Sandia National Laboratories

Operated for the United States Department of Energy
by National Technology and Engineering Solutions
of Sandia, LLC.

Albuquerque, New Mexico 87185-0101
Livermore, California 94551-0969

date: 6/3/2025

to: WIPP Records Center

from: Justin R. Kirkes
Dale O. Bowman II

Justin Kirkes

Digitally signed by Justin Kirkes
Date: 2025.06.09 09:51:53 -06'00'

subject: Milestone HYDRO 25-01: Progress Report that Documents CY24 Fluctuations in the WIPP Monitoring Well Network

1.0 Purpose

The Sandia National Laboratories (SNL) long-term, high-frequency monitoring program collects well pressure data in wells across the Culebra and Magenta Members of the Rustler Formation, the Bell Canyon Formation, and Dewey Lake Perched Anthropogenic Water (PAW) wells across the Waste Isolation Pilot Plant (WIPP) facility. Programmatic groundwater level measurements focus primarily on the Culebra Member of the Rustler Formation, as it is the most transmissive and laterally extensive water-bearing stratigraphic unit in proximity to the WIPP repository. Therefore, the Culebra groundwater level fluctuations are the focus of this progress report. Groundwater fluctuations from the Magenta, Bell Canyon, and Perched Anthropogenic water-bearing units are also presented.

The Culebra dolomite has been identified as the most likely transport pathway for potential future inadvertent human intrusion into the repository (Wagner and Hayes, 2019). Monitoring of Culebra groundwater chemical composition, change in flow, and monitoring well water levels are to be conducted both during the pre-closure and post-closure phases of the repository (DOE, 2003). The Dewey Lake, and Bell Canyon formations and the Magenta member are not currently monitored as Compliance Monitoring Parameters (COMPs) and do not have Performance Assessment (PA) flow models (Wagner and Hayes, 2019). The objective of this milestone report is to present and summarize the well pressure data collected in Culebra, Magenta, Bell Canyon, and PAWs for calendar year (CY) 2024.

2.0 Introduction

In CY2024, SNL recorded pressure data across wells in Culebra (36), Magenta (13), Bell Canyon (2), and PAWs (14). The transducers, which are generally installed at mid-formation depths, record water pressure at 15-minute intervals during routine monitoring. Pressure transducers provide a higher temporal resolution of the changes in the pressure head occurring in the wells than is provided by monthly water-level measurements alone. PAW well C-2505 was reconfigured during construction of an air intake system and no longer can be monitored using a pressure transducer.

Exceptional Service in the National Interest

Information Only

For the purposes of this report, these pressure data are reported in equivalent feet of fresh water (1 psi = 2.309 ft H_2O) and the first yearly value is normalized to zero. The data were also corrected for barometric and earth-tide effects using nSIGHTS v.2.41a (nSIGHTS 2013) in accordance with SP 9-13 Rev 1 (Bowman 2021). Data for each well are plotted individually and are also plotted in groups based on similarly sourced pressure head changes. A reference map of the Culebra monitoring well locations is shown in Figure 1. For completeness, Figure 1 also shows the Magenta and Bell Canyon well locations. A reference map of the PAWs currently being monitored is shown in Figure 2.

Exceptional Service in the National Interest

Information Only

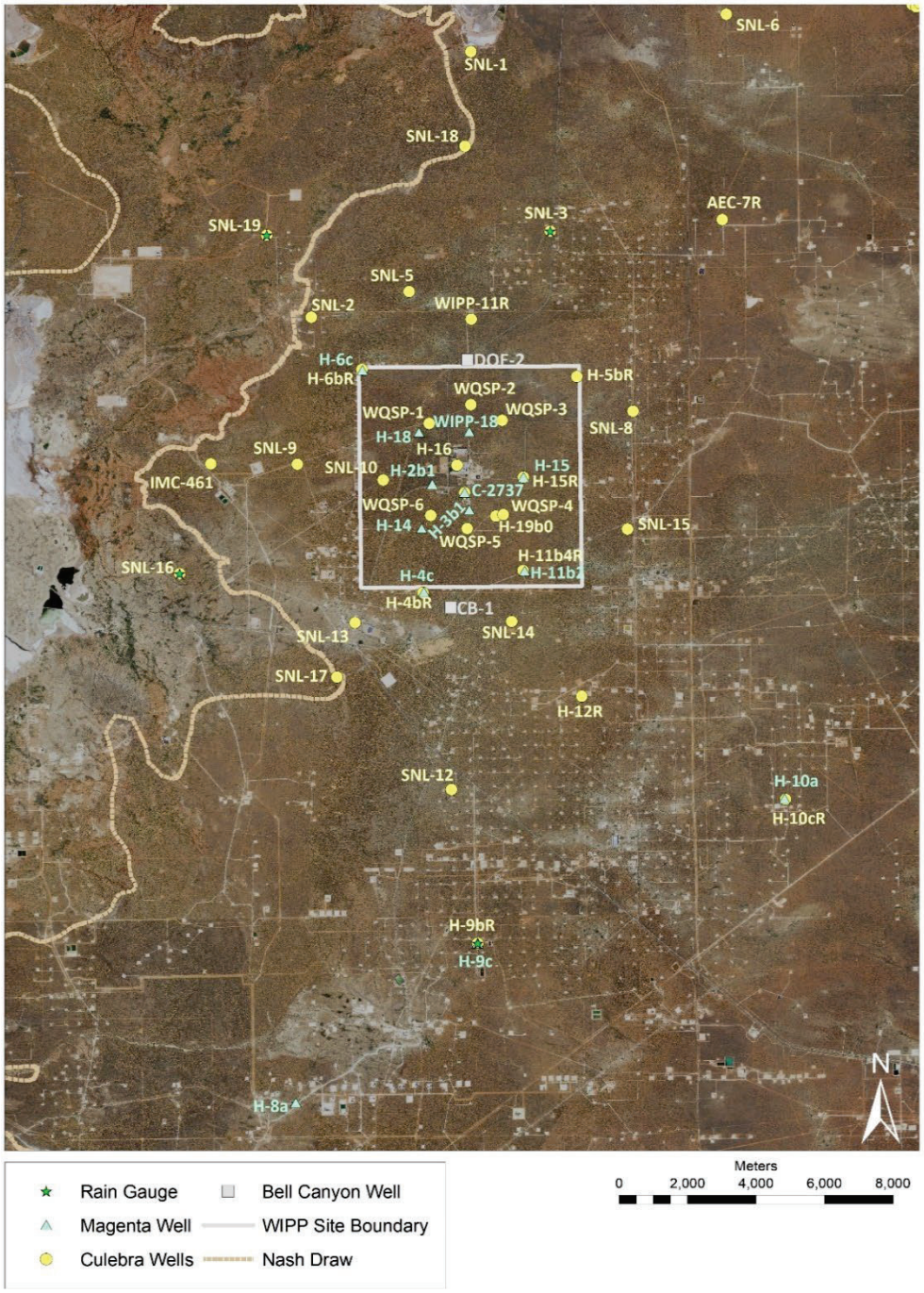


Figure 1. Locations of Culebra (yellow circles), Magenta (blue triangles), and Bell Canyon (grey squares) wells in the WIPP Groundwater Monitoring Network. Well C-2737 is a dual completion in both the Culebra and Magenta. The USGS wells are not monitored in the normal monthly monitoring run and are not included in any analysis in this document. The Land Withdrawal Boundary (LWB) is outlined in grey, and the approximate boundary of Nash Draw is outlined in a tan dashed line.

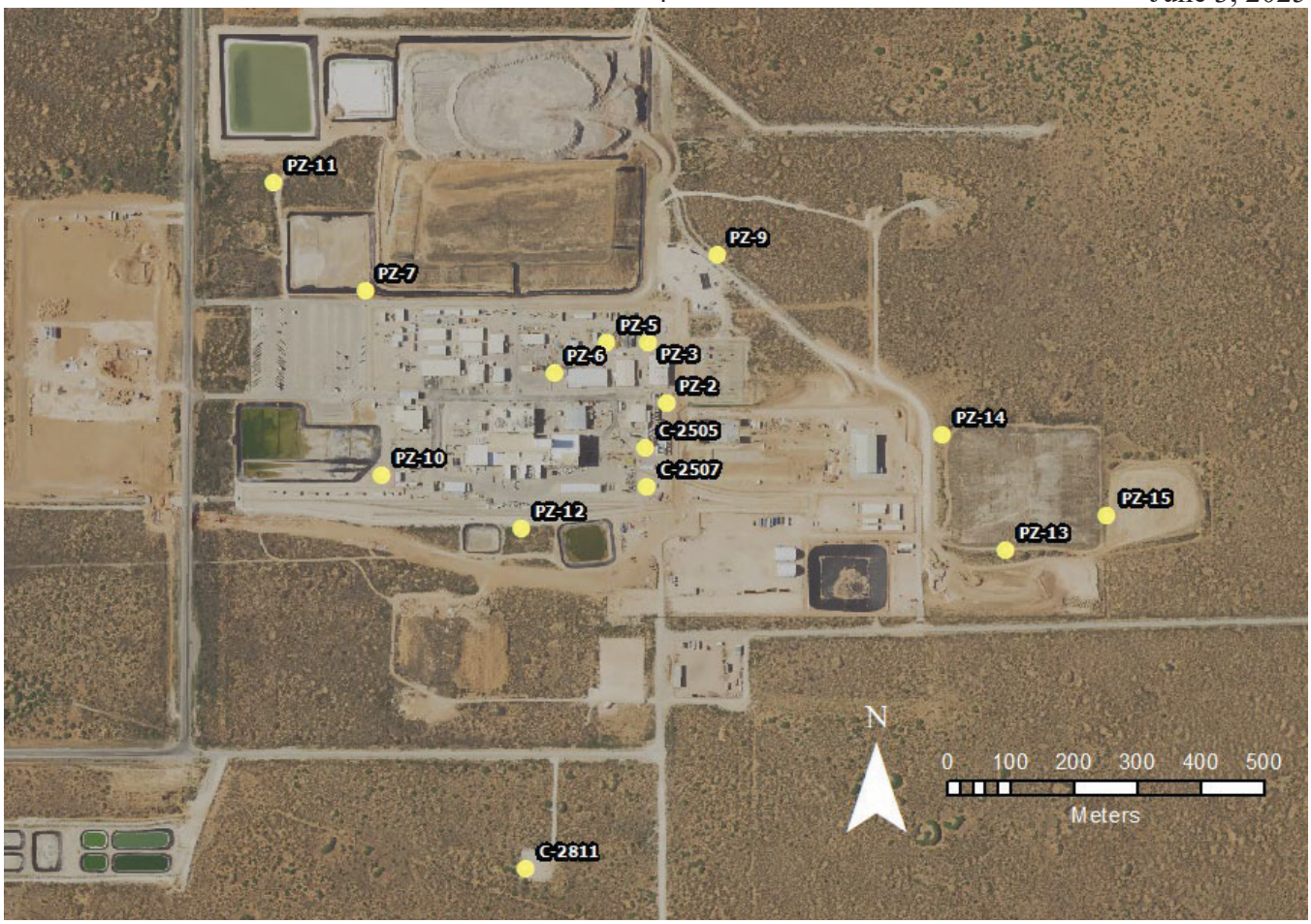


Figure 2. Locations of PAW wells (yellow circles) in the WIPP Groundwater Monitoring Network.

