFAS Survey (Appendix A) to the following NNSA sites:

- Kansas City National Security Campus (KCNSC)
- Lawrence Livermore National Laboratory (LLNL)
- Los Alamos National Laboratory (LANL)
- Nevada National Security Site (NNSS)
- Pantex Plant (Pantex)
- Sandia National Laboratories (SNL)
- Savannah River Site (SRS)
- Y-12 National Security Complex (Y-12)

Thirteen survey responses were received, with KCNSC and SNL providing surveys for three site locations and LLNL providing surveys for two site locations. The survey was adapted from the PFAS survey issued by the Department of Energy (DOE) Office of Environmental Management (EM) to DOE-EM sites. The DOE Office of Environment, Health, Safety and Security (AU) issued the same survey to the DOE PFAS Working Group participants for voluntary response.

The survey requested information on four topics: onsite drinking water, potential PFAS usage, onsite sampling/monitoring equipment, and regulatory and stakeholder engagement. The survey responses provide an initial assessment of the presence of PFAS at NNSA sites.

2.1 ONSITE DRINKING WATER

To assess onsite drinking water, the survey asked sites if they provide potable drinking water to the workforce or to residential wells and whether the drinking water has been sampled for PFAS. Drinking water is a potential pathway for PFAS exposure. The survey also asked whether the population served is more or less than 10,000 because public water systems (PWS) which serve more than 10,000 people must follow the unregulated contaminant monitoring rules (UCMRs). UCMRs require monitoring for priority unregulated contaminants in drinking water every five years. (EPA 2021c).

Of the thirteen survey responses received, three sites reported that the drinking water has been tested for at least one PFAS: LANL, NNSS, and SNL-NM. At another eight sites, the city PWS serving the site has been sampled for at least one PFAS: KCNSC, Kansas City Plant Bannister Federal Complex (KCP-BFC), Kansas City National Security Campus New Mexico Operations (KCNSC-NMO), LLNL Main Site, LLNL Site 300, SNL-CA, Savannah River Tritium Enterprise (SRTE), and Y-12. All analytical results were non-detect for the PFAS tested. LLNL Site 300 is also served by onsite wells which have not been tested for PFAS. Pantex and SNL Tonopah Test Range (TTR) have also not tested the drinking water for PFAS. Site 300 onsite wells, Pantex and SNL-TTR PWS serve fewer than 10,000 people (Figure 2.1).

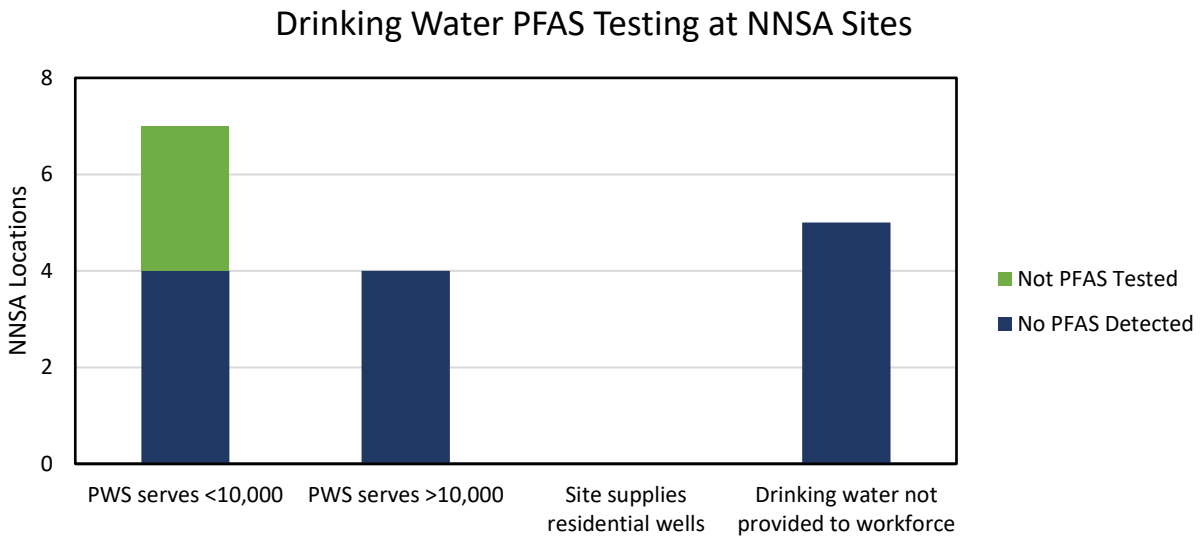

Figure 2.1: Drinking Water PFAS Testing at NNSA Sites. Drinking water PFAS testing, and population served by the PWS as reported by NNSA sites with PFAS survey selections on the x-axis. Blue bars indicate PFAS testing occurred, and the results were non-detect. No PWS detected PFAS. Green bars indicate the drinking water has not been tested for PFAS.

2.2 POTENTIAL PFAS USAGE

To assess potential PFAS usage, the survey asked sites if they currently have, or have had in the past, certain facilities, events, or disposal units onsite that could potentially be an indicator of PFAS use:

- Fire training facility
- Fire department
- Presence of AFFF-based fire suppression system
- Documented release of AFFF
- Uranium enrichment
- Metal plating processing
- Plutonium production
- Manhattan project liquid discharges
- Cold War era liquid waste discharges
- Landfill
- Wastewater treatment discharges

For example, a primary source of PFAS use is as a component of AFFF, used widely for firefighting purposes. If a site uses a PFAS containing AFFF for fire suppression in training or emergency situations, PFAS could be released into the environment. There are also historical

documents which describe Teflon® (a type of PFAS) used in uranium enrichment processing in the past.

As shown in Figure 2.2, six sites reported a fire training facility onsite: LLNL Main Site, LLNL Site 300, LANL, NNSS, Pantex, and Y-12. At LLNL, the fire training facilities are no longer active, and any required firefighting training is performed offsite. The fire training facility at Pantex has been inactive since the 1980s. There is an active fire training facility onsite at LANL, where they are working to characterize the site and searching records to see if AFFF or other PFAS containing chemicals were ever used. NNSS and Y-12 also have active fire training facilities, but they no longer use AFFF for training.

Eight sites have or have had a fire department located onsite: KCP-BFC, LLNL Main Site, LLNL Site 300, LANL, NNSS, Pantex, SNL-TTR, and Y-12. The fire departments are no longer active at both KCP-BFC and SNL-TTR. The active fire departments onsite at Pantex and Y-12 have switched to a fluorine-free foam and the active fire departments at LLNL Main Site and LLNL Site 300 do not use AFFF. The NNSS fire department is active as well and has AFFF onsite. The fire department onsite at LANL is owned and operated by Los Alamos County, though LANL provides some funding.

AFFF is effective at putting out petroleum-based fires so AFFF-based fire suppression systems are common in certain facilities. The three sites that reported having an AFFF-based fire suppression system onsite are LLNL Main Site, LANL, and Y-12. LLNL Main Site has a single AFFF-based fire suppression system onsite. LANL reported having three systems; one system has

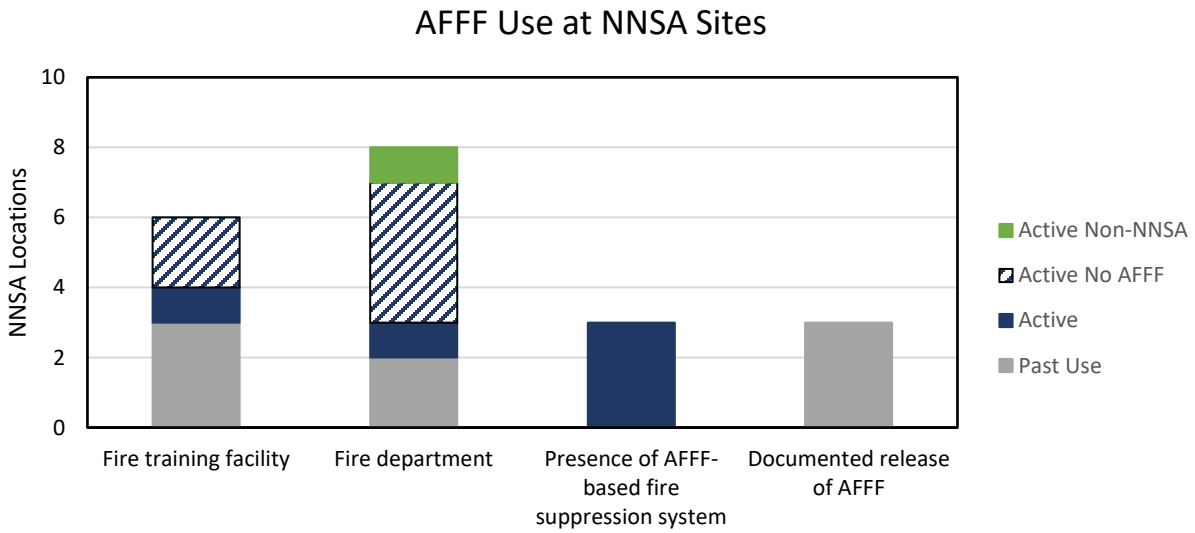

Figure 2.2: AFFF Use at NNSA Sites. AFFF usage as reported by NNSA sites with PFAS survey selections on the x-axis. Grey bars represent past uses that are no longer active onsite. Blue bars are active uses. The patterned blue bars are active uses that either do not use an AFFF foam or have switched to a fluorine free foam. Green bars are active uses that are onsite, but not managed by the NNSA.

been decommissioned and is undergoing characterization. Quarterly test releases from the second and third systems are captured and stored in waste containers onsite so there are no environmental releases. Two of the four AFFF-based fire suppression systems at Y-12 were transferred to DOE-EM and a third was decommissioned and drained of AFFF which is now stored onsite. The fourth system is active and has released AFFF for testing in the past. There is a containment dike which captures any releases from this system.

