APPENDIX J
SANITARY SEWER EVALUATION

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Appendix J
Sanitary Sewer **Evaluation**

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

Background

The former Loring Air Force Base (Loring) encompasses approximately 8,704 acres in the lower Aroostook River Basin in the northeastern tip of Maine. Loring was operated by the United States Air Force from 1950 to 1994. During base operations, aqueous firefighting foam (AFFF) containing per- and polyfluoroalkyl substances (PFAS) was used for fire suppression activities. PFAS was released intentionally into the environment during emergency response, training exercises, calibration of fire suppression systems, and unintentionally during fire suppression system malfunctions. The installation was operated by the United States Air Force until it was deactivated in September of 1994. Most of the former base buildings and infrastructure are currently owned and managed by the Loring Development Authority (LDA).

Infrastructure constructed at Loring to support base activities included the installation of a sanitary sewer system. This sanitary sewer system is used to transmit sanitary wastewater from the various buildings at Loring to a wastewater treatment plant (WWTP) on the southwest corner of the base which is operated by the LDA. Updates to the town of Limestone Water and Sewer District (LWSD) sanitary sewer system has resulted in the construction of a sewer force main to transfer the sanitary wastewater from Limestone to the LDA WWTP. From the LDA WWTP, treated sanitary wastewater is transmitted to the Caribou Utilities District (CUD) WWTP along Grimes Road in Caribou Maine. The combined wastewater from Loring and Limestone are subject to treatment for nutrient reduction and removal of solids prior to subsequent discharge to the Aroostook River (Wright Pierce, 2006).

Document Review of **Existing Infiltration and Inflow Evaluations**

The LDA and LWSD retained the civil engineering firm, Wright-Pierce, to complete an evaluation of potential solutions to update their aging infrastructure and reduce the costs of ongoing maintenance and repairs to their respective sanitary sewer systems. This included an evaluation of infiltration and inflow (I&I) into the sanitary sewer system, reported in January of 2006 (Wright-Pierce, 2006). Infiltration is groundwater entering the sewer system through leaking pipes and manholes. Inflow is stormwater entering the same system through direct connections such as catch basins, roof leaders, sump pumps, as well as foundation, cellar and floor drains.

The purpose of the 2006 evaluation was to determine the peak flows in the LWSD wastewater collection and treatment facilities, the wastewater flows within LDA's sanitary sewer collection system, and to develop a prioritized plan for reducing the I&I to each respective sanitary sewer collection system. A reduction of I&I could allow for the combination of flows from Loring and Limestone to the Grimes Road WWTP flows. Until the I&I was reduced the effluent from Loring and Limestone would need to be discharged from an outfall separate from the Grimes Road WWTP outfall. This evaluation included a comparison between the volume of water withdrawn for the water supply at Loring and the total volume of flow that was discharged to the LDA WWTP, as well as the collection of flow data at various manholes throughout the sanitary sewer system between March and May 2005. The flow meter data were used to inform interpretations of where I&I was entering the system and prioritize repairs to the system to reduce I&I (Wright-Pierce, 2006).

The 2006 I&I evaluation identified a discrepancy in volume between the drinking water extracted by the LDA for water supply and the flows received by the LDA WWTP. Wright-Pierce found that over 90% of the flows to the LDA WWTP are attributed to I&I instead of wastewater attributed to users of the sanitary sewer system. Additionally, Wright-Pierce was able to identify certain sections of the sewer lines which are more likely to contribute to this I&I. This effort allowed for the prioritization of repairs or abandonment of portions of the sanitary sewer system. Portions of the system that were abandoned were in portions of Loring not currently servicing users and were therefore rerouted to the local storm sewer system, to discharge to local surface water bodies (Wright-Pierce, 2006).

The ongoing repairs to the system are documented in the 2018 Preliminary Design Memorandum for the Continuing Replacement Sewers Project Loring Development Authority, Limestone, Maine (Wright-Pierce, 2018) and the 2024 Loring Development Authority Contract Drawings for Phase 5-10 Sewer Replacement Limestone Maine (Wright-Pierce, 2024). The current status of the sanitary sewer line repairs and abandonment are displayed on Figure J-1.

Evaluation of Wastewater Flow Data from 2022-2024

An evaluation of a more recent dataset including the average daily flows from the LDA prior to combination with the LWSD, the LWSD pump station, and the combined discharge from the LDA WWTP, between 2022 and 2024, as well as the average monthly withdrawals from the LDA water supply was completed by WSP. These datasets were provided to WSP by the Maine Department of Environmental Protection (MEDEP). The flow data were compared to daily precipitation totals reported at the Limestone weather station, obtained from the National Oceanic and Atmospheric Administration Climate Data Online database. These datasets are summarized in Table J-1 and illustrated in Figures J-2 through J-4.