Pressure head fluctuations for several wells include shifts, and spikes.. These fluctuations are due to various causes including adjustments to transducer depths, displacement of water during removal and replacement of transducers, transducer failures, cable stretch, or the operation of other equipment in the well. Small-scale instances of this type are not discussed in this report. Specific large-scale comments about breaks in the data or anomalous data are given on individual plots, as appropriate.

Tables 1, 2, and 3 contain a list of monitored wells in CY2024, as shown in Figures 1 and 2, and an abbreviated description of the dominant influence(s) (the most prevalent cause(s) of pressure change) on each well's pressure head. A more precise description and broader context for each of the wells and the associated influences are provided in Section 3.0. Tables 4, 5, and 6 contain the delta pressure head (Δ) and net change of pressure head (both in feet of fresh water) for CY2024. Delta pressure head is calculated per well as the difference between the minimum and maximum recorded heads, and net change of pressure head is calculated as the difference between the first and last recorded head for CY2024. In circumstances where transducers were placed at different depths during CY2024 (i.e., SNL-6 in Appendix-Figure 27), heads were adjusted to compensate for the artificial change in pressure value. This compensation was made by aligning the last head value preceding the transducer adjustment with the first head value after the transducer adjustment. These compensations are made solely for the calculations presented in Tables 4, 5, and 6.

Table 1. Culebra Wells with Pressure Transducer Data for CY2024

Well	Precipitation	Leakage	NWRA	Water Quality Sampling	Gravity Flow	Long-Term Recovery	Well	Precipitation	Leakage	NWRA	Water Quality Sampling	Gravity Flow	Long-Term Recovery
AEC-7R				X	X		SNL-8			X	X	X	
C-2737C	X	X					SNL-9	X			X	X	
H-4bR			X	X			SNL-10				X	X	
H-5bR				X	X		SNL-12			X	X		
H-6bR	X			X	X		SNL-13				X	X	
H-9bR			X	X	X		SNL-14	X		X	X		
H-10cR			X		X		SNL-15						X
H-11b4R	X		X	X			SNL-16	X			X		
H-12R			X	X			SNL-17A	X		X	X		
H-15R	X		X		X		SNL-18	X			X	X	
H-16		X					SNL-19	X			X		
H-19b0	X		X	X			WIPP-11R				X	X	
IMC-461	X				X		WQSP-1				X		
SNL-1	X			X	X		WQSP-2				X		
SNL-2	X		X		X		WQSP-3				X		
SNL-3	X			X	X		WQSP-4				X		
SNL-5				X	X		WQSP-5				X		
SNL-6						X	WQSP-6				X		

NWRA = Non WIPP Related Anthropogenic

Exceptional Service in the National Interest
Information Only

Table 2. Magenta and **Bell Canyon** Wells with Pressure Transducer Data for CY2024

Well	Precipitation	Leakage	NWRA	Water Quality Sampling	Gravity Flow	Long-Term Recovery
C-2737M		X				
H-2b1		X				
H-3b1					X	
H-4c						
H-6c			X		X	
H-8a			X		X	
H-9c			X			
H-10a			X			
H-11b2						
H-14			X		X	
H-15			X		X	
H-18					X	
WIPP-18					X	
CB-1					X	
DOE-2					X	

Exceptional Service in the National Interest
Information Only

Table 3. Perched Anthropogenic Wells with Pressure Transducer Data for CY2024

Well	Precipitation	Leakage	NWRA	Water Quality Sampling	Gravity Flow	Long-Term Recovery
C-2507			X	X		
C-2811			X	X		
PZ-2			X	X		
PZ-3			X	X		
PZ-5			X	X		
PZ-6			X	X		
PZ-7			X	X	X	
PZ-9			X	X		
PZ-10			X	X		
PZ-11			X	X	X	
PZ-12			X	X		
PZ-13			X	X		
PZ-14			X	X	X	
PZ-15			X	X	X	

Exceptional Service in the National Interest
Information Only

Table 4. Culebra Pressure Head Fluctuations

Well	Δ Hydraulic Head (ft fresh water)	Net Change (ft fresh water)	Well	Δ Hydraulic Head (ft fresh water)	Net Change (ft fresh water)
AEC-7R	2.98	2.07	SNL-8	3.54	-0.22
C-2737C	4.88	-4.70	SNL-9	1.46	0.73
H-4bR	12.31	2.15	SNL-10	1.00	-0.03
H-5bR	2.16	-1.00	SNL-12	29.77	3.51
H-6bR	1.64	0.85	SNL-13	2.23	-1.06
H-9bR	10.11	2.70	SNL-14	27.61	3.69
H-10cR	8.28	4.73	SNL-15	8.64	7.79
H-11b4R	14.24	3.74	SNL-16	1.66	-1.37
H-12R	3.74	-0.14	SNL-17A	2.95	-0.94
H-15R	4.50	0.20	SNL-18	3.36	2.03
H-16	18.44	-12.70	SNL-19	2.43	1.61
H-19b0	5.41	-0.07	WIPP-11R	1.91	1.27
IMC-461	1.37	-0.97	WQSP-1	13.96	0.62
SNL-1	1.00	0.24	WQSP-2	3.80	3.15
SNL-2	3.00	2.31	WQSP-3	196.18	-1.03
SNL-3	1.81	1.18	WQSP-4	0.85	-0.47
SNL-5	3.10	2.07	WQSP-5	62.70	-1.51
*SNL-6	11.63	10.52	WQSP-6	137.38	-3.14

*Period(s) of data were adjusted for calculations due to artificial changes (changes in transducer depth)
All files associated with this analysis are stored on Sandia's Concurrent Versioning System in location: /cvs/CVSLIB/WIPP_EXTERNAL/SP913_CY24.

Exceptional Service in the National Interest
Information Only

Table 5. Magenta and **Bell Canyon** Pressure Head Fluctuations

Well	Δ Hydraulic Head (ft fresh water)	Net Change (ft fresh water)
C-2737M	9.28	-9.04
H-2b1	11.22	-11.25
H-3b1	7.28	-7.08
H-4c	4.54	-4.16
H-6c	3.32	-3.02
H-8a	3.41	-0.92
H-9c	2.44	0.52
H-10a	4.42	-2.95
H-11b2	1.79	-0.93
H-14	2.08	-1.37
H-15	3.95	-3.78
H-18	6.51	-6.26
WIPP-18	4.78	-4.20
CB-1	1.28	0.21
DOE-2	0.50	0.09

Exceptional Service in the National Interest
Information Only

Table 6. Perched Anthropogenic Well Pressure Head Fluctuations

Well	Δ Hydraulic Head (ft fresh water)	Net Change (ft fresh water)
C-2507	1.34	-0.91
C-2811	0.98	-0.87
PZ-2	0.70	-0.46
PZ-3	1.85	-1.27
PZ-5	2.45	-1.81
PZ-6	2.43	-2.05
PZ-7	0.77	-0.75
PZ-9	0.30	0.03
PZ-10	1.88	-1.49
PZ-11	0.55	-0.52
PZ-12	1.84	-1.58
PZ-13	0.51	-0.44
PZ-14	0.64	-0.43
PZ-15	1.98	-0.87

3.0 Dominant Influences Affecting Wells

3.1 Anthropogenic Influences

The anthropogenic impacts on the WIPP monitoring wells include:
- WQSP water quality sampling: pumping for water quality sampling at WQSP wells,
- Well maintenance activities: including development, replacement, and pumping activities,
- Long-term recovery: recovery from past well development and/or nearby testing/purging/pumping that has been consistent for more than 12 months and uninterrupted in CY2024, and
- Non-WIPP related anthropogenic affects.

These human-driven impacts are discussed further in the following sections.

3.1.1 WQSP and PAW Water Quality Sampling

Sampling occurred between March and June 2024 for wells WQSP-1 through WQSP-6. Sampling occurred in April, and October 2024 for Perched Anthropogenic wells.

Exceptional Service in the National Interest
Information Only

3.1.2 Well Maintenance Activities

Well maintenance occurred between March and June 2024 for wells WQSP-1 through WQSP-6.

3.1.3 Long-Term Recovery

Wells SNL-6 and SNL-15 were drilled in areas where the Culebra contains halite cements, and the wells are still recovering from well-development activities that occurred before 2009 (DOE, 2019). The SNL-6 net recovery is 10.52 ft freshwater head (Appendix-Figure 27), the SNL-15 net recovery is 7.79 ft freshwater head (Appendix-Figure 34).

3.1.4 Culebra Non-WIPP-Related Anthropogenic (NWRA) Affects

Eight out of twelve wells in the Culebra that responded to NWRA affects in CY2024 are displayed in Appendix-Figures 1 and 2. Graphically, the events are separated into those that are associated with a singular large-scale NWRA event that began in April 2024 (Appendix-Figure 1), and those that were less affected by the same event (Appendix-Figure 2).. A negative pressure event near Culebra wells SNL-12, and SNL-14 that lasted approximately two days followed by other NWRA events for the rest of the year. Well SNL-17A showed muted NWRA affects that follow the same trend. H-4bR, H11b4R, H-12R, H-15R, and H-19b0 were also affected by the large-scale NWRA event that started April. A production well presently located near this grouping of monitoring wells is the possible source of drawdown (https://gis.ose.state.nm.us/gisapps/ose_pod_locations/). Well C-02348 (production) is located approximately 2 miles east of SNL-12 and it is owned by NG, Water Solutions Permian, LLC. Well C-02348 is the likely source of drawdown.