Three sites reported having a documented AFFF release: LANL, Pantex, and Y-12. At LANL, past releases were captured into the sanitary waste treatment system where the liquid is treated. There was a training exercise at Pantex to simulate a plane crash in which AFFF was released. The runoff from the activity flowed into the same playa lake onsite as the treated wastewater discharges. An accidental release from an AFFF-based fire suppression system occurred at Y-12. The use of this Y-12 facility was subsequently discontinued and remains inactive.

As shown in Figure 2.3, uranium enrichment occurred in the past at two sites: LLNL Main Site and Y-12. At Y-12, uranium enrichment occurred in the 1940s as part of the Manhattan Project. Research scale uranium enrichment activities were conducted at LLNL Main Site in the 1980s and 1990s. Neither site has current uranium enrichment activities.

Eight sites have or have had metal plating processing onsite: KCNSC, KCP-BFC, LLNL Main Site, LLNL Site 300, LANL, Pantex, SNL-CA, and Y-12. Metal plating processing is active at all sites except for KCP-BFC.

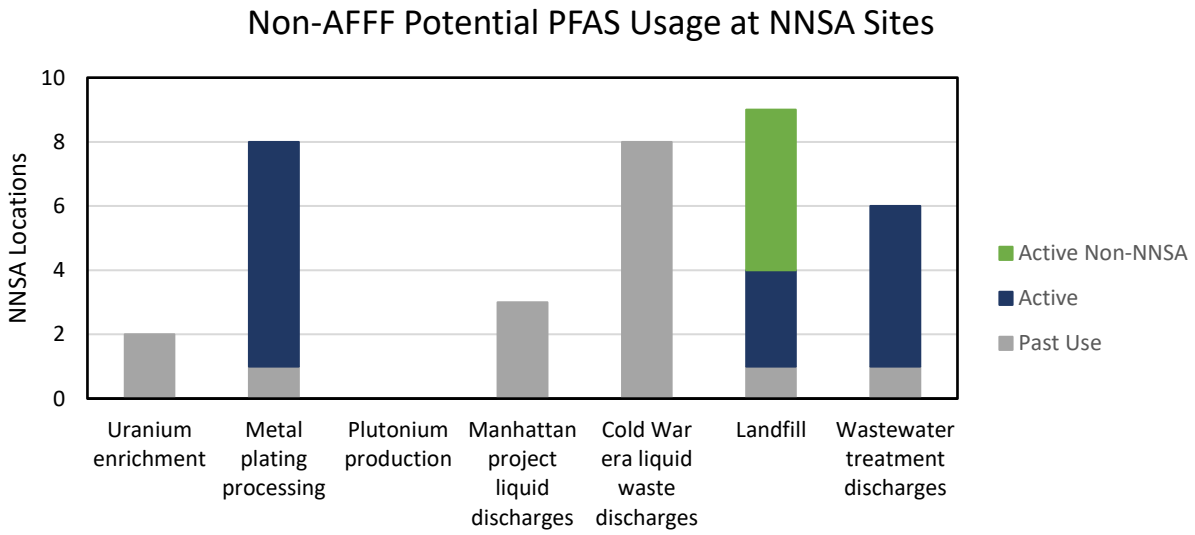

Figure 2.3: Non-AFFF Potential PFAS Usage at NNSA Sites. Potential non-AFFF PFAS usage as reported by NNSA sites with PFAS survey selections listed on the y-axis. Grey bars represent past uses that are no longer active. Blue bars are active uses. Green bars are active uses that are onsite, but not managed by the NNSA.

No sites reported plutonium production. Three sites reported Manhattan Project liquid discharges, LANL, SNL-NM, and Y-12, and eight sites reported that Cold War-era liquid waste discharges occurred, KCP-BFC, LLNL Main Site, LLNL Site 300, LANL, NNSS, Pantex, SNL-NM, and Y-12.

There are nine sites that either have an active landfill, or a closed landfill onsite: LLNL Main Site, LLNL Site 300, LANL, NNSS, Pantex, SNL-CA, SNL-NM, SNL-TTR, and Y-12. LLNL Main Site only has closed landfills while LLNL Site 300 and Y-12 have both closed and active landfills onsite. NNSS and Pantex have several active landfills onsite. Landfills onsite at LANL, SNL, and Y-12 are not managed by NNSA.

Lastly, wastewater treatment discharges were reported at six sites: KCP-BFC, LLNL Main Site, LLNL Site 300, LANL, Pantex, and Y-12. KCP-BFC no longer has liquid wastewater discharges. All other sites discharge treated wastewater under permits and/or re-use the wastewater in cooling towers.

Quantities of over 100 pounds of 172 different PFAS must be reported via the Emergency Planning and Community Right to Know Act (EPCRA) Toxic Release Inventory (TRI) requirements; therefore, the PFAS survey also asked about PFAS quantities stored onsite. Two sites reported having over 100 pounds of at least one PFAS onsite: KCNSC and Livermore Main Site (Figure 2.4). Y-12 clarified in discussions that there are over 100 pounds of AFFF stored onsite, but the PFAS component alone is under 100 pounds. Four additional sites which track PFAS chemicals reported having under 100 pounds of any one PFAS: LLNL Site 300, LANL, NNSS, and SNL-TTR. The remaining six sites have zero PFAS listed in current and historical databases.

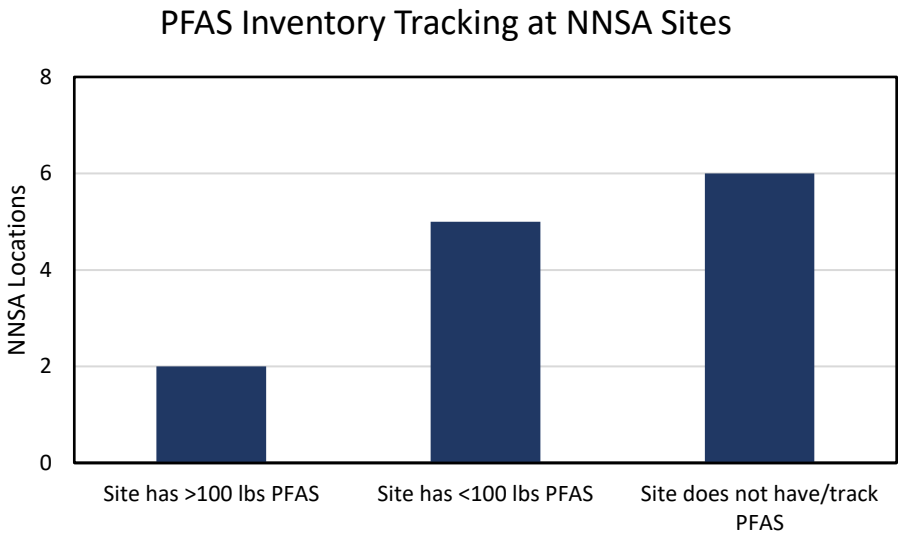

Figure 2.4: PFAS Inventory Tracking at NNSA Sites. PFAS inventories and tracking as reported by NNSA sites with survey selections on the x-axis. Quantities of greater than 100 pounds of any single PFAS must be report via TRI.

2.3 ONSITE SAMPLING AND MONITORING EQUIPMENT

The onsite sampling and monitoring equipment section asked sites whether PFAS sampling efforts have been completed onsite and whether results are available. PFAS sampling, other than drinking water, has been conducted on five of the NNSA sites: KCP-BFC, LLNL Site 300, LANL, NNSS, and Y-12 (Figure 2.5). KCP-BFC, LLNL Site 300, LANL, and NNSS sampled the groundwater for PFAS. The surface water at Y-12 was sampled by the Oak Ridge Office of Environmental Management (OREM) and LANL also completed surface water testing. Soil sampling for PFAS was conducted at KCP-BFC, LANL, NNSS, and Y-12. In addition, LANL has sampled a range of media including biota, wastewater, biosolids/sludge, and sediment. LANL is the only site which measured water values beyond 70 ppt combined PFOA and PFOS. Currently, there is no federal or state regulation or non-enforceable standard to compare solid sample results to for soil, sediment, and biota samples.

Due diligence sampling was completed at KCP-BFC during the decommissioning of the facility by S. S. Papadopulos & Associates, Inc. Three soil samples from 2015 were analyzed for PFAS. The results are considered qualitative as the samples were tested outside of the method holding time. However, PFAS are recalcitrant in the environment and not likely to have degraded significantly before analysis. Seven groundwater samples from 2016 were analyzed for the six PFAS on the EPA's third UCMR. Samples were collected from the influent to the groundwater treatment facility. Positive PFAS detections greater than the reporting limit for the groundwater and soil samples are provided in Table B.1 and Table B.2, respectively, and indicate no PFAS contamination greater than the EPA LHA of 70 ppt. There are no plans for additional sampling.

A single groundwater sample was collected at LLNL Site 300 in 2018 at the request of the Central Valley Regional Water Quality Control Board. The sample was collected from a well located downgradient from the former Navy Fire Suppression Area onsite for well closure purposes. PFHxS was detected at 7.6 and 7.8 ppt in the sample and duplicate sample, respectively. PFOA was detected at 3.2 and 2.8 ppt in the sample and duplicate sample, respectively (Table B.3). Concentrations of PFOS and other PFAS analytes were less than their reporting limits.

Sampling results from LANL PFAS testing are publicly available on the New Mexico Intellus database. PFAS concentrations are actively monitored in groundwater, soil, biota, and wastewater. Positive PFAS detections above 10 ppt for groundwater and surface water results are shown in Table B.4. Four samples exceed 70 ppt PFOA and PFOS combined. LANL continues to sample and monitor PFAS concentrations onsite. The Soil, Foodstuffs, and Biota Program at LANL monitors ecosystem health. This program has collected deceased animals from both on and off LANL property, some of which were submitted for PFAS analysis. The source of PFAS for these media is unknown.