This evaluation identified that groundwater extraction rates remain relatively constant throughout the year, averaging 0.046 millions of gallons per day (MGD). Sanitary sewer flows from LDA were reported up to 3.37 MGD in the spring and as low as 0.18 MGD in the fall. The difference between extraction and outflow, presented in Table J-1 as a monthly average in MGD, ranges between 0.18 and 1.79 MGD with an average of 0.56 MGD.

The greatest discrepancy tends to occur during the spring when the snow melts and the water table is the highest. The minimum tends to occur in September or October coinciding with the dryest part of the year. Flows are highest during precipitation events; however, they remain elevated above the expected flow rates attributable to water consumption throughout the year, indicating that both infiltration of groundwater and inflow of precipitation are occurring.

The contribution of sanitary sewer flow from Limestone is shown to be roughly an order of magnitude lower than the contribution from the LDA. The Limestone sanitary sewer flows show a similar pattern and response to precipitation. Higher flows are reported in the spring, likely associated with melting snow and a higher water table, and lower flows in the fall during drier periods.

Comparison Between the Modeled Water Table and Manhole Elevations

Elevation of the sanitary sewer manholes reported from historic record drawings were compared to modeled groundwater elevations across the installation. The modeled groundwater elevations represent average water levels throughout the year and were developed from a groundwater flow model created to support the PFAS remedial investigation. Figure J-1 depicts where the sanitary sewer is submerged below the water table and reports the difference between the manhole elevation and the water table. These areas are interpreted to have the greatest likelihood of groundwater infiltration and often overlap with planned or completed repairs to the system. It is interpreted that I&I outside of these areas is primarily attributed to inflow of precipitation however it is possible that isolated perched aquifers may result in groundwater infiltration in portions of the sanitary system which are not reflected in this figure.

PFAS in Wastewater

Evaluation of the concentrations of PFAS compounds in wastewater discharge is required for wastewater utilities across the state of Maine. These include sampling of the discharge from Outfall 001A from the CUD WWTP on Grimes Road, which discharges to the Aroostook River, reported in Table J-2. The presence of PFAS in these samples resulted in additional sampling throughout the sanitary sewer network. The results of these analyses were provided to WSP by MEDEP.

Two wastewater samples, CSS-1 and CSS-2 were collected to identify concentrations in the discharge of the LDA at various points through the sanitary network. Two wastewater samples, CSS-3 and CSS-4 were collected within the Limestone sanitary sewer system and represent wastewater quality at two pump stations. Two samples, CSS-5 and CSS-6, were collected at the LDA WWTP, representing the combined flow from the LDA and town of Limestone. CSS-5 was collected prior to the chlorine contact chamber and CSS-6 was collected after chlorine contact and represents the effluent from the LDA WWTP. Two additional samples were collected from the Aroostook River, one upstream and one downstream of Outfall 001A. The locations of these additional samples are shown on Figure J-5 with analytical results reported in Table J-2.

Concentrations of PFAS in the Outfall 001A samples indicate some variation in concentrations of PFOS, reported between 47 and 118 nanograms per liter (ng/L). Of the targeted sanitary sewer samples, CSS-1 exhibits the highest concentrations of PFOS at 79.4 ng/L while CSS-2 exhibits the lowest at 9.22 ng/L. CSS-3 and CSS-4 exhibit concentrations of PFOS and the other PFAS compounds at concentrations between 10 and 11 ng/L. Concentrations in CSS-5 and CSS-6 represent a slight decrease from CSS-1, attributed to dilution from the combination of flow from the LWSD.

Radar plots displaying the relative proportion of the predominant PFAS compounds in the sanitary sewer samples were constructed for each location with axes including PFOS, PFOA, PFNA, PFHxS, PFBS, and 6:2 FTS. These compounds are displayed on the radar plots as they represent the majority of the total PFAS identified in the samples. The PFAS signature from the sanitary sewer and surface water samples were compared to three groundwater samples from monitoring wells OW07001, BW05009, and BW06006. These wells are representative of groundwater impacts attributed to PFAS source areas identified during the Remedial Investigation from the Crash Fire Station, the Structural Fire Station, and the Burn House.

The relative proportions of the PFAS compounds identified in groundwater representative of on-site source areas are similar to samples CSS-1, CSS-5, CSS-6, and Outfall 001A. These samples are predominantly PFOS and PFHxS. Samples collected within the sanitary sewer system in Limestone including CSS-3 and CSS-4 do not have the same proportions of PFAS as the on-site sources, the LDA WWTP, or the CUD WWTP.

Samples collected upstream and downstream of the CUD WWTP outfall 001A indicate there is an increase in concentration of PFAS in surface water below the outfall, from 0.818 ng/L above the outfall to 3.52 ng/L of PFOS below the outfall. The sample results indicate the sample below the outfall contains higher concentrations of PFOS and PFHxS.

Conclusions

Groundwater infiltration is responsible for a large portion of the flow through the sanitary sewer system serving Loring. A portion of the PFAS concentrations identified in the wastewater system is attributed to transport from PFAS source areas identified during the Remedial Investigation at Loring.