Well H-9bR was subject to the most prominent positive pressure events in May through mid-July 2024, which did not largely affect other wells. Heavy oil and gas exploration activity in the vicinity of H-9bR which are likely the cause of the NWRA experienced during this time. The remaining NWRA wells experience smaller, isolated effects.

3.1.5 Magenta & PAW Non-WIPP-Related Anthropogenic (NWRA) Affects

Six wells out of twelve in the Magenta that responded to NWRA affects in CY2024 are displayed in Appendix-Figure. H-9c and H-10a both experienced a singular NWRA affect that started in January 2024 and lasted until November 2024. H-6c, H-8a, H-9c, H-10a, H-11b2, H-14, and H-15 showed a brief recovery period starting in early December 2024 that lasted approximately 2 weeks. The PAWs experienced various anthropogenic affects from localized retention pond leakage.

3.1.6 Shaft Leakage Event

Two wells that responded to shaft leakage that began in January 2022 are displayed in Appendix-Figure 3. Well H-16 showed a pressure head response of -12.70 ft fresh water and C-2737C showed a head response of -4.70 ft fresh water.

3.2 Natural Processes

The main natural processes that impact Culebra, Magenta, and Bell Canyon monitoring wells are precipitation events in Nash Draw and gravity-driven flow. We acknowledge that these processes also exist in our previously described anthropogenically affected wells in section 3.1.3; however, natural processes tend to be muted by anthropogenic events. The following sections discuss wells with responses dominated by natural processes.

Exceptional Service in the National Interest
Information Only

3.2.1 General Water Level Change

In 2024, water levels in some wells (13) had a net positive head change of greater than 1 foot indicating recovery for these wells in the Culebra. The data show an average annual precipitation for 2024 (6.16 inches) compared to 2023 (6.13 inches). Cumulative change in head in the Culebra in 2023 was 7.29 ft while in 2024 cumulative head change was 30.17 ft, -54.44 ft in the Magenta, 0.29 ft in the Bell Canyon, and -12.23 ft in the PAWs. Cumulative head changes are computed by adding all net pressure changes for the monitored wells in each aquafer.

3.2.2 Precipitation

Eleven Culebra wells in the vicinity of Nash Draw show relatively immediate pressure head responses to precipitation events. Four wells (H-19b0, H-11b4R, H-15R, and SNL-14) located in an area near the repository showed immediate pressure head responses to precipitation events. Appendix-Figures 7, and 8 correlates precipitation data collected from rain gauges on well pads, Appendix-Figure 9 shows individual rain gauge events. SNL-3, H-9bR, SNL-16, and SNL-19, to show pressure head responses to those precipitation events. The pressure head fluctuations for all twelve wells mentioned (C-2737, H-6bR, H-9bR, IMC-461, SNL-1, SNL-2, SNL-3, SNL-9, SNL-16, SNL-17A, SNL-18, and SNL-19) are consistent with precipitation fluctuations seen in previous years (Bowman & Hayes, 2019 and 2020). Magenta, and PAWs all showed muted responses to precipitation.

3.2.3 Gravity Flow

Sixteen Culebra wells experienced minimal pronounced pressure data affects from precipitation or anthropogenic events (AEC-7R, H-5bR, H-6bR, H-9bR, H-10cR, H-15R, WIPP-11R, SNL-1, SNL-3, SNL-5, SNL-8, SNL-9, SNL-10, SNL-13, SNL-14, SNL-18). AEC-7R and SNL-8 are located in areas of the Culebra with the largest distance from recharge, relatively low transmissivity, and other geologic factors that mute or prevent hydraulic responses observed in other wells. Wells AEC-7R, C-2737C, H-6bR, SNL-1, SNL-2, SNL-3, SNL-9, were all slightly affected by rain events in the region. Wells H-5bR, H-6bR, H-12R, IMC-461, SNL-1, SNL-3, SNL-8, SNL-9, SNL-10, SNL-13, SNL-16, SNL-17A, SNL-19, H-15R, H-19b0, WIPP-11R, WQSP-1, WQSP-3, WQSP-4, and WQSP-5 all experienced net head pressure changes that were less than +/- 2 ft of fresh water. Nine Magenta wells experienced net head pressure losses of greater than 2 ft of fresh water. Four Magenta wells (H-8a, H-9c, H-11b2, H-14) experienced net head pressure changes that were less than +/- 2 ft of fresh water. Two Bell Canyon wells experienced net head pressure changes of less than +/- 2 ft of fresh water. Thirteen PAWs experienced net head pressure changes of less than +/- 2 ft of fresh water.

4.0 Summary

Wells within the Culebra, Magenta, and Bell Canyon Groundwater Monitoring Networks are affected by both anthropogenic influences and natural processes. Wells within the perched anthropogenic system show very little water flow and are affected by leakage of local retention ponds in the area. The largest pressure head changes for CY2024 were in wells being developed and sampled, followed by those affected by the April NWRA event. Most wells that have been predominantly affected by natural processes in past years continue to behave consistent with previous years' precipitation responses. CY2024 was relatively the same as 2023 in regard to precipitation, the water levels in a majority of the observation wells are leveling out or beginning to recover.

Exceptional Service in the National Interest
Information Only

Many of the pressure responses described in this report that are important to our understanding of the Culebra in the WIPP vicinity would not have been identifiable using only monthly water level data. The monitoring of Culebra, Magenta, Bell Canyon, and PAW wells using pressure transducers continues to enhance monthly water level measurements by recording high-resolution changes in pressure heads.

Exceptional Service in the National Interest
Information Only

References

Bowman, D.O. 2021. SP 9-13 Data Thinning and Removal of Barometric and Earth Tide Effects from Water-Level Data, REV 1. Sandia National Laboratories. Carlsbad, NM ERMS 574997

Bowman, D.O. and Hayes, A. 2019. WIPP Milestone Report: 2018 Culebra Monitoring Network Groundwater Level Fluctuations. Sandia National Laboratories. Carlsbad, NM. ERMS 571630

Bowman, D.O. and Hayes, A. 2020. WIPP Milestone Report: 2019 Culebra Monitoring Network Groundwater Level Fluctuations. Sandia National Laboratories. Carlsbad, NM. ERMS 573306

Davis, Steve. 2019. NP 16-1, Revision 7, Corrective Action. Carlsbad, NM

New Mexico Office of the State Engineer 2024. https://gis.ose.state.nm.us/gisapps/ose_pod_locations/

nSIGHTS v. 2.41a covered under NSIGHTS Version 2.41a User Manual Version 2.41a., 2013. Sandia National Laboratories. Carlsbad, NM. ERMS 555653

U.S. Department of Energy (DOE) 2003. Strategic Plan for Groundwater monitoring at the WASTE Isolation Pilot Plant. Carlsbad Field Office. Carlsbad, New Mexico. DOE/WIPP-03-3230

U.S. Department of Energy (DOE) 2019. Title 40CFR Part 191 subparts B and C Compliance Recertification Application 2019 for the Waste Isolation Pilot Plant: Appendix HYDRO-2019 Hydrological Investigations. Carlsbad Field Office. Carlsbad, New Mexico. DOE/WIPP-19-3609

Wagner, S. and Hayes, A. 2019. Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2018. Sandia National Laboratories. Carlsbad, New Mexico. ERMS 570837

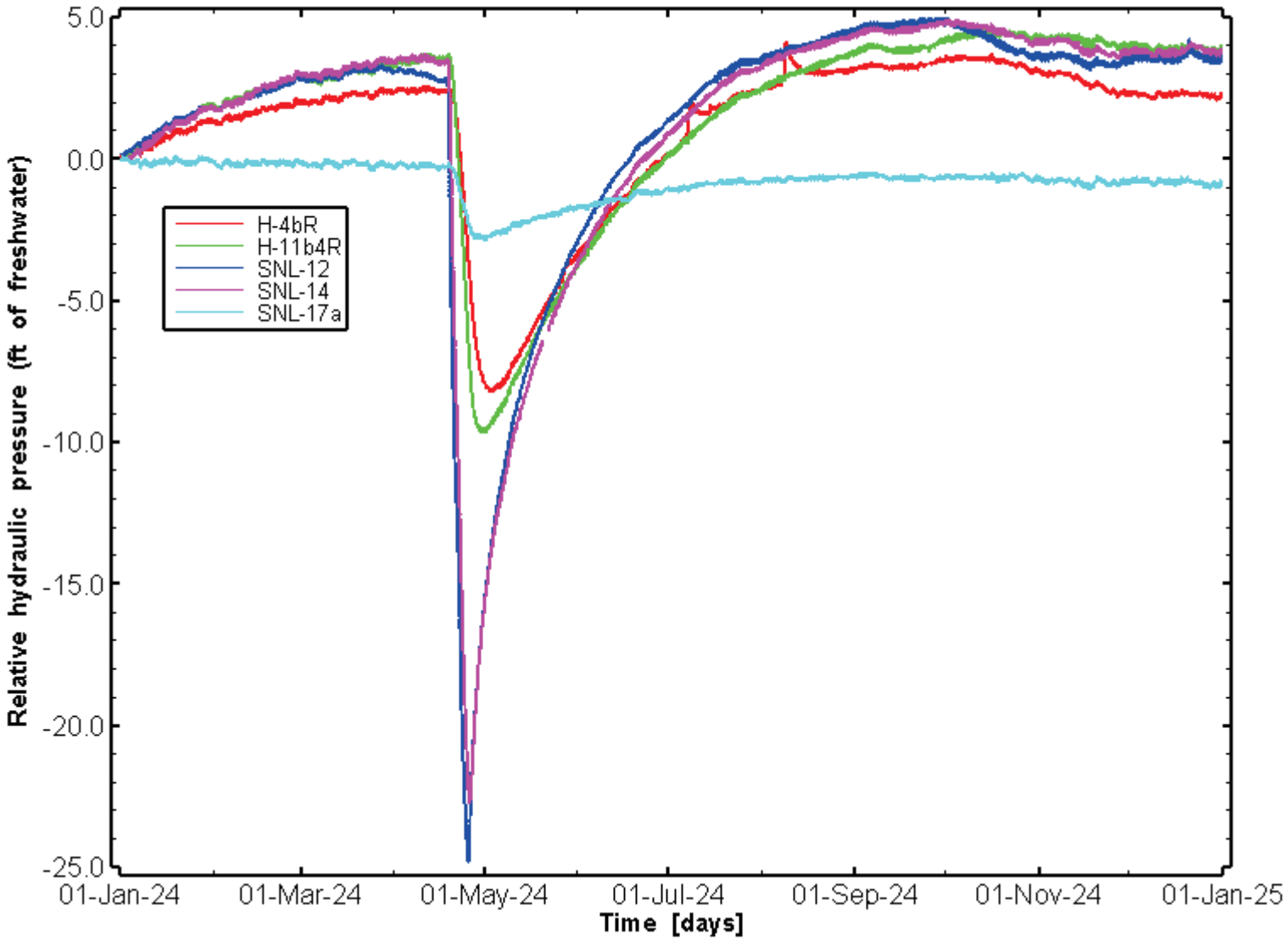
Exceptional Service in the National Interest