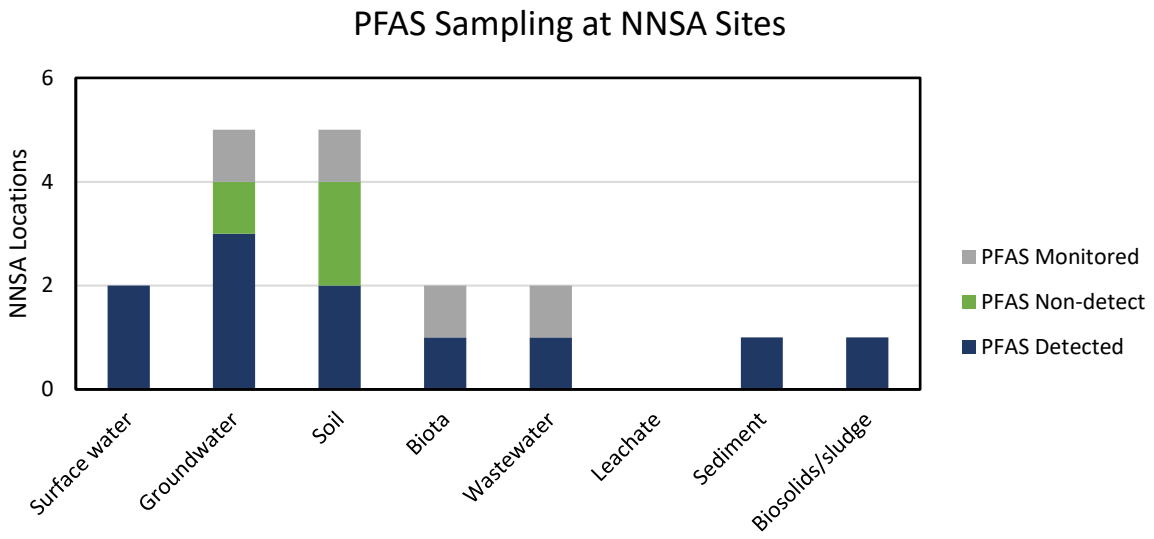

Figure 2.5: PFAS Sampling at NNSA Sites. PFAS sampling and monitoring efforts at NNSA sites with potential sampling media listed on the x-axis. Blue bars indicate that at least one PFAS was detected in the named media. Green bars indicate that PFAS testing has been done, but no PFAS were detected. Grey bars indicate that PFAS are being monitored.

DOE-EM has completed surface water sampling at Y-12 and elsewhere at Oak Ridge. The maximum concentration of PFAS detected in surface water at Y-12 was in the range of 20 – 30 ppt.

In addition to the uses described in the previous section, PFAS can also be found in monitoring and sampling equipment, *e.g.* Teflon®. This can lead to inadvertent contamination of samples from Teflon®-containing sampling and monitoring equipment including well liners, sampling collectors, tubes, and vials, and personal protective equipment (PPE). If PFAS sampling had been completed, the survey asked if the site took appropriate precautions to avoid inadvertent contamination during the sampling process. If the site has not completed sampling yet, the survey asked sites whether any new sampling or monitoring equipment would be required to conduct PFAS sampling to avoid contamination.

All sites that completed PFAS sampling used methods to avoid inadvertent contamination of sample results by monitoring and sampling equipment. However, if additional samples are required at LLNL Site 300, new sampling equipment and PPE would be required (Figure 2.6). In addition to LLNL Site 300, four other sites reported needing new sampling equipment (LLNL Main Site, Pantex, SNL-NM, and Y-12) and three other sites reported needing new PPE (LLNL Main Site, SNL-NM, and Y-12). SNL-NM and Y-12 also reported needing new monitoring wells. Five sites reported no sampling or monitoring equipment needs (KCNSC, KCP-BFC, KCNSC-NMO, SNL-CA, and SRTE) and two sites reported other needs (LLNL Main Site and LLNL Site 300). SNL-TTR reported that sampling and monitoring equipment needs onsite are unknown.

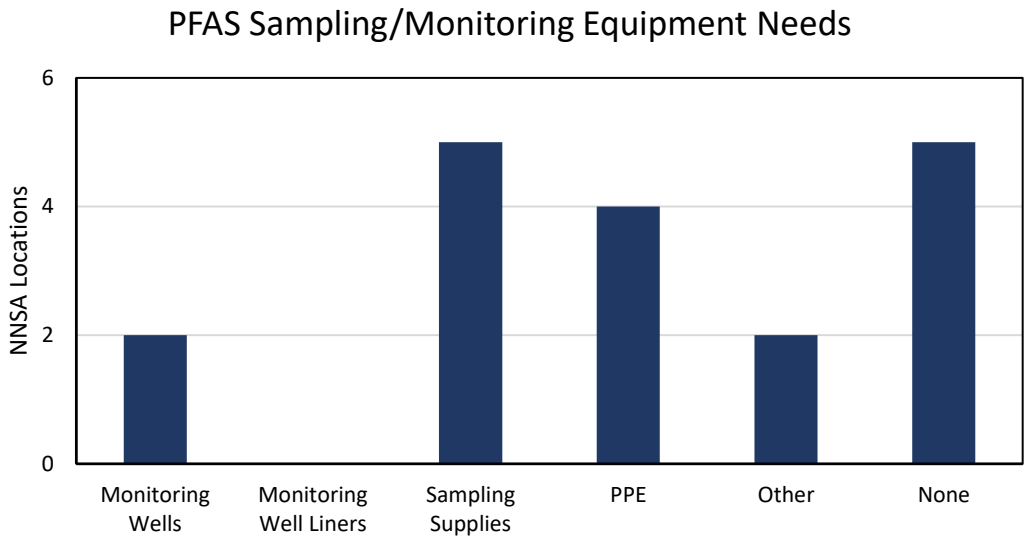

Figure 2.6: PFAS Sampling/Monitoring Equipment Needs. PFAS sampling and monitoring equipment needs as reported by NNSA sites with potential sampling and monitoring equipment selections from the PFAS survey on the x-axis.

2.4 REGULATOR AND STAKEHOLDER ENGAGEMENT

The final section of the PFAS survey addresses interactions with regulators and stakeholders. Emerging PFAS regulations vary significantly by state (Section 3). The survey asked whether sites have been contacted by tribal, local, state, or federal entities and whether that contact prompted any NNSA response.

Six sites reported no contact from regulators or stakeholders regarding PFAS, KCNSC, KCP-BFC, KCNSC-NMO, SNL-CA, SNL-TTR, and SRTE (Figure 2.7). Pantex and NNSS reported federal outreach. Pantex held discussions with the EPA regarding PFAS testing at the Superfund site, but there were no actions that resulted from the conversations. NNSS received data calls from the DOE. Y-12 proactively contacted the Tennessee State PFAS External Working Group to stay engaged on PFAS issues with state regulators.

Four of the remaining sites were contacted by state entities, LLNL Main Site, LLNL Site 300, LANL, and SNL-NM. One site, LLNL Main Site, was contacted locally, and LANL was contacted by a local non-governmental organization. LLNL Main Site and LLNL Site 300 were contacted by state and local water boards and by the CA Department of Toxic Substance Control. New Mexico Environment Department (NMED) contacted LANL and SNL-NM.

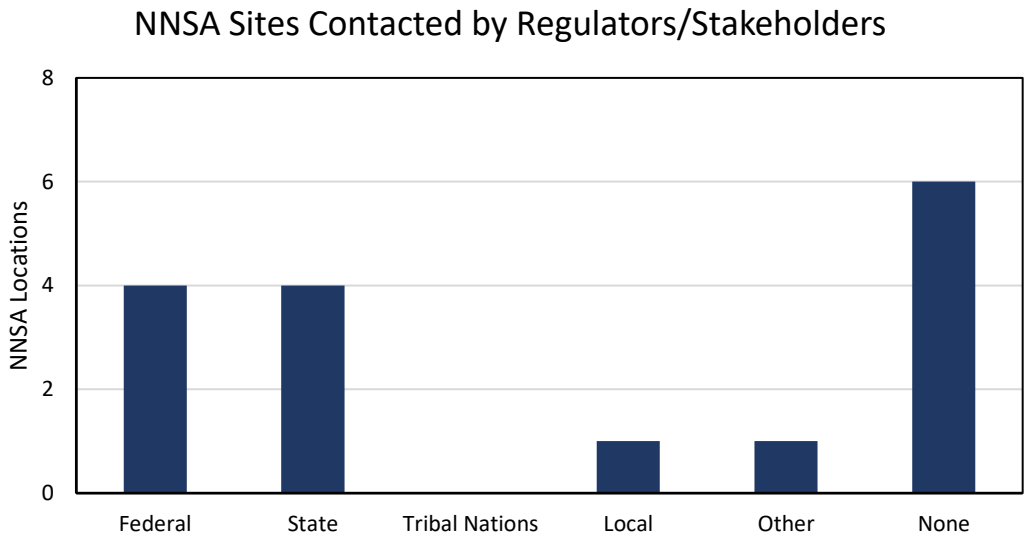

Figure 2.7: NNSA Sites Contacted by Regulators/Stakeholders. NNSA sites which reported contact regarding PFAS from federal, state, tribe, local, or other regulators or stakeholders.

In response to requests from regulators and stakeholders, four sites have completed searches for historical uses of PFAS, including AFFF, onsite: LLNL Main Site, LLNL Site 300, Pantex, and Y-12 (Figure 2.8). Two sites, LANL and SNL-NM, have included PFAS in their current monitoring programs, LLNL Site 300 completed a single sample, and the NNSS responded to data calls from the DOE.