References

Wright-Pierce, 2006. Greater Limestone Wastewater Treatment Facility Flow Monitoring Study for the Limestone Water & Sewer District and Loring Development Authority Limestone, Maine; January.

Wright-Pierce, 2018. Preliminary Design Memorandum for the Continuing Replacement Sewers Project Loring Development Authority, Limestone, Maine; July.

Wright-Pierce, 2024. Loring Development Authority Contract Drawings for Phase 5-10 Sewer Replacement, Limestone Maine; August.

FIGURES

Notes:
- Sanitary sewer invert elevations at manholes and collection network were obtained from historical site utility record drawings.
- Reported status of sewer line abandonment and repairs are based on Wright Pierce record and contract drawings from 2006, 2011, and 2024.
- A portion of the sewer lines have been rerouted to discharge to the storm water collection system.
Modeled groundwater contours represent the water table generated from a modflow groundwater flow model generated by WSP for the Loring PFAS Remedial Investigation (RI) Summary Report, in progress. The modeled water table is calibrated to the average water level elevation from semi-annual synoptic water level gauging events between 2022 and 2024l and represents an average of the recorded seasonal high and seasonal low water levels.
- The distance of the sanitary sewer invert below the water table was calculated at each manhole where it is reported in historical record drawings. This was completed by subtracting the elevation of the reported sanitary sewer invert elevations from the elevation of the modeled water table at those locations.
- This distance is highlighted on this figure in the "Sanitary Sewer Invert Distance Below Water Table" layer, which was developed using inverse distance weighted interpolation techniques on the calculated distance. Only portions of this interpolated layer that show where the infrastructure is below the water table, are displayed.
- Elevations reported compared to the North American Vertical Datum 1988.

Symbol Key

- Former Installation Boundary
- Sewer Lines Rerouted to Storm Water System
- Stream
- Surface Water Body
- Modeled Water Table Contours
- 640 Water Level Elevation

Status of Sanitary Line Repairs

- Completed
- Proposed
- Original Sanitary Lines
- Sanitary Sewer Manhole
- 656.54 Invert Elevation at Manhole

Sanitary Sewer Invert Distance Below Water Table (feet)

- -15 - -10
- -10 - -5
- -5 - -2.5
- -2.5 - 0

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Figure J-1
Sanitary Sewer Potential Infiltration and Inflow and Status of Infiltration and Inflow Reduction Efforts
PFAS CERLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

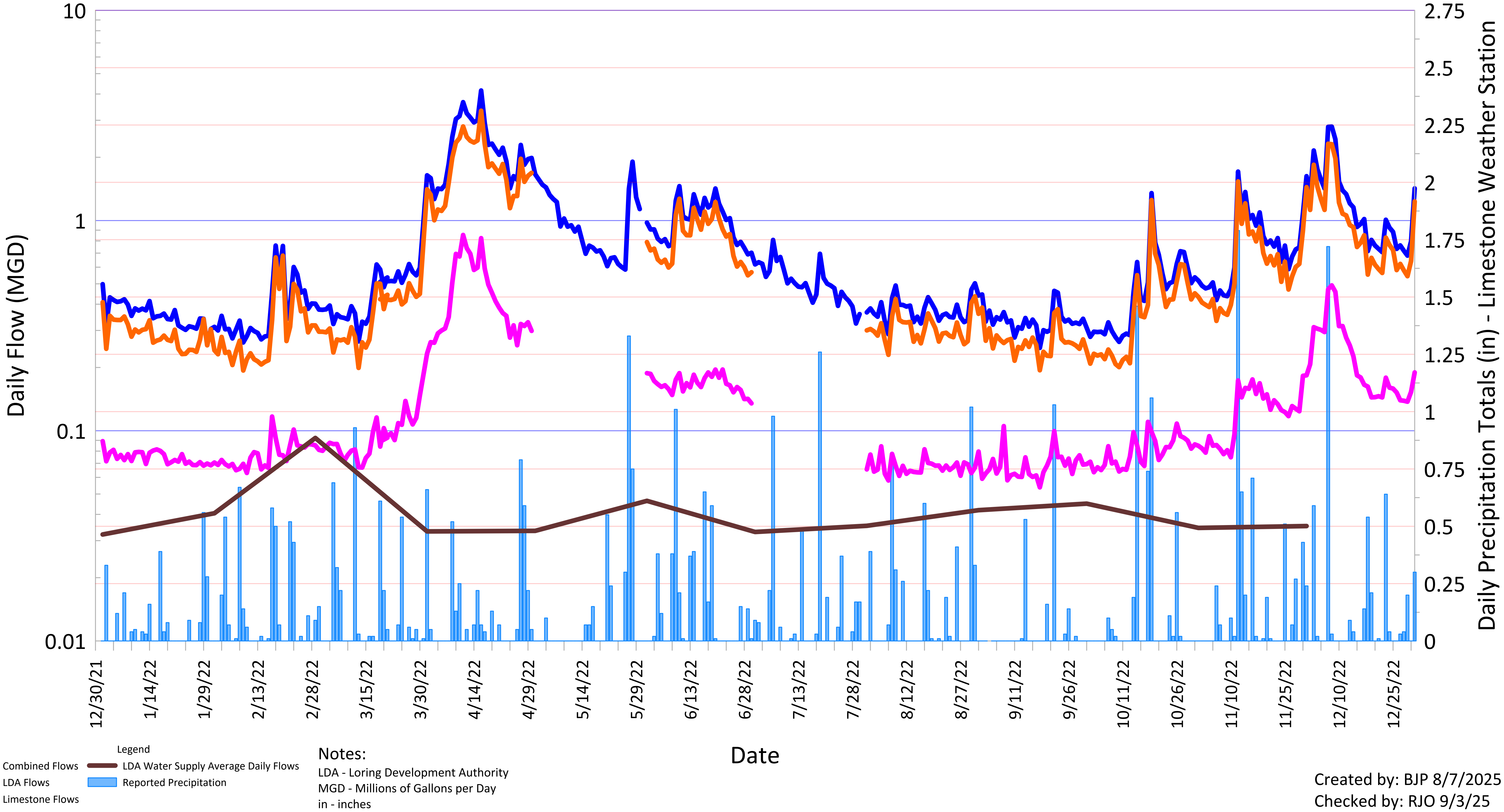
0 100 200 400 600 800 1,000 Meters
0 425 850 1,700 2,550 3,400 Feet