Information Only

Appendix

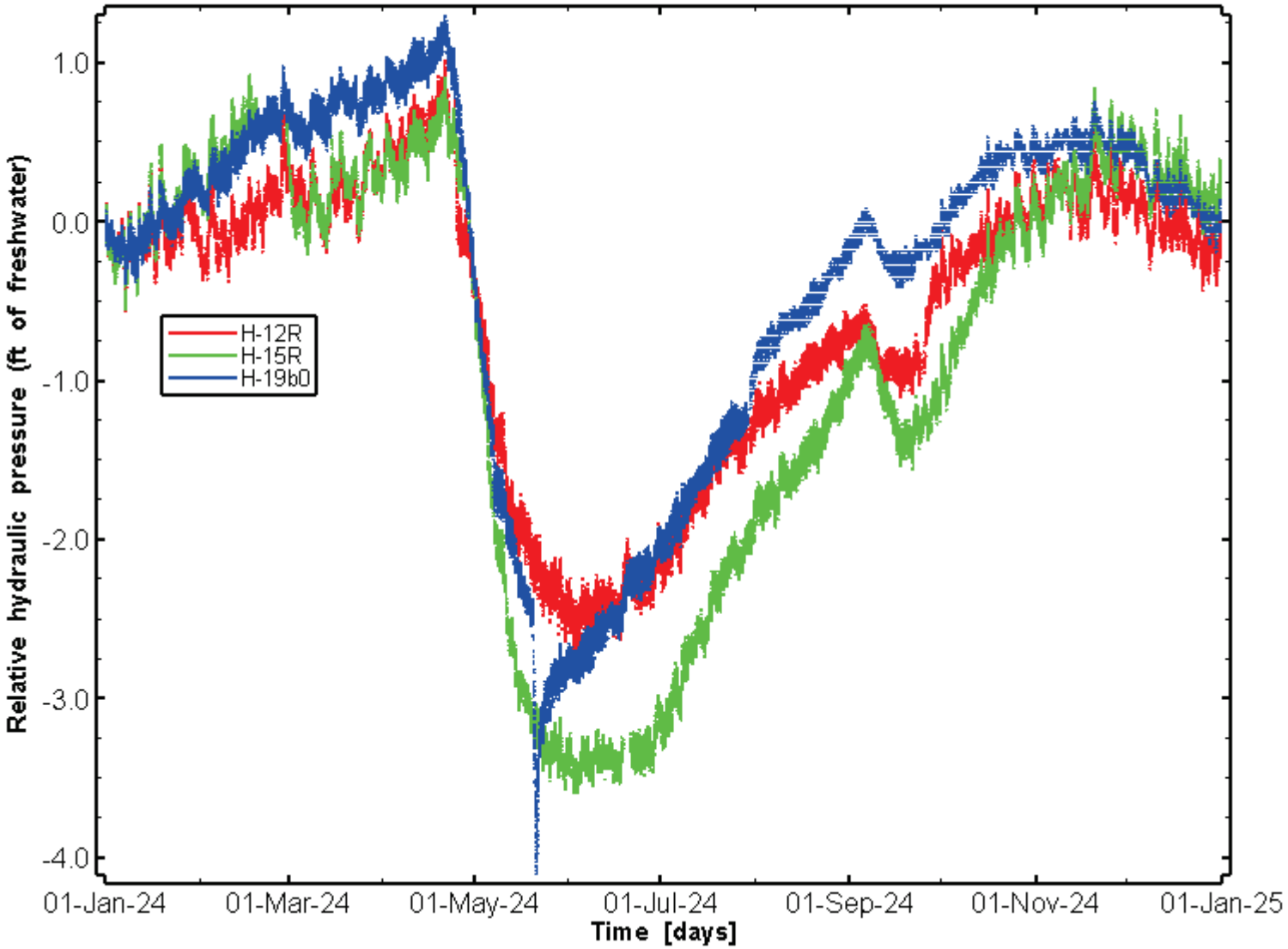
The Appendix contains both composite and individual graphs of pressure head data from Culebra, Magenta, Bell Canyon, and PAW monitoring wells. Gaps and/or inconsistencies that exist in the data are described in individual well graphs, and they were evaluated under NP 16-1, Rev 7 (Davis, 2019), and addressed in a Corrective Action Requests (CARs) and Corrective Action Plans (CAPs), as needed.

Exceptional Service in the National Interest
Information Only



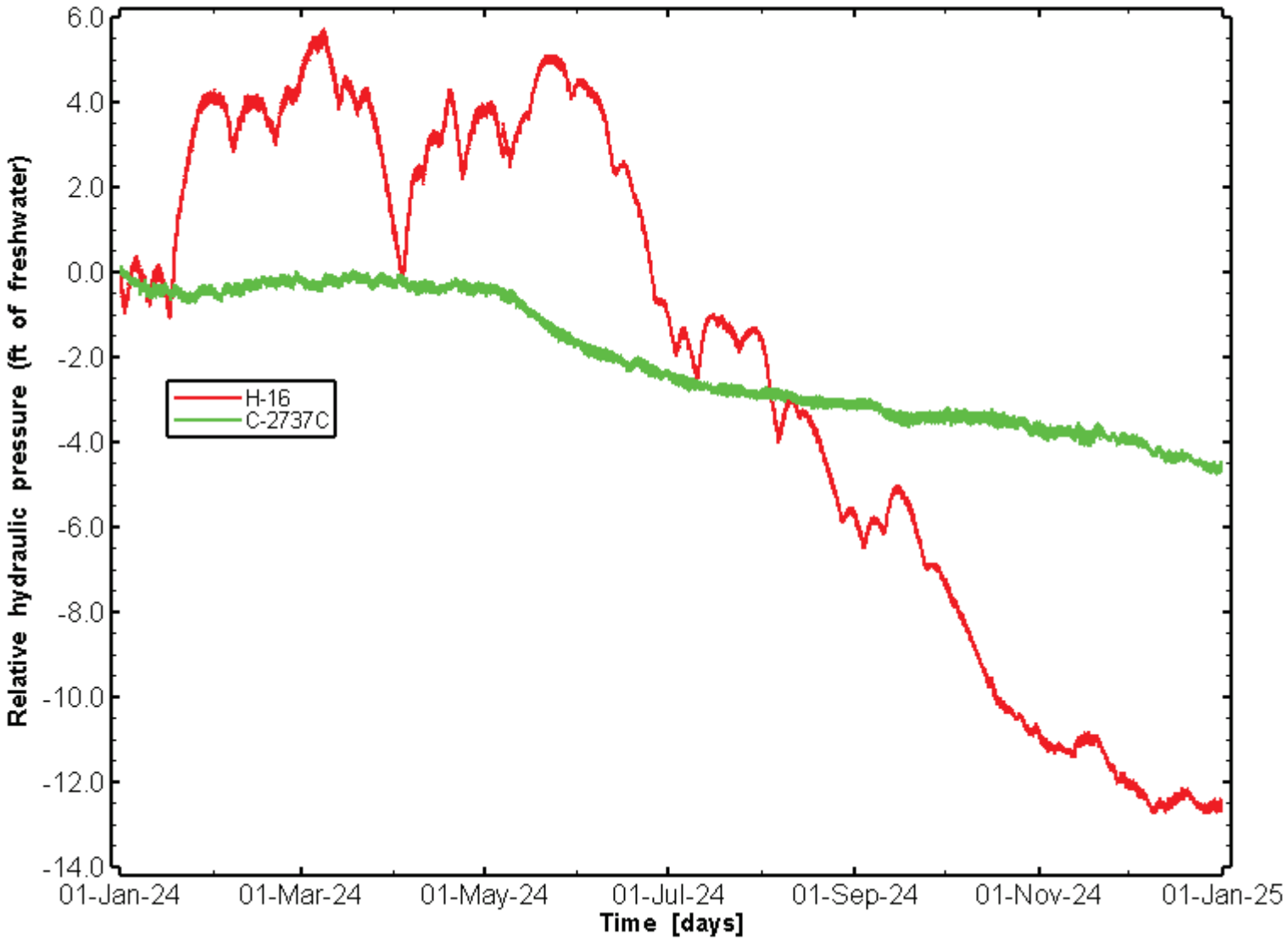
Appendix-Figure 1. Five Culebra wells located in the southern region of the monitoring network were affected by a NWRA event beginning in late April 2024.