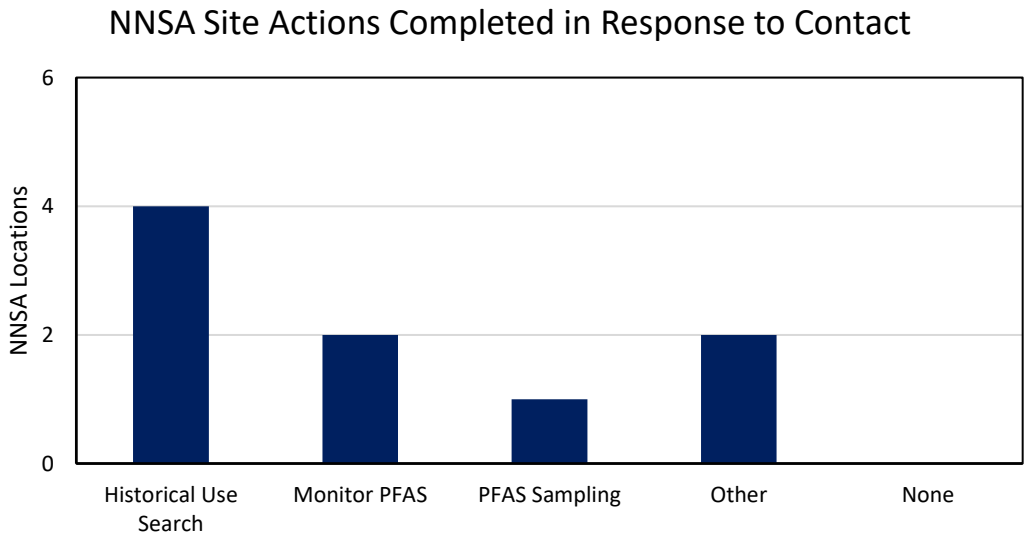

Figure 2.8: NNSA Site Actions Completed in Response to Contact. NNSA sites who responded to contact regarding PFAS from regulators or stakeholders by completing a historical search of PFAS use, monitor or sampling for PFAS, other actions or no actions required.

2.5 KEY NNSA PFAS SURVEY TAKEAWAYS

Figure 2.9 summarizes some of the key takeaways from the PFAS survey across the NNSA enterprise.

- PFAS testing results of drinking water were non-detect in all eleven PWS tested.
- Potential PFAS usage varies significantly by site; however, PFAS-containing AFFF was used for fire suppression activities at most sites.
- PFAS inventories vary by site and AFFF represents the majority of PFAS inventories.
- Five locations have completed PFAS sampling of groundwater, surface water, soil, biota, wastewater, sediment, and/or biosolids/sludge.
- One site received sampling results greater than the EPA LHA of 70 ppt and that site continues to actively monitor PFAS.
- Eight locations indicated that new sampling equipment would be required to sample for PFAS.
- About half of NNSA sites have not been contacted by regulators or stakeholders regarding PFAS.
- NNSA sites have responded to data calls and sampling, monitoring, and other requests.

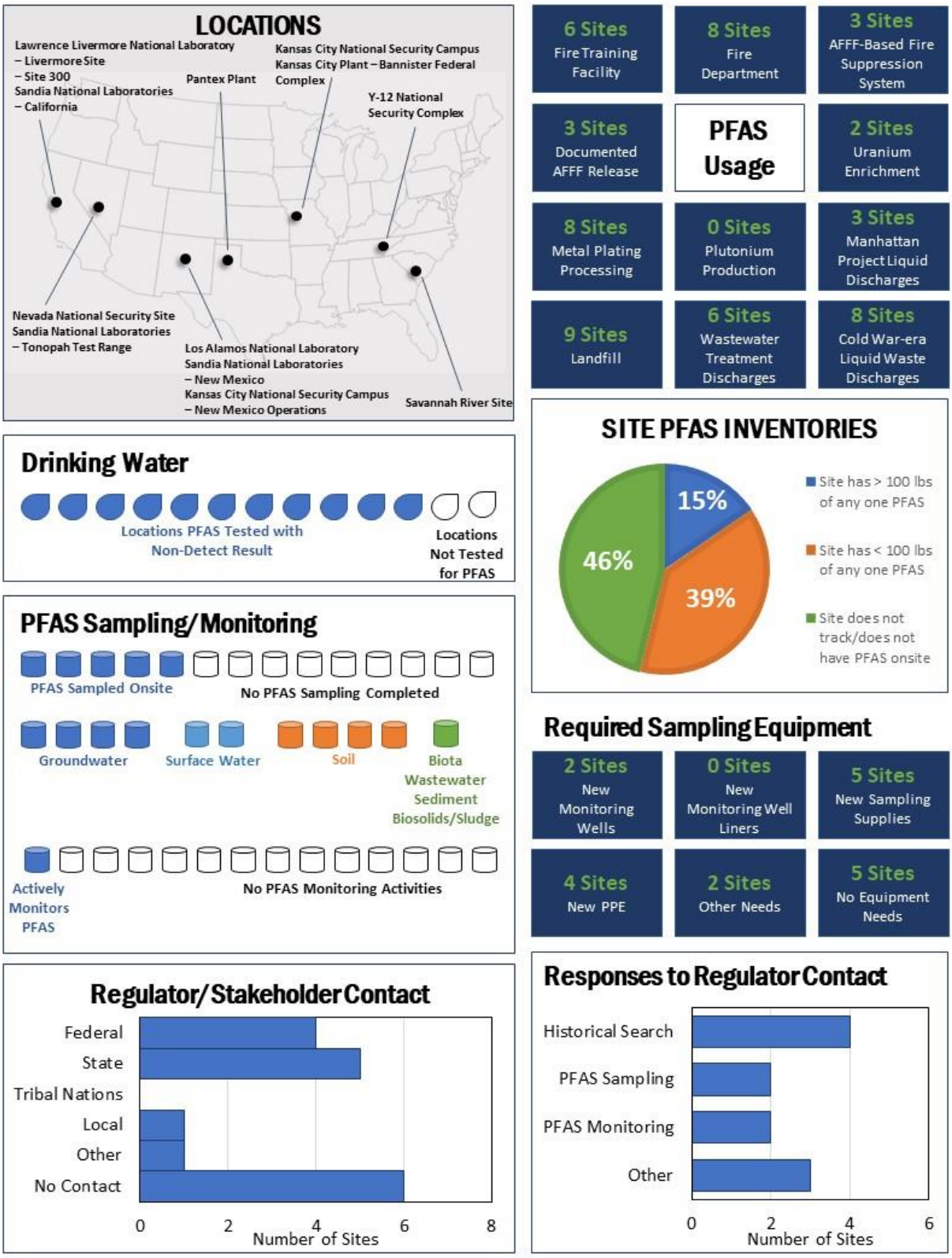

Figure 2.9: Key takeaways of PFAS survey results across the NNSA enterprise.

3 PFAS Regulatory Environment

Environmental Protection Agency

On the federal level, the EPA has set a non-enforceable drinking water LHA of 70 ppt combined for PFOA and PFOS (EPA 2016a). In 2011, six PFAS, including PFOA and PFOS, were added to the third UCMR (EPA 2012). The third UCMR required monitoring of these PFAS in PWS serving more than 10,000 people from 2012 – 2015. There were no PFAS included in the fourth UCMR for monitoring from 2017 – 2021 (EPA 2016b). The proposed fifth UCMR, which will require monitoring from 2023 – 2025, includes 29 PFAS molecules (EPA 2020b).

In February 2019, the EPA released a PFAS Action Plan with objectives to; (1) establish a maximum contaminant level (MCL) for PFOA and PFOS, (2) propose national drinking water monitoring under the fifth UCMR, (3) add PFAS chemicals to the TRI, (4) communicate risk to the public, (5) enforce exposure activities, and (6) promote PFAS research (EPA 2019). The EPA released an updated plan in February 2020 which included a proposal to regulate PFOA and PFOS under the Safe Drinking Water Act (SDWA) (EPA 2020a). The EPA added PFOS and PFOA to the fourth Contaminant Candidate List (CCL) and released the final regulatory determinations for CCL 4 in February 2021, which included PFOS and PFOS. With the final regulatory determinations for PFOS and PFOA, EPA will move forward to implement the national primary drinking water regulation development process for these two PFAS (EPA 2021b).

Toxic Substances Control Act

Since 2006, EPA, authorized by the Toxic Substances Control Act, has reviewed 294 new PFAS and has regulated 191 PFAS through a combination of orders and significant new use rules (SNURs). SNURs require EPA to review and approve a chemical before new manufacturing (including import) and use of that chemical, or products containing that chemical, may commence. (EPA 2021f). The EPA New Chemicals Programs reviews substitute chemicals for PFOA, PFOS, and other PFAS for unreasonable risk factors like toxicity, environmental fate, and bioaccumulation characteristics (EPA 2021e).

Toxic Release Inventory

In 2020, 172 PFAS were added to the EPCRA TRI reporting requirements through Section 7321 of the 2020 National Defense Authorization Act (NDAA). The TRI program requires reporting of PFAS inventories exceeding 100 pounds for any one PFAS chemical (EPA 2021d).

3.1 CALIFORNIA

In 2017, PFOA and PFOS are added to the list of chemicals of concern under the California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) for developmental toxicity (OEHHA 2017). PFOS, its salts and degradation precursors are currently under consideration to be listed as carcinogenic in Proposition 65 (OEHHA 2021). In 2018, the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) established a notification level of 14 ppt for

PFOA and 13 ppt for PFOS in drinking water. The response level for PFOA and PFOS combined was set at 70 ppt (SWRCB 2021). In 2019, The DDW issued a notification that decreased drinking water notification levels to 5.1 ppt for PFOA and 6.5 ppt for PFOS (SWRCB 2021). The notification levels are nonregulatory. Assembly Bill 756 allows the SWRCB to order PFAS testing of PWS, in certain cases. Notifications to the state and local water boards is required if results are greater than the notification levels. If results exceed the response level of 70 ppt combined PFOA and PFOS, the PWS must either shut down the system or notify customers of the exceedance (A.B. 756).

In 2020, the DDW decreased the response level for drinking water from 70 ppt combined to 10 ppt and 40 ppt for PFOA and PFOS respectively (SWRCB 2021). Senate Bill 1044 prohibits the manufacture, sale, distribution, and use of Class B firefighting foams which intentionally contain PFAS chemicals. SB 1044 also requires that manufacturers of firefighting PPE provide to purchasers, at time of sale, written notice if the PPE contains intentionally added PFAS chemicals. This bill is effective January 1, 2022 (S.B. 1044). Assembly Bill 2762 bans two dozen chemicals from use in cosmetic products, including thirteen PFAS and PFAS salts, effective January 1, 2025 (A.B. 2762).

The DDW issued a drinking water notification level of 0.5 ppt for perfluorobutanesulfonic acid (PFBS) and a response level of 5 ppt for PFBS in 2021 (SWRCB 2021). Assembly Bill 1200 would ban the use of PFAS in plant-based food packaging and require cookware manufacturers to notify customers if their products contain any PFAS, via package labels and online product descriptions (A.B. 1200).