SOURCES:	Drawn:	Drawn Date:	PROJ: 775361701
Aerial Imagery obtained from NAIP, USDA-FSA. Published September, 2021.	RJO	10/3/2025	
	Checked:	Checked Date:	
	LP	10/6/2025	

Figure J-2

Sanitary Sewer Reported Flows - 2022

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base Limestone, ME



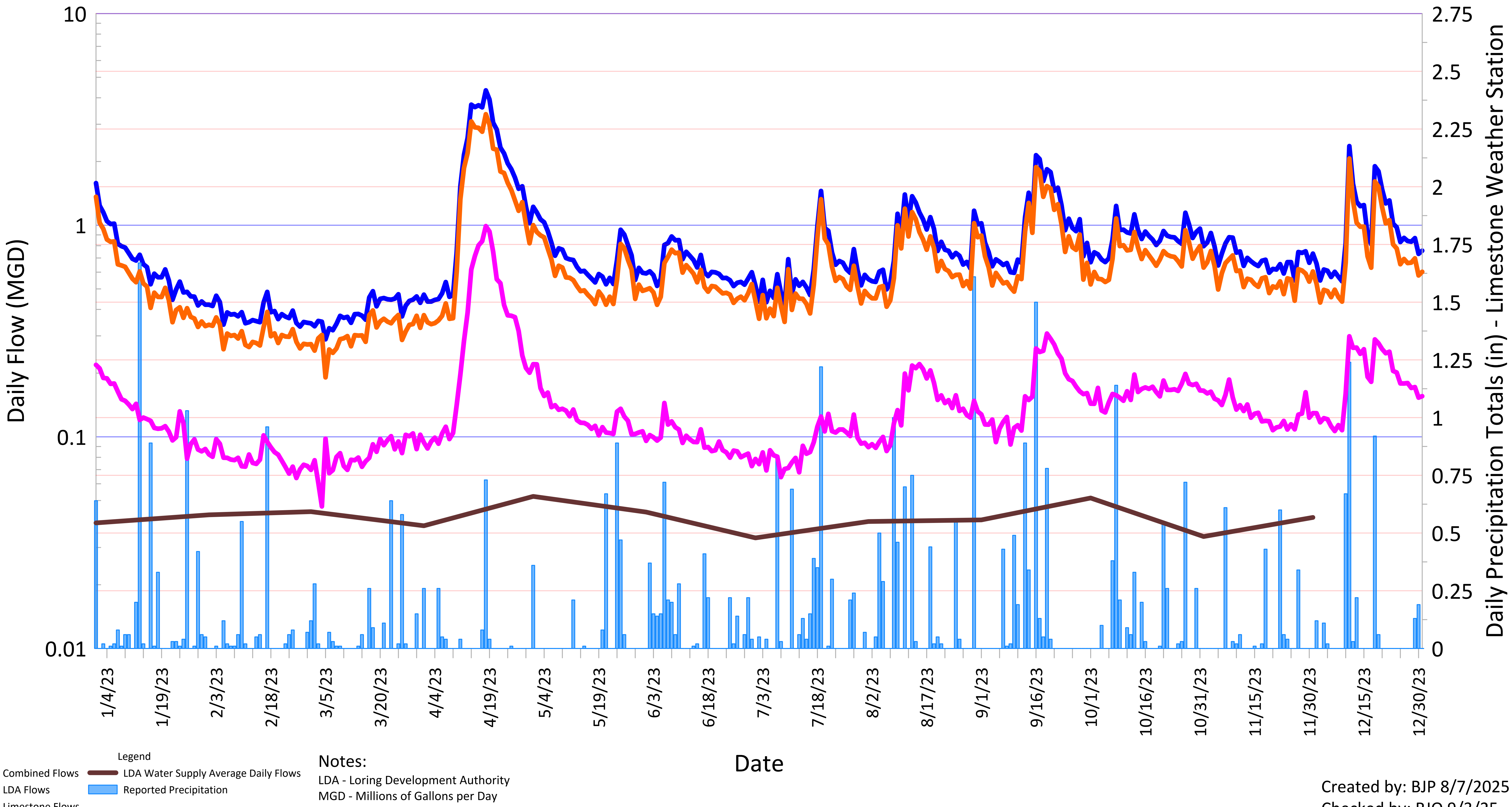
Notes:
LDA - Loring Development Authority
MGD - Millions of Gallons per Day
in - inches