Exceptional Service in the National Interest
Information Only



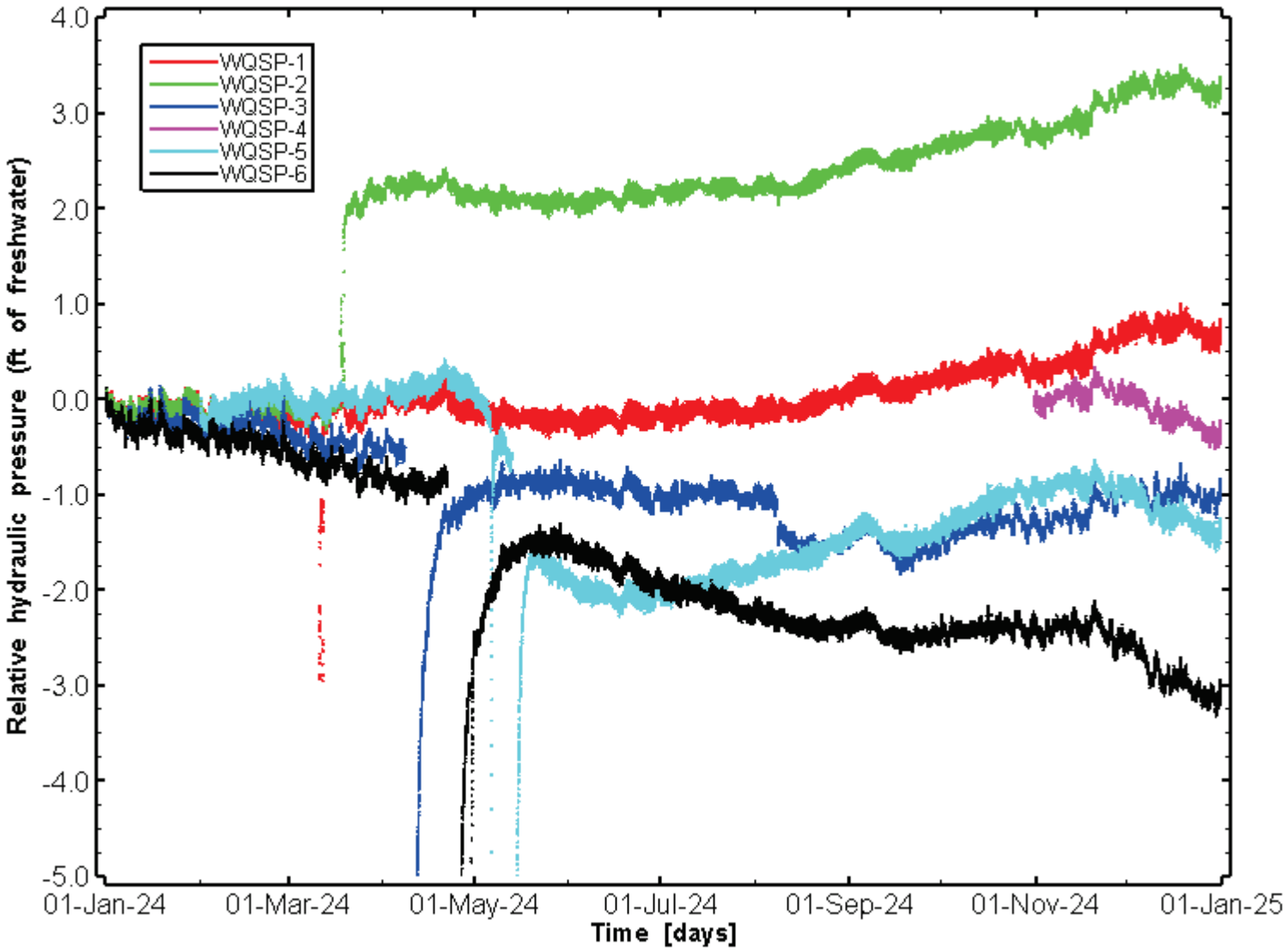
Appendix-Figure 2. Three Culebra wells located in the eastern region of the monitoring network were affected by a NWRA event starting in late April 2024.

Exceptional Service in the National Interest
Information Only



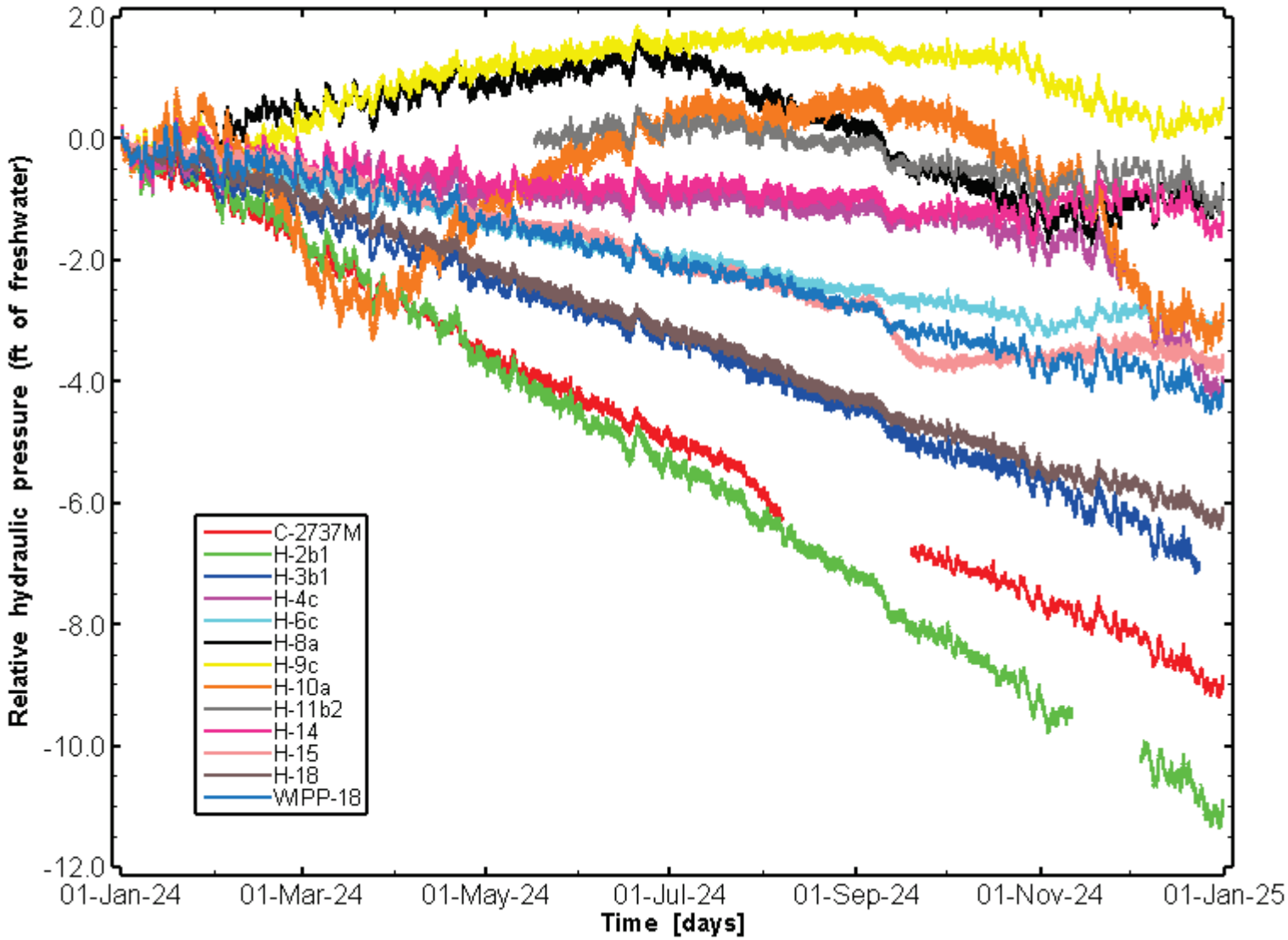
Appendix-Figure 3. Two wells were affected by shaft leakage starting in early January 2022.

Exceptional Service in the National Interest
Information Only



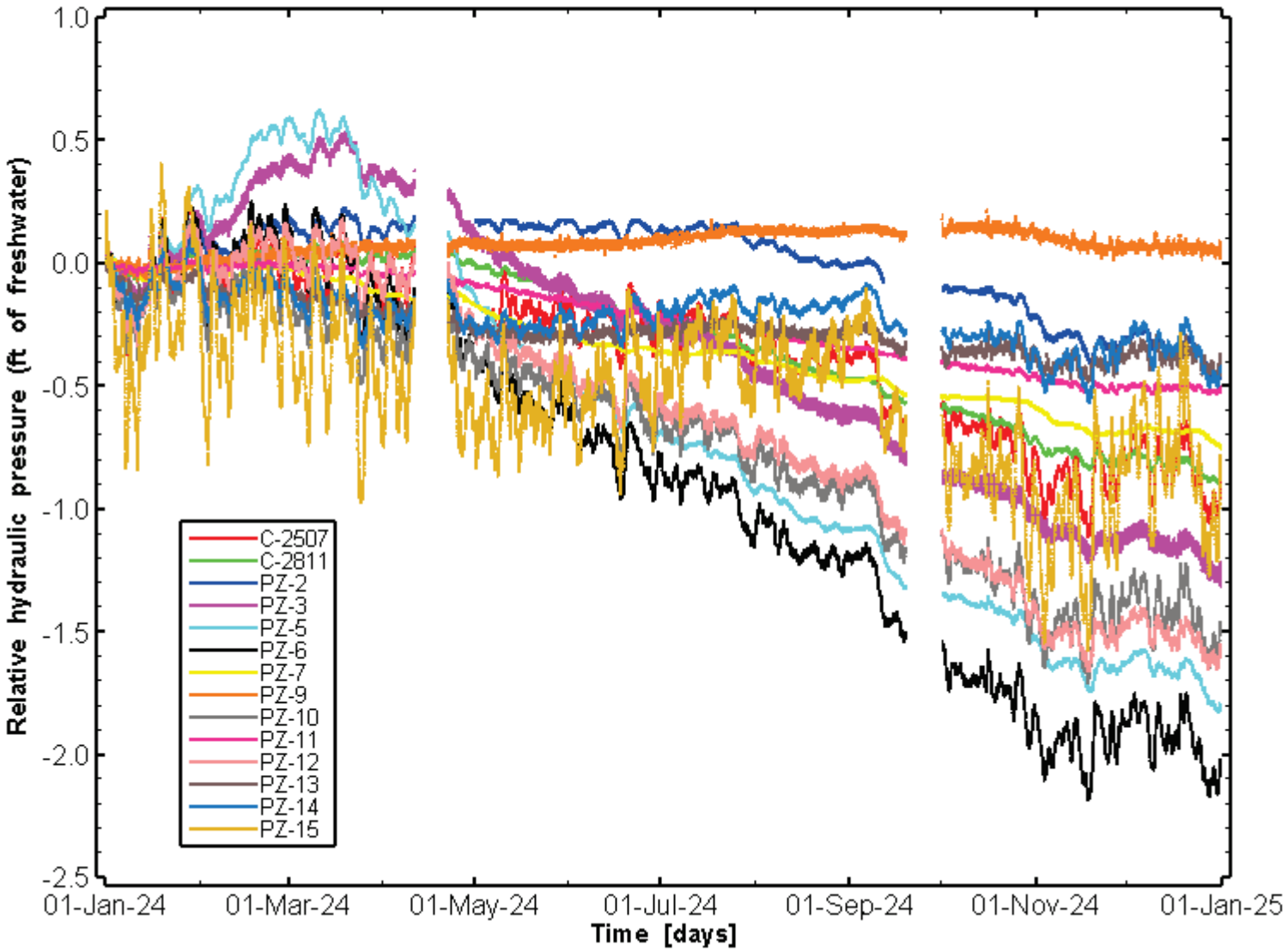
Appendix-Figure 4. WQSP wells response. Data gaps are identified in individual well graphs.