3.2 MISSOURI

Missouri has no active nor pending regulations regarding PFAS (Safer States 2021).

3.3 NEVADA

Assembly Bill 97 regarding PFAS containing products was signed into law in May 2021. The bill prohibits certain Class B firefighting foams which contain PFAS from being used for testing or firefighting training purposes and requires reporting of any releases to the Nevada Division of Environmental Protection (NDEP). Assembly Bill 97 directs the NDEP to establish a working group to study PFAS issues. These items are effective January 2022. The bill also limits the concentration of flame-retardant organohalogenated chemicals in certain textiles, including upholstered furniture and mattresses, effective July 2022 (A.B. 97).

3.4 NEW MEXICO

In 2018, the New Mexico Water Quality Control Commission added PFOA, PFOS, and perfluorohexane sulfonic acid (PFHxS) to the state list of toxic pollutants, effective December 21, 2018 (20.6.4 NMAC). In 2020, the discharge permits for LANL were updated to require testing for 18 PFAS analytes. PFOA and PFOS discharges are screened at the EPA LHA concentration of 70 ppt for PFOS and PFOA combined (NMED 2020).

3.5 SOUTH CAROLINA

A bill was introduced in the South Carolina House which would require the South Carolina Department of Health and Environmental Control to establish a maximum contaminant level (MCL) for PFOS, PFOA, and other PFAS in PWS (H. 3515).

3.6 TENNESSEE

The Tennessee Department of Environment & Conservation (TDEC) released a strategy document on its plan to assess PFAS across Tennessee in 2020. The document includes a statewide public drinking water sampling effort which will test for 29 PFAS analytes (TDEC 2020). TDEC has also formed an interdisciplinary working group to help address PFAS (TDEC 2021).

3.7 TEXAS

The Texas Commission on Environmental Quality (TCEQ) added sixteen PFAS to the Protective Concentration Levels (PCL) standards for the Texas Risk Reduction Program (TRRP) in September of 2014 (TCEQ 2021), including PFOA and PFOS. The PCL standards apply to certain remediation sites. There is a proposed bill filed in March of 2021 in the Texas legislature, regarding PFAS containing products used in firefighting, SB 2073 and HB 4506. If passed, the bill would prohibit the manufacture, sale, and distribution of firefighting foams containing PFAS chemicals. The bill would also require disclosure of firefighting PPE which contains PFAS chemicals (S.B. 2073).

4 Next Steps

The PFAS survey results indicate that there are no NNSA sites with PFAS contamination in drinking water and only one NNSA site with groundwater PFAS levels exceeding the EPA drinking water LHA at the time of this report. There have also been limited regulatory requests directing NNSA sites to complete drinking water sampling and environmental sampling for PFAS.

NNSA HQ is implementing the following steps to support a comprehensive Departmental approach to PFAS:

- *Partner with DOE-AU and NNSA sites and programs to implement the DOE PFAS policy*

  The NNSA is partnering with DOE-AU and NNSA sites to implement the DOE PFAS policy issued on September 16, 2021, "*Addressing Per-and Polyfluoroalkyl Substances at the Department of Energy*."

- *Continue Collaboration with DOE-EM*

  NNSA is collaborating with DOE-EM on PFAS activities of mutual interest at multi-program sites including LANL, NNSS, SRS, and Y-12. Presenting a clear message and coordinated approach to these sites regarding PFAS is essential to effective implementation of current and potential new PFAS requirements.

- *Participate and Support the DOE PFAS Working Group and the new DOE PFAS Coordinating Committee*

  NNSA is participating in the DOE PFAS Working Group chaired by DOE-AU and will participate in the new DOE PFAS Coordinating Committee. NNSA HQ encourages NNSA site PFAS points of contact to join the PFAS working group and participate when able. There is already site participation from some NNSA sites including KCNSC, NNSS and Y-12.

5 References

A.B. 1200, 2020-21 Leg., Reg. Sess. (Cal. 2021). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB1200

A.B. 2762, 2019-20 Leg., Reg. Sess. (Cal. 2020). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB2762

A.B. 756, 2019-20 Leg., Reg. Sess. (Cal. 2019). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB756

A.B. 97, 81st Leg., Reg. Sess. (Nev. 2021) https://www.leg.state.nv.us/App/NELIS/REL/81st2021/Bill/7397/Overview

Baduel, C., Mueller, J.F., Rotander, A., Corfield, J., Gomez-Ramo, M.-J. 2017. "Discovery of Novel Per- and Polyfluoroalkyl Substances (PFAS) at a Fire Fighting Training Ground and Preliminary Investigation of their Fate and Mobility." Chemosphere 185: 1030 – 1038. doi:10.1016/j.chemosphere.2017.06.096

Boulanger, B., Vargo, J., Schnoor, J.L., Hornbuckle, K.C. 2004. "Detection of Perfluorooctane Surfactants in Great Lakes Water." *Environmental Science and Technology* 38, no. 15: 4064 – 4070. doi:10.1021/es0496975

Center for Disease Control (CDC). 2021. Early Release: Per- and Polyfluoroalkyl Substances (PFAS) Tables, NHANES 2011-2018. https://www.cdc.gov/exposurereport/pfas_early_release.html (Accessed July 26, 2021)

Cohen, H.A. 2017. *Due Diligence Site Investigation Stage III Supplemental Report Bannister Federal Complex Kansas City, MO*. S.S. Papadopulos & Associates, Inc. March.

Environmental Protection Agency (EPA). 2012. *The Third Unregulated Contaminant Monitoring Rule (UCMR 3)*. EPA 815-F-12-002. May. https://www.epa.gov/sites/production/files/2015-10/documents/ucmr3_factsheet_general.pdf

EPA. 2016a. *Fact Sheet PFOA & PFOS Drinking Water Health Advisories*. EPA 800-F-16-003. November. https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf

EPA. 2016b. *The Fourth Unregulated Contaminant Monitoring Rule (UCMR 4)*. EPA 815-F-16-007. December. https://www.epa.gov/sites/production/files/2017-03/documents/ucmr4-fact-sheet-general.pdf

EPA. 2019. *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*. EPA 823R18004. February.

EPA. 2020a. *EPA PFAS Action Plan: Program Update*. EPA 100K20002.

EPA. 2020b. *Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems*. EPA 815-F-20-004. December. https://www.epa.gov/sites/production/files/2021-01/documents/ucmr5-proposal-factsheet-draft.pdf

EPA. 2021a. Basic Information on PFAS. https://www.epa.gov/pfas/basic-information-pfas (Accessed July 6, 2021)

EPA. 2021b. Contaminant Candidate List (CCL) and Regulatory Determination. https://www.epa.gov/ccl (Accessed July 6, 2021)

EPA. 2021c. Learn About the Unregulated Contaminant Monitoring Rule. https://www.epa.gov/dwucmr/learn-about-unregulated-contaminant-monitoring-rule (Accessed July 6, 2021)

EPA. 2021d. List of PFAS Added to the TRI by the NDAA. January. https://www.epa.gov/toxics-release-inventory-tri-program/list-pfas-added-tri-ndaa (Accessed July 6, 2021)

EPA. 2021e. New Chemicals Program Review of Alternatives for PFOA and Related Chemicals. February. https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/new-chemicals-program-review-alternatives-pfoa-and

EPA. 2021f. Risk Management of Per- and Polyfluoroalkyl Substances (PFAS) under TSCA. June. https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfas (Accessed July 7, 2021)

H. 3515, 124th Gen. Assemb., Reg. Sess. (S.C. 2021). https://www.scstatehouse.gov/billsearch.php?billnumbers=3515&session=124&summary=B

Houtz, E.F., Higgins, C.P., Field, J.A., and Sedlak, D.L. 2013. "Persistence of Perfluoroalkyl Acid Precursors in AFFF-Impacted Groundwater and Soil." *Environmental Science and Technology* 47, no. 15: 8187 – 8195. doi:/10.1021/es4018877

Hu, X.C., Andrews, D.Q., Lindstrom, A.B., Bruton, T.A., Schaider, L.A., Grandjean, P., Lohmann, R., Carignan, C.C., Blum, A., Balan, S.A., Higgins, C.P., and Sunderland, E.M. 2016. "Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants." *Environmental Science & Technology Letters* 3, no. 10: 344 – 350. doi:10.1021/acs.estlett.6b00260

Los Alamos National Laboratory (LANL). 2021. *Intellus New Mexico*. https://www.intellusnm.com/index.cfm (Accessed July 2, 2021)

Interstate Technology Regulatory Council (ITRC). 2020. PFAS – Per- and Polyfluoroalkyl Substances. https://pfas-1.itrcweb.org/ (Accessed July 6, 2021)

Lawrence Livermore National Laboratory (LLNL). 2018. *Lawrence Livermore National Laboratory Site 300 Per- and Polyfluoroalkyl Substances (PFAS) Sampling Results for Monitor Well W-25M-01*. LLNL-MI-763061. November.