Created by: BJP 8/7/2025
Checked by: RJO 9/3/25

Figure J-3

Sanitary Sewer Reported Flows - 2023

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base Limestone, ME



Notes:
LDA - Loring Development Authority
MGD - Millions of Gallons per Day
in - inches

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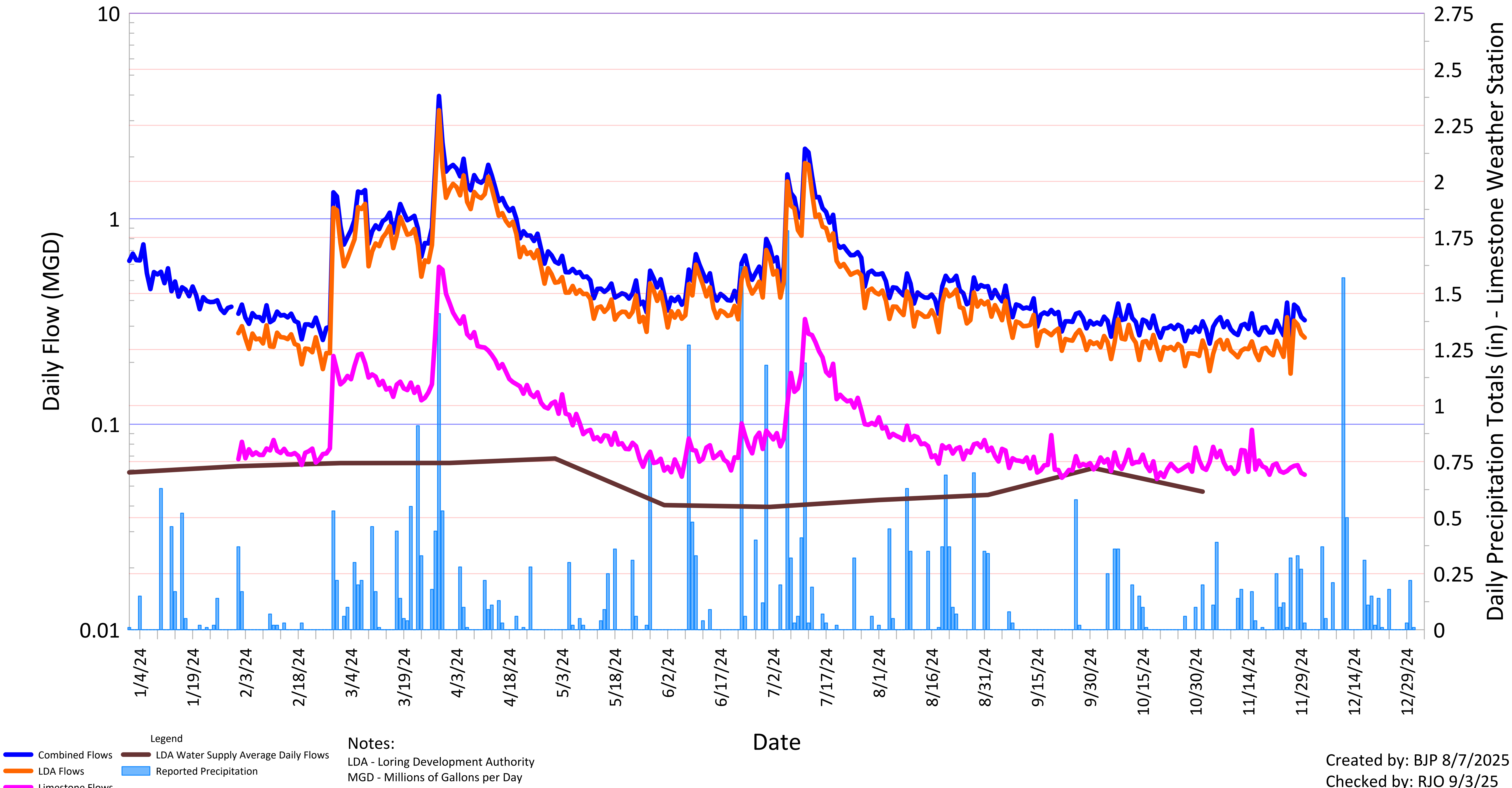
Figure J-4