Exceptional Service in the National Interest
Information Only



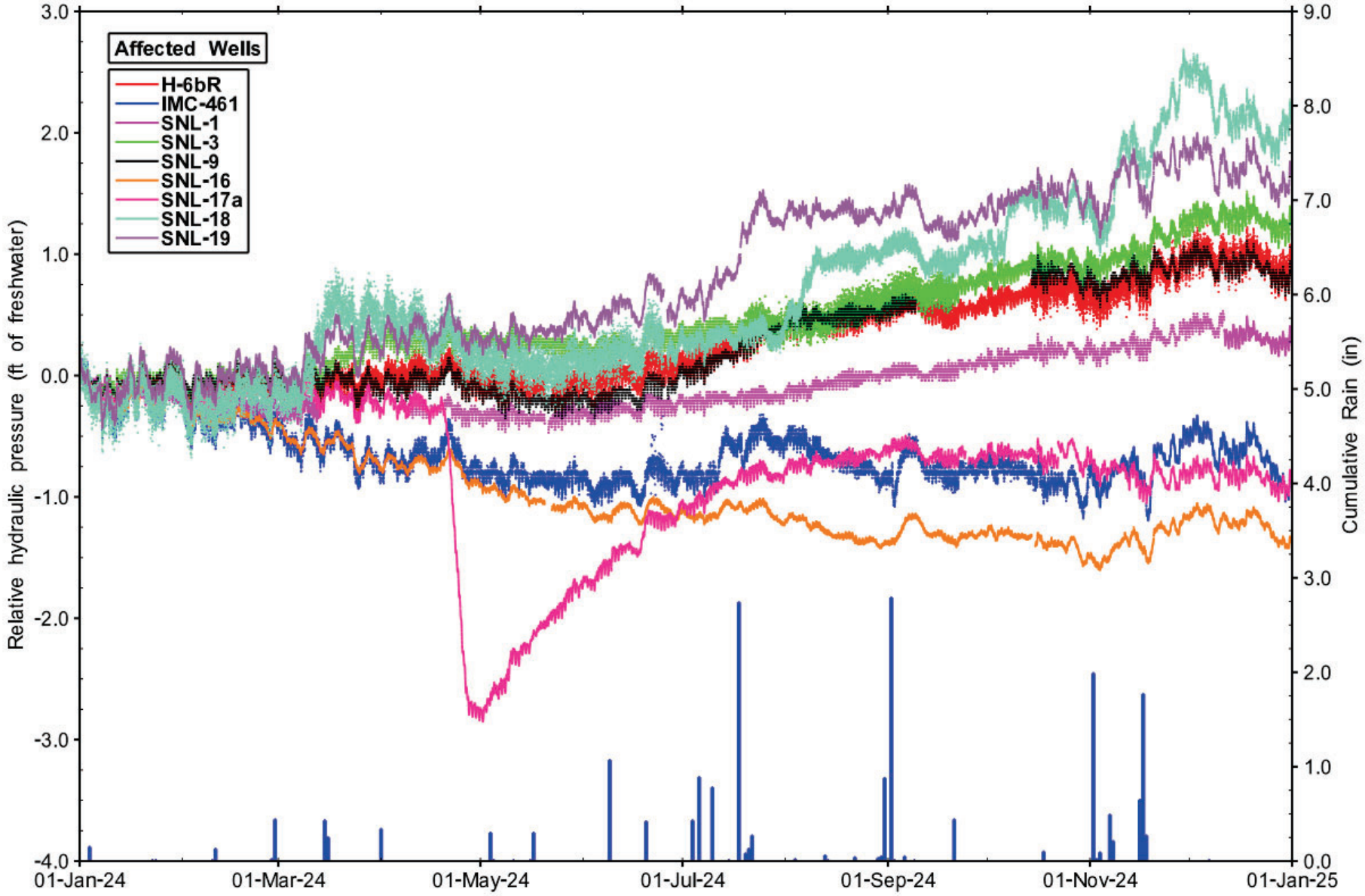
Appendix-Figure 5. Magenta monitored well pressure head response. Data gaps are identified in individual well graphs.

Exceptional Service in the National Interest
Information Only



Appendix-Figure 6. Perched Anthropogenic Wells (PAWs) monitored pressure head response. Data gaps are identified in individual well graphs.

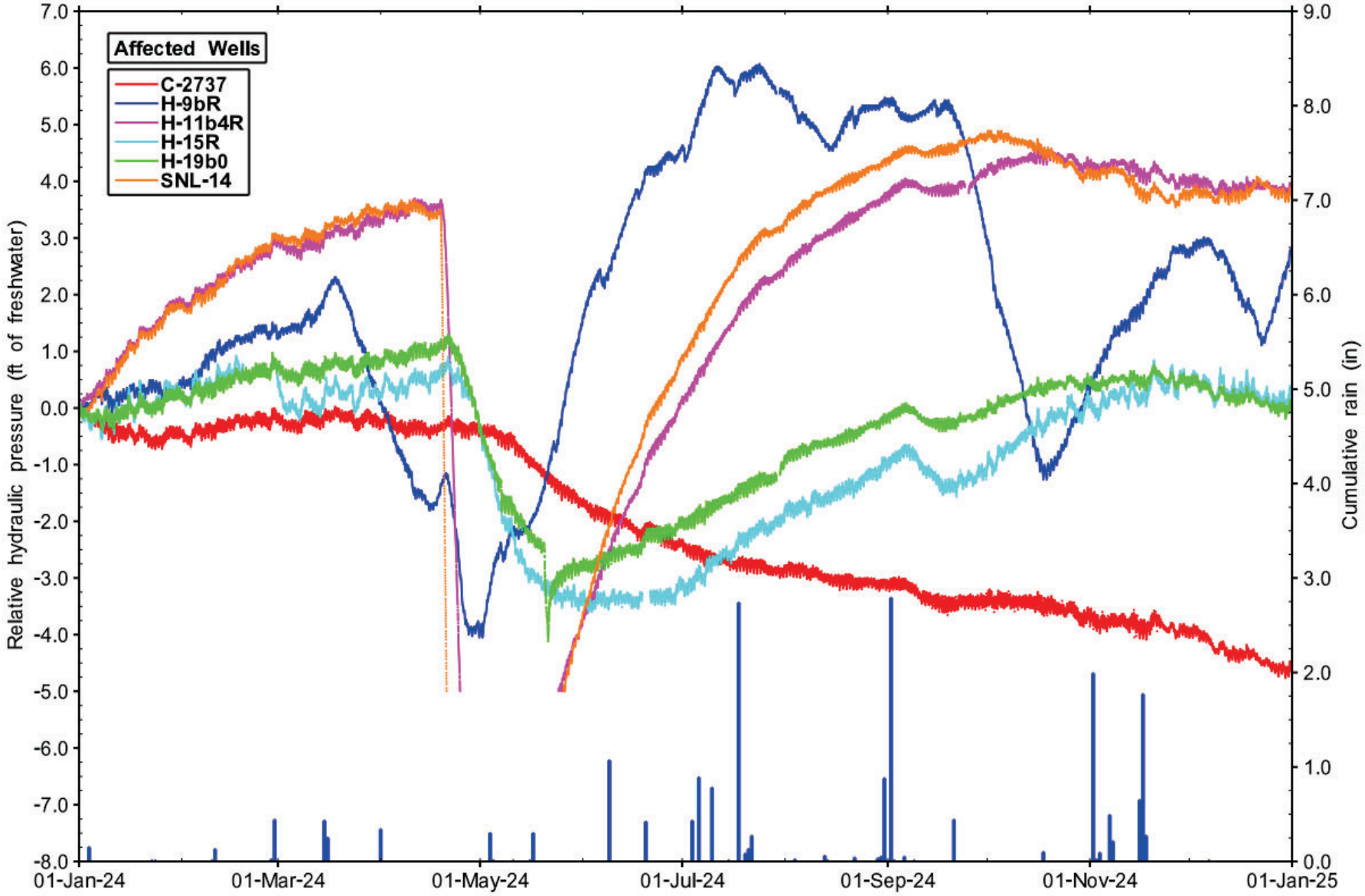
Exceptional Service in the National Interest
Information Only



Appendix-Figure 7. Precipitation events. Data gaps are identified in individual well graphs.

Exceptional Service in the National Interest

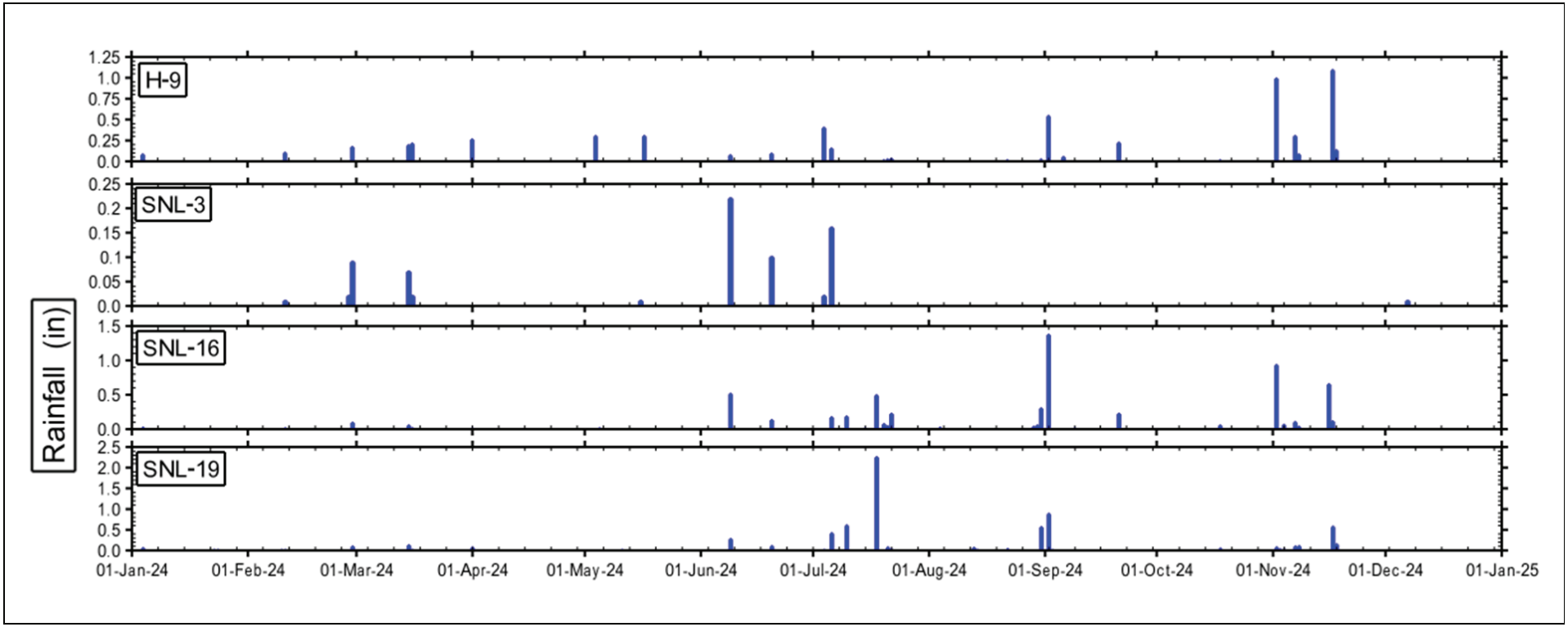
Information Only



Appendix-Figure 8. Precipitation events. H-11b4R and SNL-14 have been clipped to focus on greater data parity.