New Mexico Environmental Department (NMED). 2020. State Certification Los Alamos National Laboratory Industrial Wastewater NPDES Permit No. NM0028355. November. https://www.epa.gov/sites/production/files/2021-01/documents/nmed_swqb_401_certification_-_lanl_outfall_nm0028355_final.pdf

Office of Environmental Health Hazard Assessment (OEHHA). 2017. *Safe Drinking Water and Toxic Enforcement Act of 1986: Notice to Interested Parties November 10, 2017*. https://aboutblaw.com/QZc

OEHHA. 2021. *Chemical Selected for Consideration for Listing by the Carcinogen Identification Committee and Request for Relevant Information on the Carcinogenic Hazard of: PFOS and its salts and Transformation and Degradation Precursors*. March. https://oehha.ca.gov/proposition-65/crnr/chemical-selected-consideration-listing-carcinogen-identification-committee-and

Route, W.T., Russell, R.E., Lindstrom, A.B., Strynar, M.J., Key, R.L. 2014. "Spatial and Temporal Patterns in Concentrations of Perfluorinated Compounds in Bald Eagle Nestlings in the Upper Midwestern United States." *Environmental Science and Technology* 48, no. 12: 6653 – 6660. doi:10.1021/es501055d

S.B. 1044, 2019-20 Leg., Reg. Sess. (Cal. 2020) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB1044

S.B. 2073, H.B. 4506, 87th Leg., Reg Sess. (Tex. 2021) https://capitol.texas.gov/BillLookup/History.aspx?LegSess=87R&Bill=SB2073

Safer States. 2021. PFAS. https://www.saferstates.com/toxic-chemicals/pfas/

Schuetze, A., Heberer,, T., Effkemann, S., Susanne, J. 2010. "Occurrence and Assessment of Perfluorinated Chemicals in Wild Fish from Northern Germany." *Chemosphere* 78 no. 6: 647 – 652. doi:10.1016/j.chemosphere.2009.12.015

Sharma, B.M., Bharat, G.K., Tayal, S., Larssen, T., Becanova, J., Karaskova, P., Whitehead, P.G., Futter, M.N., Butterfield, D., Nizzetto, L. 2016. "Perfluoroalkyl Substances (PFAS) in River and Ground/Drinking Water of the Ganges River Basin: Emissions and Implications for Human Exposure." *Environmental Pollution* 208: 704 – 713. doi:10.1016/j.envpol.2015.10.050

State Water Resources Control Board (SWRCB). 2021. Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS). https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/PFOA_PFOS.html (Accessed July 6, 2021)

Tennessee Department of Environment and Conservation (TDEC). 2020. *TDEC's Strategy to Assess the Impact of Per- and Polyfluoroalkyl Compounds on Public Drinking Water Sources in Tennessee*. https://www.tn.gov/content/dam/tn/environment/sustainable-practices/policy/pfas/opsp_pfas_tdec-pfas-drinking-water-source-assessment-strategy.pdf

TDEC. 2021. PFAS. May. https://www.tn.gov/environment/program-areas/opsp-policy-and-sustainable-practices/policy/pfas.html (Accessed July 7, 2021)

Texas Commission on Environmental Quality (TCEQ). 2021. TRRP Protective Concentration Levels. April. https://www.tceq.texas.gov/remediation/trrp/trrppcls.html (Accessed July 7, 2021)

A1 NNSA PFAS SURVEY

Emerging Contaminants: Per- and Polyfluoroalkyl Substances (PFAS) General Assessment Survey for NNSA Sites

On-Site Drinking Water

- If the site provides potable drinking water, check all boxes that apply:
  - ☐Population served by public water system (PWS) is under 10,000
  - ☐Population served by PWS is over 10,000
  - ☐Site provides potable water to residential wells
  - ☐Site does not provide drinking water to workforce

- Has drinking water at the site been sample for PFAS?
  - ☐Yes, no PFAS were detected
  - ☐Yes, PFAS were detected
  - ☐No, drinking water has not been sampled

PFAS Usage

- Does your site currently have, or previously had, any of the following facilities, events, and/or disposal units?
  - ☐Fire training facility
  - ☐Fire department
  - ☐Presence of AFFF-based fire suppression system
  - ☐Documented release of AFFF
  - ☐Uranium enrichment
  - ☐Metal plating processing
  - ☐Plutonium production
  - ☐Manhattan project liquid discharges
  - ☐Cold War era liquid waste discharges
  - ☐Landfill
  - ☐Wastewater treatment discharges

- Does your site track and maintain past and present inventories of PFAS?
  - ☐Yes, the site has more than 100 pounds of any one PFAS
  - ☐Yes, the site does not have more than 100 pounds of any one PFAS
  - ☐No

On-Site Sampling/Monitoring Equipment

- Check all environmental media that had been tested at the site with <u>positive</u> PFAS results:
  - ☐Drinking water
  - ☐Surface water
  - ☐Groundwater
  - ☐Soil

☐Biota
☐Wastewater
☐Leachate
☐Sediment
☐Biosolids/sludge
☐No positive detections
☐The site has not sampled

- Are on-site PFAS concentrations actively monitored?
  ☐Yes, in drinking water
  ☐Yes, in surface water
  ☐Yes, in groundwater
  ☐Yes, in soil
  ☐Yes, in biota
  ☐Yes, in wastewater
  ☐Yes, in leachate
  ☐Yes, in sediment
  ☐Yes, in biosolids/sludge
  ☐No; previous positive detections, but not actively monitoring
  ☐No; have not detected or sampled for PFAS

- Are there analytical results available from PFAS sampling?
  ☐Yes
  ☐No

- Have PFAS been measured beyond the NNSA site boundary?
  ☐Yes
  ☐No

- If your site has not yet sampled for PFAS, do you currently use monitoring equipment that contains PFAS (*e.g.*, Teflon)? Please select all that apply:
  ☐Yes, new monitoring wells would be required for PFAS sample
  ☐Yes, monitoring well liners would need to be replaced for PFAS sampling
  ☐Yes, new sampling supplies would be required for PFAS samples
  ☐Yes, new PPE would be required for PFAS sampling
  ☐Other: Click or tap here to enter text.
  ☐No

- If your site has sampled for PFAS, was sampling conducted with the appropriate methods to avoid inadvertent contamination (*e.g.*, proper PPE, monitoring equipment, and sampling tools)?
  ☐Yes
  ☐No

Regulatory & Stakeholder

- Has the site been contact by regulators/stakeholders regarding PFAS?
  ☐Federal
  ☐State
  ☐Tribal Nations
  ☐Local
  ☐Other: Click or tap here to enter text.
  ☐No

- Have regulators/stakeholders prompted any of the following responses?
  ☐Search for historical uses of AFFF or other PFAS related materials
  ☐Include PFAS analysis in current monitoring program
  ☐site sampling for PFAS
  ☐Other: Click or tap here to enter text.
  ☐None

A2 SITE-BY-SITE SURVEY RESULTS

A2.1 KANSAS CITY NATIONAL SECURITY CAMPUS

The NNSA KCNSC provided responses for three different locations. (1) The Kansas City National Security Campus (KCNSC) located near Kansas City, Missouri opened in 2013. The site is leased by the NNSA and operated by Honeywell Federal Manufacturing and Technologies (FM&T), LLC. (2) The Kansas City Plant (KCP) was located at the Bannister Federal Complex (BFC), referred to as KCP-BFC in this report. The site was owned by the NNSA and operated by Honeywell FM&T until decommissioning began in 2014. The site is being redeveloped and NNSA is involved through the NNSA Long-Term Stewardship (LTS) program. (3) The Kansas City National Security Campus New Mexico Operations (KCNSC-NMO) is a satellite site in Albuquerque, New Mexico. The site is leased by the NNSA and operated by Honeywell FM&T.

Drinking Water

The KCNSC and KCP-BFC receive drinking water from the Kansas City PWS and KCNSC-NMO drinking water is sourced from the City of Albuquerque PWS. Both cities have completed PFAS testing, and the results were non-detect for PFAS.

Potential PFAS Usage

KCNSC: KCNSC has active metal plating processing onsite. All wastewater is captured by tanks and goes through the Industrial Wastewater Pretreatment Facility. There are no releases into the environment. KCNSC has small quantities of several chemicals with PFAS listed as a constituent stored onsite.

KCP-BFC: Since the KCP-BFC facility has been decommissioned, all potential PFAS uses are historical and no longer active. There was a fire department onsite along with metal plating processing. Cold War-era liquid waste discharges and wastewater treatment discharges occurred. There are no records or quantifications of PFAS containing chemicals onsite.

KCNSC-NMO: KCNSC-NMO has no active or historical potential PFAS usages onsite. The site has zero PFAS inventory.

On-Site Sampling/Monitoring Equipment

KCNSC and KCNSC-NMO have not completed PFAS sampling. Plans to sample would only be developed if requested by the state permit. The KCNSC and KCNSC-NMO do not currently use monitoring equipment that contains PFAS.

Due diligence sampling was completed at KCP-BFC during the decommissioning of the facility by S. S. Papadopulos & Associates, Inc. Three soil samples from 2015 were analyzed for 14 PFAS. The results are considered qualitative as the samples were tested outside of the method holding time. However, PFAS are recalcitrant in the environment and not likely to have degraded significantly before analysis. Seven groundwater samples from 2016 were analyzed for 15 PFAS, including the six PFAS on the USEPA's third UCMR. Samples were collected from

the influent to the groundwater treatment facility. Results for the groundwater and soil samples are provided in Table B.1 and Table B.2, respectively, and indicate no PFAS contamination greater than the EPA LHA of 70 ppt. There are no plans for additional sampling.

Regulatory & Stakeholder Engagement

The KCNSC, KCP-BFC, and KCNSC-NMO have not been contacted by any regulators or stakeholders outside of the DOE/NNSA PFAS survey data call.

Key Takeaways

- Drinking water is supplied by municipal PWSs and PFAS were not detected in samples
- KCP-BCF and KCNSC-NMO had no documentation of PFAS usage onsite
- KCNSC has small quantities of PFAS onsite; wastewater is pretreated and not released to the environment
- The KCP-BFC groundwater sampling results for PFAS are less than the 70 ppt EPA LHA
- KCNSC and KCNSC-NMO have not completed PFAS sampling

Table A2.1: KCP-BFC water sampling results. PFAS water sampling results from KCP-BFC with positive PFAS detections greater than the reporting limit (Cohen 2017).

Chemical name	Detections [Out of 8 Samples]	Concentration Range [ppt]
Perfluorobutanesulfonate (PFBS)	1	37
Perfluoroheptanoic acid (PFHA)	7	2* – 8
Pefluorohexanesulfonate (PFHxS)	1	9*
Perfluorohexanoic acid (PFHxA)	5	6 – 21
Perfluorononanoic acid (PFNA)	5	1* – 7
Perfluorooctanoic acid (PFOA)	8	1* – 9

*Concentration value is close to or less than the reporting limit for the method and estimated.

Table A2.2: KCP-BFC soil sampling results. PFAS soil sampling results from KCP-BFC with positive PFAS detections (Cohen 2017). Three soil samples were tested for 14 PFAS. Only one sample tested positive for PFAS.