Sanitary Sewer Reported Flows - 2024

PFAS CERCLA Remedial Investigation Site Characterization Summary Report

Former Loring Air Force Base, Limestone, ME



Notes:
LDA - Loring Development Authority
MGD - Millions of Gallons per Day
in - inches

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Legend

Sanitary Sewer Features

Original Sanitary Lines

Status of Sewer Line Repairs

Completed

Proposed

Sanitary Sewer Sampling Location

Groundwater Monitoring Well

Notes:
LDA - Loring Development Authority
WWTP - Wastewater Treatment Plant

Radar plots display the relative proportion of the predominant PFAS compounds. Concentrations of the 6 compounds at each sampling location is presented in Table J-2.

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0 200 400 800 1,200 1,600 2,000 Meters

0 1,250 2,500 5,000 7,500 Feet

Figure J-5
Sanitary Sewer Radar Plots
PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

NOTES:
Aerial Imagery obtained from NAIP, USDA-FSA. Published September, 2021.

Drawn: BJP	Drawn Date: 8/7/2025	PROJ: 775361701
Checked: RJO	Checked Date: 9/3/2025	

TABLES

Table J-1
Groundwater Extraction and Sewer Discharge

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

Date	LDA WWTP Combined Daily Flow (MGD)			Limestone Pump Station #2 Daily Flow (MGD)			LDA Daily Flow Contribution* (MGD)			LDA Water Supply Groundwater Extraction (MGD)	LDA Daily Flow -LDA Water Supply Extraction (MGD)
	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Average
Jan-22	0.36	0.26	0.50	0.07	0.07	0.09	0.29	0.23	0.41	0.03	0.26
Feb-22	0.39	0.26	0.76	0.08	0.06	0.12	0.31	0.19	0.68	0.04	0.27
Mar-22	0.45	0.27	0.62	0.09	0.07	0.15	0.35	0.20	0.50	0.09	0.26
Apr-22	2.27	1.27	4.15	0.44	0.23	0.85	1.82	1.00	3.33	0.03	1.79
May-22	1.01	0.58	1.90	ND	--	--	ND	--	--	0.03	--
Jun-22	1.00	0.69	1.46	0.17	0.13	0.20	0.83	0.55	1.27	0.05	0.79
Jul-22	0.52	0.32	0.81	ND	0.00	0.00	ND	0.00	0.00	0.03	--
Aug-22	0.38	0.29	0.50	0.07	0.06	0.08	0.31	0.23	0.44	0.04	0.27
Sep-22	0.34	0.25	0.46	0.07	0.05	0.11	0.27	0.19	0.39	0.04	0.23
Oct-22	0.48	0.26	1.35	0.08	0.06	0.11	0.40	0.20	1.25	0.05	0.35
Nov-22	0.76	0.42	1.71	0.12	0.07	0.18	0.64	0.33	1.54	0.03	0.60
Dec-22	1.26	0.68	2.80	0.23	0.14	0.49	1.03	0.54	2.32	0.04	1.00
Jan-23	0.70	0.42	1.58	0.13	0.08	0.22	0.57	0.33	1.36	0.04	0.53
Feb-23	0.38	0.33	0.48	0.08	0.06	0.10	0.30	0.26	0.39	0.04	0.26
Mar-23	0.39	0.29	0.49	0.08	0.05	0.10	0.31	0.19	0.40	0.04	0.27
Apr-23	1.84	0.44	4.34	0.37	0.09	0.99	1.47	0.34	3.35	0.04	1.43
May-23	0.73	0.53	1.22	0.13	0.10	0.22	0.60	0.42	1.00	0.05	0.55
Jun-23	0.64	0.52	0.88	0.10	0.07	0.14	0.54	0.42	0.77	0.04	0.50
Jul-23	0.63	0.42	1.45	0.09	0.06	0.13	0.54	0.35	1.33	0.03	0.50
Aug-23	0.85	0.50	1.40	0.14	0.09	0.22	0.70	0.41	1.20	0.04	0.66
Sep-23	1.07	0.60	2.14	0.17	0.09	0.31	0.90	0.49	1.88	0.04	0.86
Oct-23	0.89	0.67	1.23	0.16	0.13	0.20	0.72	0.53	1.08	0.05	0.67
Nov-23	0.71	0.55	0.92	0.13	0.11	0.19	0.58	0.44	0.76	0.03	0.54
Dec-23	1.01	0.54	2.37	0.19	0.11	0.30	0.82	0.43	2.07	0.04	0.78
Jan-24	0.48	0.35	0.75	ND	--	--	ND	--	--	0.06	--
Feb-24	0.39	0.26	1.34	0.08	0.06	0.21	0.31	0.19	1.13	0.06	0.25
Mar-24	1.16	0.65	3.96	0.20	0.13	0.58	0.95	0.52	3.37	0.06	0.89
Apr-24	1.25	0.60	1.96	0.21	0.12	0.39	1.04	0.48	1.62	0.06	0.97
May-24	0.49	0.35	0.66	0.09	0.06	0.14	0.40	0.28	0.52	0.07	0.33
Jun-24	0.49	0.36	0.80	0.07	0.06	0.10	0.42	0.30	0.70	0.04	0.38
Jul-24	0.96	0.47	2.19	0.15	0.08	0.32	0.81	0.37	1.87	0.04	0.77
Aug-24	0.46	0.34	0.54	0.08	0.06	0.11	0.37	0.28	0.45	0.04	0.33
Sep-24	0.36	0.28	0.47	0.07	0.05	0.09	0.30	0.23	0.40	0.05	0.25
Oct-24	0.31	0.25	0.39	0.06	0.05	0.08	0.24	0.19	0.32	0.06	0.18
Nov-24	0.30	0.24	0.39	0.06	0.06	0.09	0.24	0.18	0.33	0.05	0.19