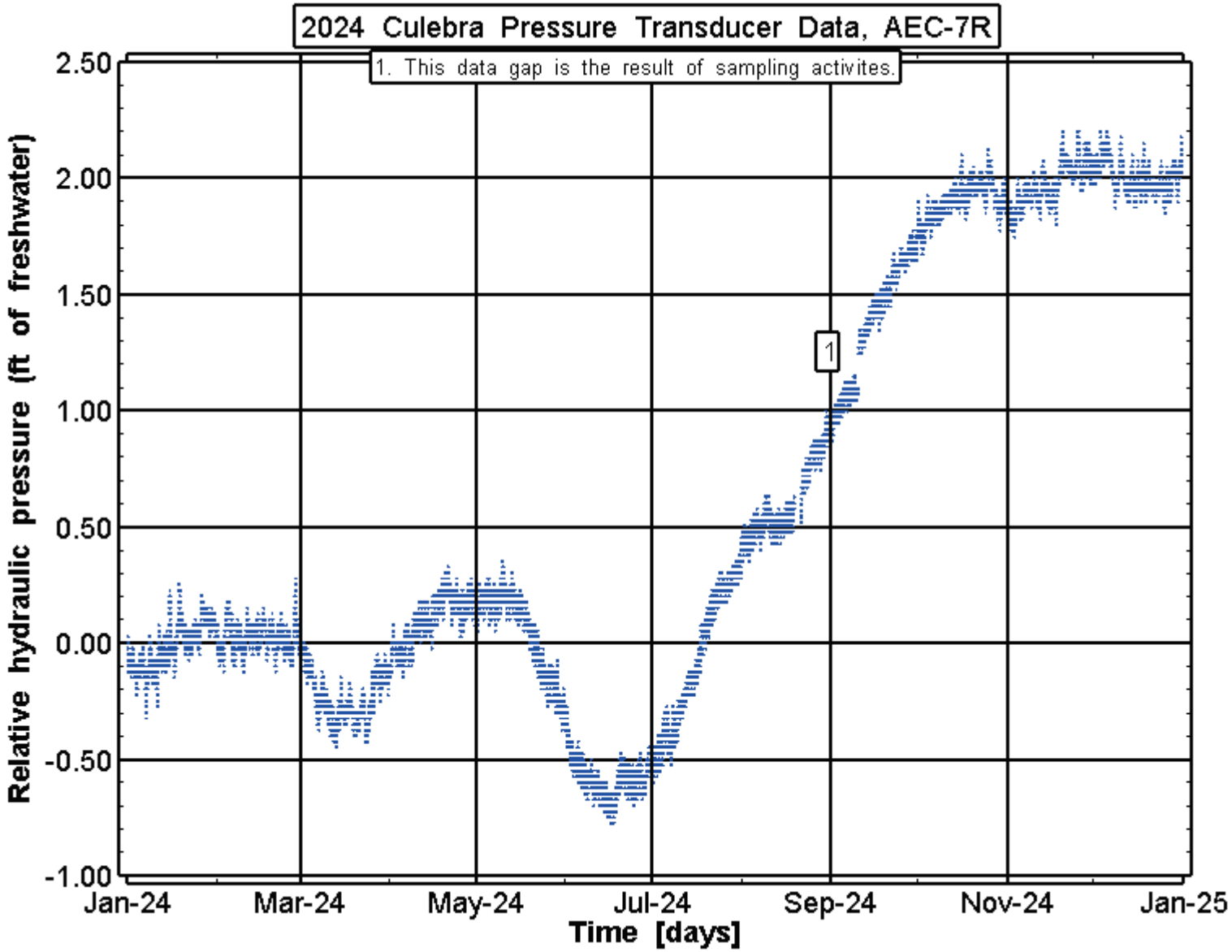
Exceptional Service in the National Interest

Information Only

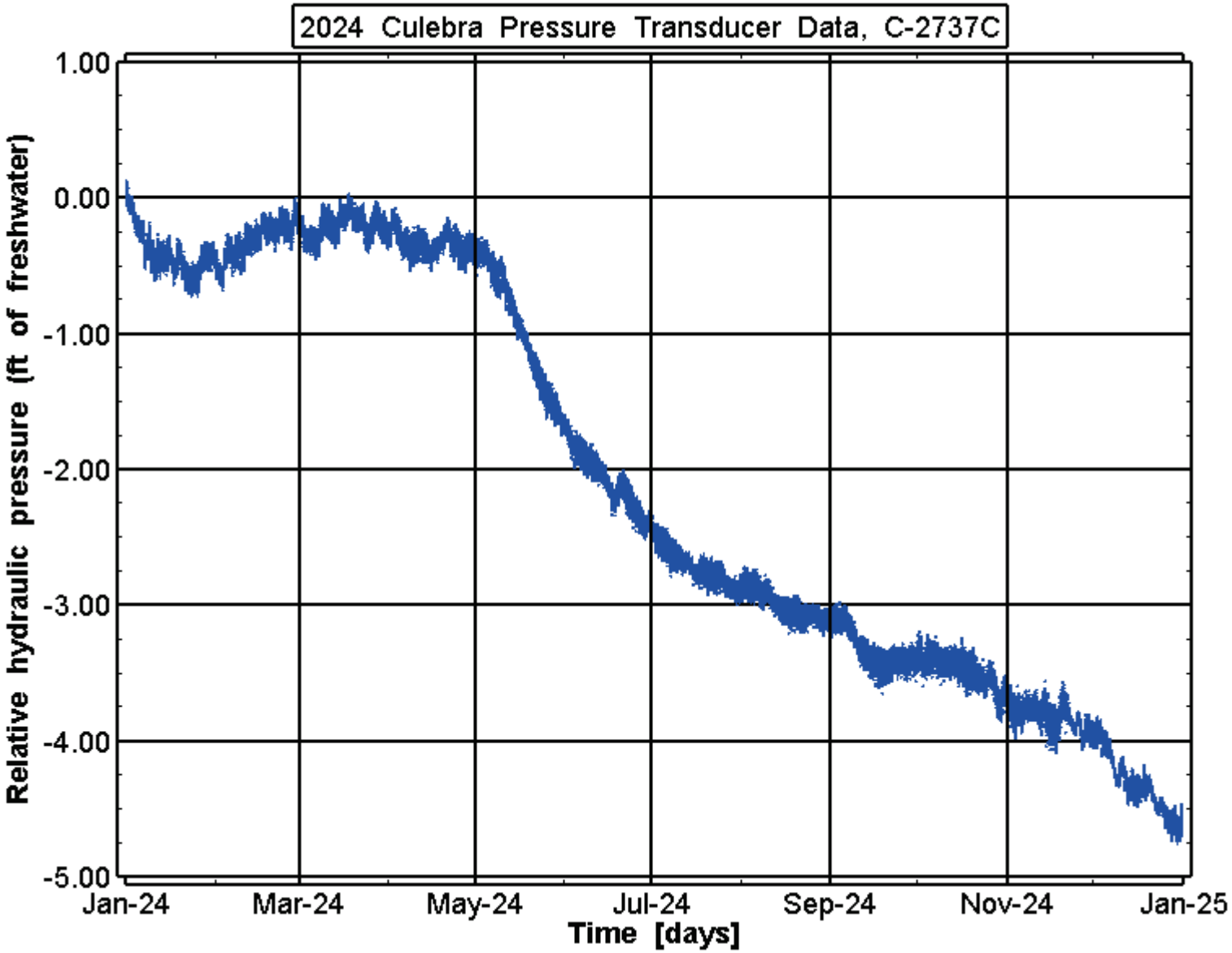


Appendix-Figure 9. Precipitation events.