Chemical name	Detections [Out of 3 Samples]	Concentration Range [ng/g]
Perfluorononanoic acid (PFNA)	1	0.24*

*Concentration value is estimated

A2.2 LAWRENCE LIVERMORE NATIONAL LABORATORY

LLNL provided two surveys, one for the Livermore Main Site, located in Livermore, CA, and one for LLNL Site 300, located between Livermore and Tracy, CA. The Livermore Main Site and Site 300 are NNSA sites run by M&O contractor Lawrence Livermore National Security, LLC. The DOE-EM is completing environmental restoration activities at Site 300 and deactivation and decommissioning (D&D) activities at the Livermore Site. The Livermore Site and Site 300 are part of the NNSA LTS program.

Drinking Water

The LLNL Livermore Site is served by the city of Livermore PWS. The population served is under 10,000 people. LLNL does test their distribution of drinking water but not for PFAS as it is not a requirement. The City of Livermore has tested the PWS, and the result was non-detect for PFAS. LLNL Site 300 is served by onsite wells and the San Francisco Public Utilities Commission (SFPUC) Hetch-Hetchy water. SFPUC tested its drinking water sources and found no PFAS contamination. The Site 300 wells have not been tested.

Potential PFAS Usage

Livermore Main Site: There was a fire training facility located onsite that is no longer active, training is currently conducted offsite. There is an active fire department onsite that does not use AFFF. There is an AFFF-based fire suppression system onsite that may be active. Research scale uranium enrichment activities were done on site in the 1980s and 1990s but are not active. Metal plating processing is also active onsite. There were Cold War-era liquid waste discharges onsite. No active landfills exist onsite, but there are buried landfills managed through the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also known as Superfund. Treated wastewater discharges onsite either go into arroyos or are re-used in cooling towers.

LLNL Livermore Main Site does not have more than 100 pounds of any one PFAS onsite. Five-gallon containers of a PFAS containing firefighting foam concentrate were found onsite but disposed of through Radioactive and Hazardous Waste Management.

Site 300: There was also a fire training facility located at Site 300 that is no longer active and an active fire department onsite that does not use AFFF. Metal plating processing is active onsite. There were Cold War-era liquid waste discharges onsite. There are both active landfills and landfills which have undergone closure following RCRA regulations. The wastewater treatment system discharges via misting or discharges are re-injected into the ground.

Site 300 has fewer than 100 pounds of any one PFAS onsite. There are approximately 20 gallons of a Class A firefighting foam which does not contain PFAS.

On-Site Sampling/Monitoring Equipment

There has been no environmental sampling done at the Livermore Main Site. A single groundwater sample was collected at Site 300 on September 11, 2018 at the request of the

Central Valley Regional Water Quality Control Board. The sample was collected from a well located downgradient from the former Navy Fire Suppression Area onsite for well closure purposes. Care was taken to avoid any contamination of the sampling equipment. Analysis was completed using a modified EPA Method 537 which tested for 19 PFAS. PFHxS was detected at 7.6 and 7.8 ppt in the sample and duplicate sample, respectively. PFOA was detected at 3.2 and 2.8 ppt in the sample and duplicate sample, respectively. PFOS and all other PFAS tested less than the reporting limits (Table B.3). The Central Valley Regional Water Quality Control Board confirmed that these are trace detections and do not indicate groundwater contamination. The well was decommissioned in 2019.

While care was taken to avoid contamination of the single groundwater sample, if further PFAS sampling is required, LLNL would need new equipment, personal protective equipment (PPE), analytical laboratory contracts and field samplers.

Regulatory & Stakeholder Engagement

The San Francisco Bay Area Water Board (Livermore Main Site), the Central Valley Regional Water Quality Control Board (Site 300) and the California Department of Toxic Substance Control contacted LLNL regarding potential PFAS use onsite. In response, LLNL collected a groundwater sample in 2018 and provided the sampling results (Table A2.3) and historical information to the governing bodies.

Key Takeaways

- LLNL Main Site drinking water sources tested non-detect for PFAS
- The groundwater sampling event at a location with likelihood of PFAS presence at LLNL Site 300 indicated no PFAS concentrations greater than the 70 ppt EPA LHA
- AFFF is not used onsite at the fire departments (Site 300 and Livermore Main Site); however, there is an AFFF-based fire suppression system (Livermore Main Site)

Table A2.3: LLNL Site 300 PFAS Sampling Results. LLNL Site 300 groundwater sampling results with positive PFAS detections (LLNL 2018). W25M-01 is the sample name.

Chemical Name	W-25M-01 [ppt]	W-25M-01-DUP*[ppt]
Total Perfluorohexanesulfonic acid (PFHxS)	7.6	7.8
Total Perfluorooctanoic acid (PFOA)	3.2	2.8

*Duplicate sample

A2.3 LOS ALAMOS NATIONAL LABORATORY

LANL is located in Los Alamos, New Mexico. The NNSA is active onsite with research and development activities and production. DOE-EM also has a large presence onsite completing cleanup activities. The M&O contractors for the NNSA and the DOE-EM are Triad National Security, LLC, and Newport News Nuclear BWXT (N3B), respectively. The PFAS survey results reported here focus on NNSA activities at LANL; however, LANL/NNSA is actively coordinating with LANL/DOE-EM for onsite PFAS activities.

Drinking Water

The PWS onsite was transferred from the DOE to Los Alamos County in the 1990s. While DOE owns the land, Los Alamos County owns the well infrastructure. The PWS serves a population of more than 10,000. N3B tested for PFAS in the drinking water on behalf of Los Alamos County. N3B used the EPA modified method 537.1 and found that PFAS levels were less than the detection limit. The results are publicly available on the New Mexico Intellus database.

Potential PFAS Usage

There is an active fire training facility onsite. LANL is currently characterizing the site and searching records to see if AFFF or other PFAS containing chemicals were ever used onsite. There is an active fire department onsite that is owned and operated by Los Alamos County. NNSA partially funds this effort. LANL maintains a chemical database which lists several AFFF containers at the fire department as disposed. The US Forest Service has a firefighting station on the DOE site that houses helicopters. There were two historical wildfires in the area, but the use of a PFAS containing foam to put out wildfires is uncommon.

There are three AFFF fire suppression systems onsite at LANL. Two systems are active and currently use AFFF. All releases from quarterly tests are captured into waste containers. The third system has been decommissioned and is undergoing characterization. LANL is planning to research alternatives to replace the AFFF. There have been AFFF releases in the past, but the chemicals were captured by the sanitary waste treatment system. Some of that treated wastewater is discharged and the rest goes into the cooling towers for the supercomputer. These releases were stopped in 2018.

Metal plating processing is active onsite. There are no active landfills onsite managed by the NNSA. Manhattan project liquid discharges and Cold War-era liquid waste discharges occurred in the past. LANL is in the process of determining whether these two discharges could have contained PFAS. Wastewater treatment discharges occur onsite from the sanitary treatment system, which is permitted for regulated outfalls. Some of the liquid is routed to effluent reclamation where the water is treated via reverse osmosis and reused in the cooling towers for the supercomputer.

The site has less than 100 pounds of any one PFAS located onsite.

On-Site Sampling/Monitoring Equipment

LANL has tested several different environmental media for PFAS including surface water, groundwater, soil, biota, wastewater, sediments, and biosolids/sludge. Sampling results are publicly available on the Intellus database. PFAS concentrations are actively monitored in groundwater, soil, biota, and wastewater. PFAS detections above 10 ppt in groundwater and surface water are shown in Table A2.4. Four samples exceed 70 ppt LHA for PFOA and PFOS combined. The Soil, Foodstuffs, and Biota Program at LANL monitors ecosystem health. This program has collected deceased animals from both on and off LANL property, some of which were submitted for PFAS analysis. The source of PFAS for these media is unknown. All sampling was and is conducted to avoid inadvertent contamination from sampling equipment.

Regulatory & Stakeholder Engagement

The New Mexico Environmental Department (NMED) contacted LANL in 2018 after three PFAS were added to the New Mexico Ground Water Toxics List. Since there are no PFAS standard values yet, the results were compared to the EPA LHA. NMED requested sampling of all monitoring wells for PFAS starting in October 2020. A non-government organization contacted DOE headquarters (HQ) about PFAS usages at LANL.

Table A2.4: LANL PFAS Sampling Results. LANL surface water and groundwater sampling results which tested at 10 ppt or higher for PFOA, PFOS, or PFHxS, the three PFAS on the New Mexico state list of toxic substances (LANL 2021). Results are reported in parts per trillion (ppt). Bolded values exceed 70 ppt PFOA and PFOS combined.

Location ID	PFOS	PFOA	PFHxS
Vine Tree Spring	16.5	4.77	4.7
Vine Tree Spring (FD)	14.5	4.29	4.27
LAOI-7	3.7	2.45	24.0
LAO-3a	12.2	7.16	27.2
MCO-7	46.3	22.0	13.7
PAO-5n	**124**	**40.0**	15.4
POI-4	**40.2**	**47.8**	19.6
R-3i	18.5	47.6	18.6
R-3i (FD)	19.6	45.7	17.8
CdV-16-2(i)r	-*	10.8	-*
CDV-16-4ip S1	-*	11.7	-*
Martin Spring	-*	12.6	-*
CDV-16-02659	-*	10.2	-*
CDV-16-02659 (FD)	-*	10.2	-*
Sandia Below Wetlands†	**70.0**	**14.4**	9.68
Sandia Right Fork at Power Plant†	**95.2**	**21.0**	7.79

*Result less than the reporting limit
†Surface water sample
FD = Field Duplicate

Key Takeaways

- Drinking water sources tested non-detect for PFAS
- PFAS sampling results at LANL are publicly available through the Intellus New Mexico database
- PFOA and PFOS were detected in two groundwater samples and two surface water samples greater than the EPA LHA
- LANL continues to test and monitor PFAS concentrations in a variety of environmental media
- AFFF is used onsite at the AFFF-based fire suppression system

A2.4 NEVADA NATIONAL SECURITY SITE

The NNSS is located outside of Las Vegas, Nevada. The NNSA and DOE-EM are both active onsite. This survey response represents a cumulative effort of both organizations' activities.