Notes:
LDA - Loring Development Authority
MGD - Millions of Gallons per Day
WWTP - Wastewater Treatement Plant
* LDA contribution calculated by WWTP as the difference between total effluent and town of Limestone total contribution
ND - No Data
Each value represents a daily average extraction or outflow for the month.

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Table J-2
Sanitary Sewer PFAS Analytical Results

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

Analyte	Outfall 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A	OUTFALL 001-A
	10/17/2022	11/15/2022	12/15/2022	1/17/2023	2/15/2023	3/16/2023	4/17/2023	5/21/2023	6/15/2023	7/19/2023
	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorobutanoic Acid (PFBA)	8.73	5.43	5.98	6.58	5.95	6.89	3.96	6.79	7.5	9.42
Perfluoropentanoic Acid (PFPeA)	23	15	18	19.4	15	15.2	9.4	17.4	21.1	22.4
Perfluorohexanoic Acid (PFHxA)	22.4	14.1	16.6	17.4	14.8	16	9.83	18.5	22.7	20.2
Perfluoroheptanoic Acid (PFHpA)	8.93	8.17	8.74	8.8	6.21	6.06	5.25	8.02	11.2	9.12
Perfluorooctanoic Acid (PFOA)	11.8	11	13.6	12.5	9.11	8.73	7.97	12.4	16	15.6
Perfluorononanoic Acid (PFNA)	1.27 J	1.58 J	1.7 J	1.42 JF	1.18 J	0.894 J	1.13 J	0.882	1.8	2.58
Perfluorodecanoic Acid (PFDA)	0.591 J	0.44 J	0.302 J	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	0.687 J
Perfluorouecanoic Acid (PFUnA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorododecanoic Acid (PFDoA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorotridecanoic Acid (PFTrDA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorotetradecanoic Acid (PFTeDA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorobutanesulfonic Acid (PFBS)	5.46	3.38	3.82	4.42	2.66	3.17	2.01	4.19	4.32	3.15
Perfluoropentanesulfonic Acid (PFPeS)	3.95	3.58	4.5	5.03	3.92	3.88	2.11	4.12	0.22	3.5
Perfluorohexanesulfonic Acid (PFHxS)	58.9	64.9	50.9	60.5	53.3	83.8	35.2	53.3	77.7	58.1
Perfluoroheptanesulfonic Acid (PFHpS)	1.91 U	1.14 J	1.32 J	1.25 J	0.877 J	0.922 J	0.915 J	1.23	2.09	1.63 J
Perfluorooctanesulfonic Acid (PFOS)	49.3	85.8	63.4	65.8	47.5	95.6	50.2	58.6	87.6	118
Perfluorononanesulfonic Acid (PFNS)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorodecanesulfonic Acid (PFDS)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorododecanesulfonic Acid (PFDoS)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	1.83 J	1.47 J	1.51 J	2.37	1.75 U	1.73 U	1.84 U	2.7	3.37	4.28
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluorooctanesulfonamide (FOSA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	1.21 JF
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.801 J	1.73 U	1.89 U	1.82 U	1.75 U	1.73 U	1.84 U	1.84 U	1.74 U	0.765 J
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	47.7 U	43.3 U	47.3 U	45.5 U	43.8 U	43.2 U	45.9 U	45.9 U	17.4 U	17.9 U
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	1.91 U	1.73 U	1.89 U	1.82 U	1.75	1.73 U	1.84 U	1.84 U	1.74 U	1.79 U
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Perfluorohexadecanoic Acid (PFHxDA)	3.81 U	3.46 U	3.78 U	3.64 U	1.92 J	2.44 J	3.67 U	3.67 U	3.47 U	3.58 U
Perfluorooctadecanoic Acid (PFODA)	3.81 U	3.46 U	3.78 U	3.64 U	3.51 U	3.45 U	3.67 U	3.67 U	3.47 U	3.58 U
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
11-Chloroeicosafluoro-3-Oxauecane-1-Sulfonic Acid (11Cl-PF3OUdS)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Notes:
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U - Analyte not detected at the associate reporting limits
J - The result is an estimated value
JF - The results are considered to be an estimated maximum concentration
NR - Not recorded

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PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base, Limestone, ME

Analyte	LIMESTONE WS-CSS-1	LIMESTONE WS-CSS-2	LIMESTONE WS-CSS-3	LIMESTONE WS-CSS-4	LIMESTONE WS-CSS-5	LIMESTONE WS-CSS-6	LIMESTONE WS-RW-DOWNSTREAM	LIMESTONE WS-RW-UPSTREAM
	9/24/2024	9/24/2024	9/24/2024	9/24/2024	09/24/24	9/24/2024	9/24/2024	9/24/2024
	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorobutanoic Acid (PFBA)	10.8	6.3 J	25.6 U	2.54 J	7.65	8.29	3.07 J	6.12 U
Perfluoropentanoic Acid (PFPeA)	26.1	21.1	12.8 U	4.2	20.1	21.5	4	3.06 U
Perfluorohexanoic Acid (PFHxA)	21.6	12.2	2.56 J	2.5	15.9	21.2	6.35	0.658 J
Perfluoroheptanoic Acid (PFHpA)	11	1.18 J	6.4 U	1.47 U	6.8	8.01	1.25 J	0.512 J
Perfluorooctanoic Acid (PFOA)	19.8	1.53 J	6.4 U	0.907 J	14.4	14.8	2.92	0.642 J
Perfluorononanoic Acid (PFNA)	1.59	0.727 J	6.4 U	1.47 U	1.33 J	1.39 J	0.608 J	1.53 U
Perfluorodecanoic Acid (PFDA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorouecanoic Acid (PFUnA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorododecanoic Acid (PFDoA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorotridecanoic Acid (PFTrDA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorotetradecanoic Acid (PFTeDA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorobutanesulfonic Acid (PFBS)	4.85	1.58 U	6.4 U	1.47 U	8.94 F	3.98	1.26 J	1.53 U
Perfluoropentanesulfonic Acid (PFPeS)	5.79	1.58 U	6.4 U	1.47 U	4.38	4.24	1.52 U	1.53 U
Perfluorohexanesulfonic Acid (PFHxS)	81.1	2.47	6.4 U	1.47 U	56.9	56.6	2.77	1.53 U
Perfluoroheptanesulfonic Acid (PFHpS)	1.8	1.58 U	6.4 U	1.47 U	1.38 J	1.33 J	1.52 U	1.53 U
Perfluorooctanesulfonic Acid (PFOS)	79.4	9.22	11	10.2 F	52.1	66.2	3.52	0.818 J
Perfluorononanesulfonic Acid (PFNS)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorodecanesulfonic Acid (PFDS)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
Perfluorododecanesulfonic Acid (PFDoS)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08	6.12 U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
Perfluorooctanesulfonamide (FOSA)	0.748 JF	1.58 U	6.4 U	1.47 U	0.674 J	0.725 JF	1.52 U	1.53 U
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	0.647 J	1.52 U	1.53 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	15 U	15.8 U	64 U	14.7 U	15.1 U	15.6 U	15.2 U	15.3 U
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	15 U	15.8 U	64 U	14.7 U	15.1 U	15.6 U	15.2 U	15.3 U
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	2.99 U	3.16 U	12.8 U	2.95 U	3.03 U	3.12 U	3.04 U	3.06 U
Perfluorohexadecanoic Acid (PFHxDA)		3.58 U			3.58 U	3.58 U	3.58 U	3.58 U
Perfluorooctadecanoic Acid (PFODA)		3.58 U			3.58 U	3.58 U	3.58	3.58 U
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	1.5 U	1.58 U	6.4 U	1.47 U	1.51 U	1.56 U	1.52 U	1.53 U
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
11-Chloroeicosafluoro-3-Oxauecane-1-Sulfonic Acid (11Cl-PF3OUdS)	5.98 U	6.32 U	25.6 U	5.9 U	6.05 U	6.23 U	6.08 U	6.12 U
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	2.99 U	3.25	12.8 U	2.95 U	3.03 U	3.12 U	3.04 U	3.06 U
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	2.99 U	3.16 U	12.8 U	2.95 U	3.03 U	3.12 U	3.04 U	3.06 U
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	2.99 U	3.16 U	12.8 U	2.95 U	3.03 U	3.12 U	3.04 U	3.06 U
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	7.48 U	3.16 U	32 U	7.37 U	7.57 U	7.79 U	7.6 U	7.65 U
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	37.4 U	13.3 J	160 U	36.8 U	37.8 U	39 U	38 U	38.2 U
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	37.4 U	39.5 U	160 U	36.8 U	37.8 U	39 U	38 U	38.2 U

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