Drinking Water

The PWS onsite serves fewer than 10,000 people. The drinking water was tested as there is firefighting foam use onsite. The results were less than detection for all PFAS analyzed.

Potential PFAS Usage

There is an active fire training facility onsite, but firefighting foams are not used during training exercises. There is an active fire department which has firefighting foams onsite. If there were past releases of AFFF into the environment, contamination is unlikely due to the depth of the water table below the surface. There were Cold War-era liquid waste discharges in the past. There are active landfills onsite surrounded by monitoring wells.

The site has under 100 pounds of any one PFAS. There is AFFF stored onsite for fire suppression where water cannot be used. A large reserve of AFFF is stored at the Remote Sensing Laboratory which is leased by the Department of Defense. No PFAS chemicals were listed in the inventory database, which goes back to 2000.

On-Site Sampling/Monitoring Equipment

Soil and groundwater samples have been collected onsite and analyzed for PFAS resulting in no positive detections. Sampling is conducted to avoid inadvertent contamination from sampling materials and equipment.

Regulatory & Stakeholder Engagement

The NNSS has not been contacted by any regulators or stakeholders outside of DOE data calls.

Key Takeaways

- Drinking water sources tested non-detect for PFAS
- There have been no positive PFAS detections in soil and groundwater sampling
- AFFF is used onsite at the fire department

A2.5 PANTEX PLANT

Pantex Plant (Pantex) is an NNSA production site located in Amarillo, Texas, managed by Consolidated Nuclear Security (CNS), LLC. The Pantex Plant is part of the NNSA LTS program.

Drinking Water

The PWS onsite serves employees and contractors, fewer than 10,000 people. The drinking water onsite has not been tested.

Potential PFAS Usage

There was a fire training facility onsite which became inactive in the 1980s. The fire department onsite switched to a fluorine-free alternative within the last year. There was a documented AFFF release in the 1980s during a training exercise which simulated an aircraft crash onsite. The runoff from this activity flowed into playa lakes onsite, which is where treated wastewater flows.

Metal plating processing onsite is active. There were Cold War-era liquid waste discharges onsite. Several active and closed landfills are present onsite. The active landfills include one for non-hazardous demolition debris and one for remediation waste. Wastewater treatment discharges flow into a storage lagoon. There are several pump and treat systems for organics and metals which then flow into the lagoon. This water is either used for irrigation or flows into the playa lakes.

Pantex does not have any PFAS listed in current inventories or historical inventories.

On-Site Sampling/Monitoring Equipment

No sampling has been done onsite. Pantex is a Superfund site which will undergo 5-year review in 2023. There has been discussion with the EPA about PFAS characterization onsite. If PFAS sampling is required, Pantex would need new sampling supplies to avoid inadvertent contamination.

Regulatory & Stakeholder Engagement

Some interaction with the EPA occurred several years ago when PFAS first came to light as an emerging contaminant. There were no resulting required activities. As mentioned above, EPA has discussed PFAS characterization with NNSA as part of the Superfund 5-year review.

Key Takeaways

- The drinking water onsite has not been tested for PFAS
- The site has documented activities where PFAS may have been present and in some cases released to the environment
- The fire department switched to a fluorine free firefighting foam alternative
- No PFAS environmental sampling has been completed onsite
- NNSA has been in discussion with EPA on PFAS characterization

A2.6 SANDIA NATIONAL LABORATORIES

SNL submitted PFAS surveys for three locations, Livermore, California (SNL-CA), Albuquerque, New Mexico (SNL-NM), and the Tonopah Test Range (SNL-TTR) near Tonopah, Nevada. SNL is owned by the NNSA and the three sites are operated by National Technology and Engineering Solutions of Sandia, LLC. SNL sites are co-located with other organizations. SNL-CA is co-located with LLNL, SNL-NM is co-located with Kirtland Airforce Base, and SNL-TTR is co-located with the NNSS. SNL-NM is part of the NNSA LTS program.

Drinking Water

Drinking water at SNL-CA is supplied by LLNL through the City of Livermore PWS. While LLNL has not tested its distribution for PFAS, the city has tested its PWS, and the result was non-detect for PFAS. Drinking water at SNL-NM is supplied by Kirtland Air Force Base (KAFB). KAFB tested its drinking water, and the results came back non-detect for PFAS. SNL-TTR has two wells onsite. One is used to supply drinking water to the workforce (< 150) and the other is for construction use. The drinking water at SNL-TTR has not been tested for PFAS.

Potential PFAS Usage

SNL-CA: There is active metal plating processing onsite. SNL-CA has no active landfills onsite, but there is an old Navy landfill onsite. PFAS are not tracked; however, there is an active chemical database.

SNL-NM: SNL-NM has had Manhattan project liquid discharges and Cold War-era liquid discharges onsite. The active landfills are run by KAFB. SNL-NM started tracking PFAS in their chemical database in 2021. They have less than 100 pounds of any one PFAS onsite.

SNL-TTR: Most potential PFAS usages onsite are owned by the US Air Force (USAF). The USAF has a runway nearby, which is a potential source of PFAS. The USAF also had a fire training facility which discharged AFFF; however, there are no documented AFFF releases on the SNL-TTR site. The landfills onsite are either DOE legacy sites or operated by the USAF. The only known PFAS onsite is a 5-gallon container of AFFF on the rescue truck.

On-Site Sampling/Monitoring Equipment

There has been no PFAS sampling on the SNL sites. SNL-NM would need new monitoring wells, sampling supplies, and PPE to avoid inadvertent contamination during PFAS sampling.

Regulatory & Stakeholder Engagement

SNL-NM was contacted by NMED in January 2021 due to an updated permit requirement to test PFAS in stormwater. A plan to address this requirement is under development. SNL-CA and SNL-TTR have not been contacted regarding PFAS outside of the DOE data calls.

Key Takeaways

- Drinking water sources tested non-detect for PFAS at SNL-CA and SNL-NM while drinking water has not been tested for PFAS at SNL-TTR

- There are no known uses of AFFF owned by SNL-CA, SNL-NM, and SNL-TTR
- PFAS sampling has not occurred at SNL sites
- SNL-NM is addressing the updated permit requirement to test for PFAS in stormwater

A2.7 SAVANNAH RIVER SITE – SAVANNAH RIVER TRITIUM ENTERPRISE

The Savannah River Site (SRS) in Aiken, South Carolina is owned by DOE-EM and operated by Savannah River Nuclear Solutions, LLC. The NNSA activities onsite are currently limited to the Savannah River Tritium Enterprise (SRTE), though future activities are related to the NNSA pit production mission. A follow-on discussion with SRS-SRTE was not held.

Drinking Water
The population served by the PWS is under 10,000 people. SRS received a result of non-detect for PFAS when the treated drinking water was tested.

Potential PFAS Usage
There are no potential PFAS usages related to the NNSA SRTE. The site does not track PFAS inventories.

On-Site Sampling/Monitoring Equipment
No PFAS sampling has been completed onsite.

Regulatory & Stakeholder Engagement
SRTE has not been contacted by any regulatory or stakeholder agencies outside of the PFAS Survey data call.

Key Takeaways

- Drinking water sources tested non-detect for PFAS
- There are no potential PFAS usage at SRTE
- PFAS sampling has not been completed onsite

A2.8 Y-12 NATIONAL SECURITY COMPLEX

The Y-12 National Security Complex (Y-12) is an NNSA production site located in Oak Ridge, Tennessee. Y-12 is managed by CNS. DOE-EM is active at Y-12, but only to address legacy contamination and for D&D work. The Oak Ridge DOE-EM contractor responsible for cleanup is URS|CH2M Oak Ridge, LLC.

Drinking Water
Y-12 is served by the City of Oak Ridge PWS which serves over 10,000 people. The City of Oak Ridge tested the drinking water, and the result was non-detect for PFAS tested.

Potential PFAS Usage

There is an active fire training facility onsite but starting in 2017, AFFF is no longer used for training. The fire department onsite has AFFF capabilities, but recently transitioned to a fluorine free foam. There are four AFFF-based suppressions systems onsite, but only one is active. Two of the four systems were transferred to DOE-EM. The third system was completely drained of AFFF in 2018 and the AFFF waste was disposed. There is a containment dike for the active AFFF-based fire suppression system. Accidental activation of this system has resulted in the release of AFFF in the past. Annual testing of the fire suppression system also resulted in the release of AFFF. To continue to meet NFPA standards and regulatory requirements, all testing of the fire suppression system is now captured and containerized as required.

Uranium enrichment was done in the 1940s as part of the Manhattan project. Metal plating processing was also done in the past and currently. There were both Manhattan project liquid discharges and Cold War-era liquid waste discharges onsite. Several landfills onsite are active but operated by DOE-EM. The wastewater treatment systems onsite discharges under a National Pollutant Discharge Elimination System permit.

There is less than 100 pounds of any one PFAS, including the AFFF from the drained fire suppression system which is stored onsite. There are minor amounts of other chemicals which contain PFAS used in laboratories at Y-12.

On-Site Sampling/Monitoring Equipment

The NNSA co-sampled onsite soils with the Tennessee Department of Environment and Conservation. Results show low levels of PFAS. DOE-EM performed limited surface water sampling on the Y-12 site with positive detections of less than 70 ppt. If additional sampling is required, Y-12 will need new sampling equipment to avoid inadvertent contamination including new monitoring wells, sampling supplies, and PPE.

Regulatory & Stakeholder Engagement

The staff of the Environmental Compliance Department at Y-12 participate in the TN state working group on PFAS and the DOE PFAS working group.

Key Takeaways

- Drinking water sources tested non-detect for PFAS
- The fire department switched to a fluorine free foam alternative
- AFFF is used onsite at the AFFF-based fire suppression system
- Surface water sampling results tested positive for PFAS less than the 70 ppt LHA

Office of Safety, Infrastructure, and Operations
1000 Independence Avenue, S.W.
Washington, D.C. 20585