Exceptional Service in the National Interest
Information Only

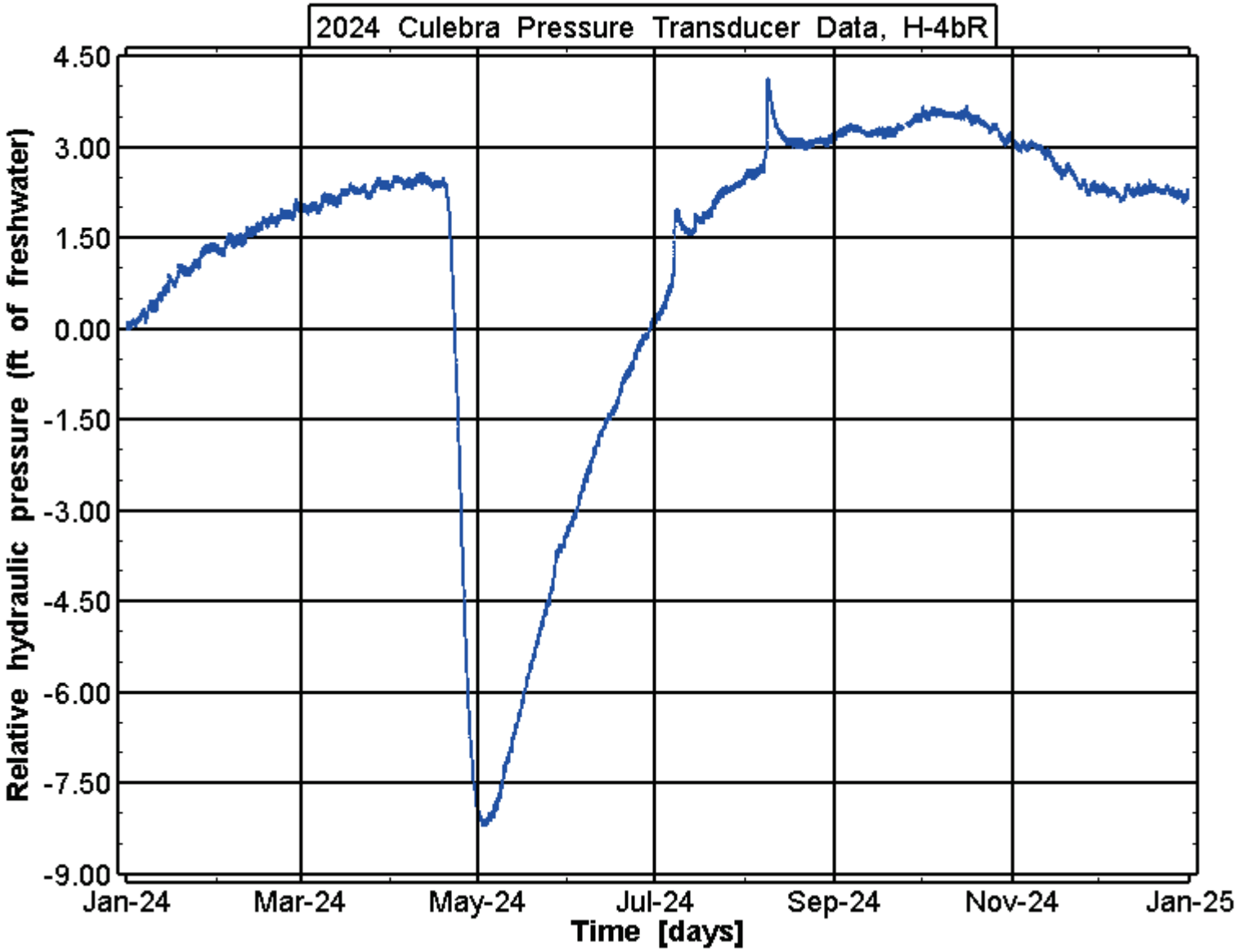


Appendix-Figure 10. Well AEC-7R experienced a net change in pressure head of 2.07 ft fresh water in 2024.



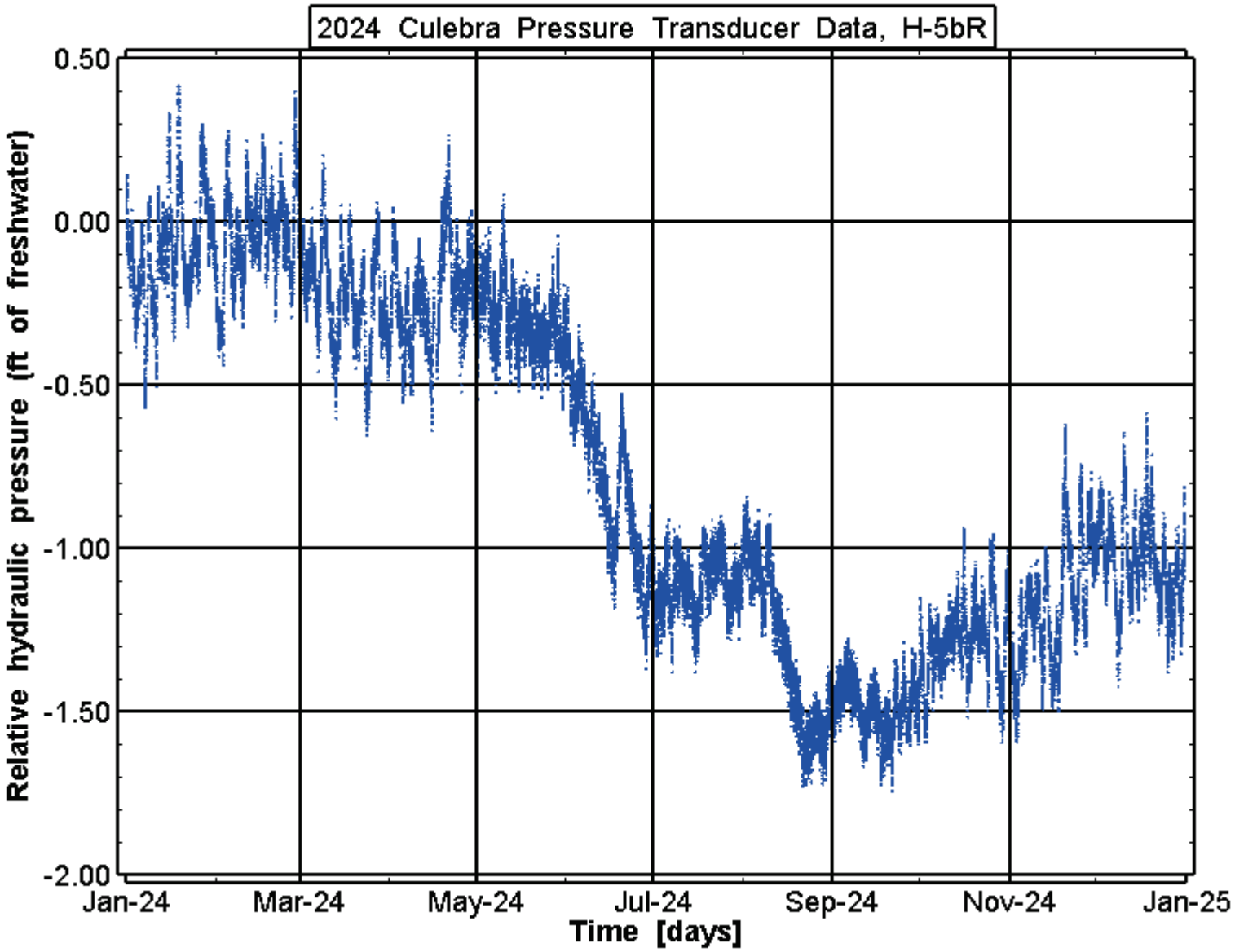
Appendix-Figure 11. Well C-2737C experienced a net change in pressure head of -4.70 ft fresh water in 2024. This well was affected by shaft leakage.

Exceptional Service in the National Interest
Information Only



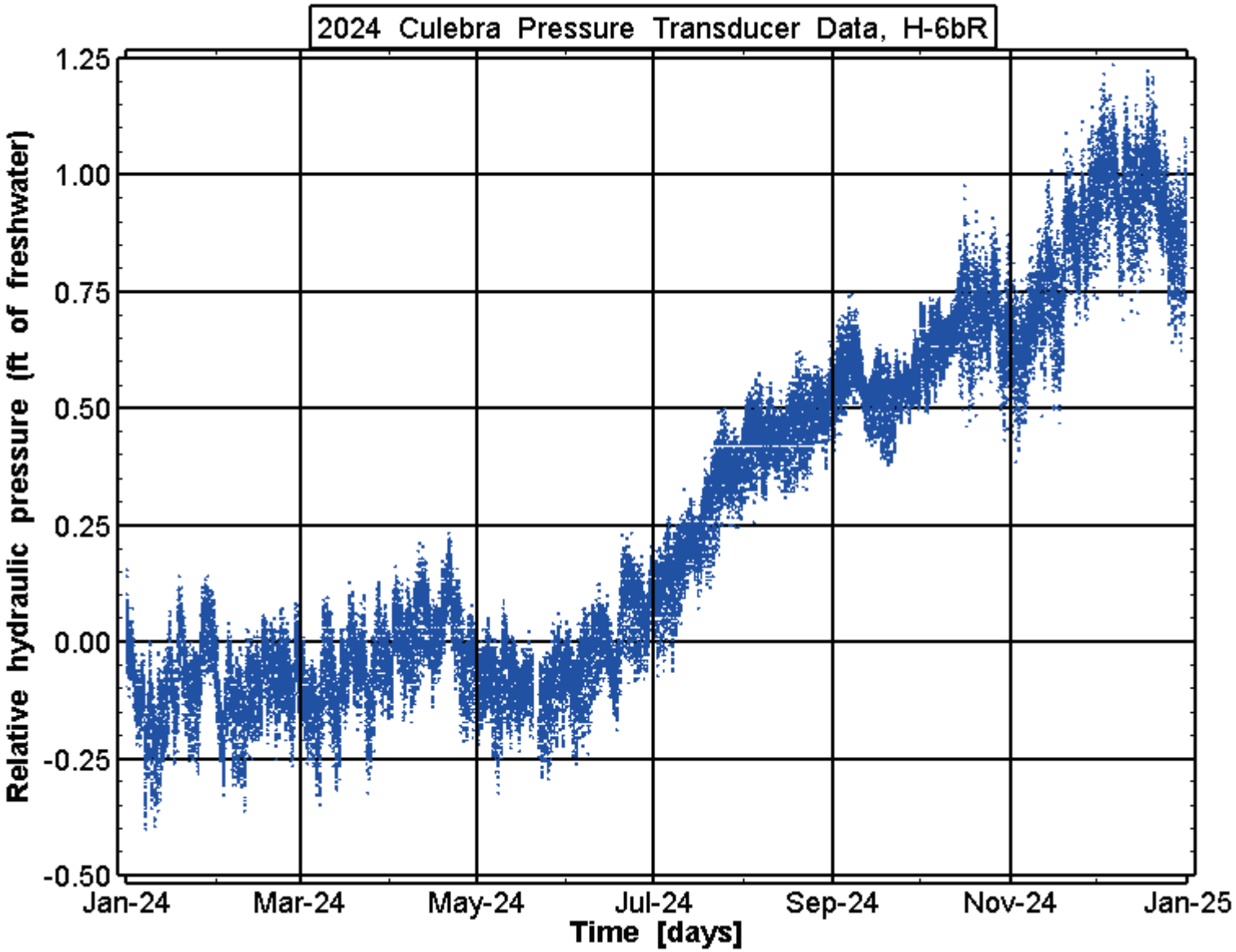
Appendix-Figure 12. Well H-4bR experienced a net change in pressure head of 2.15 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only



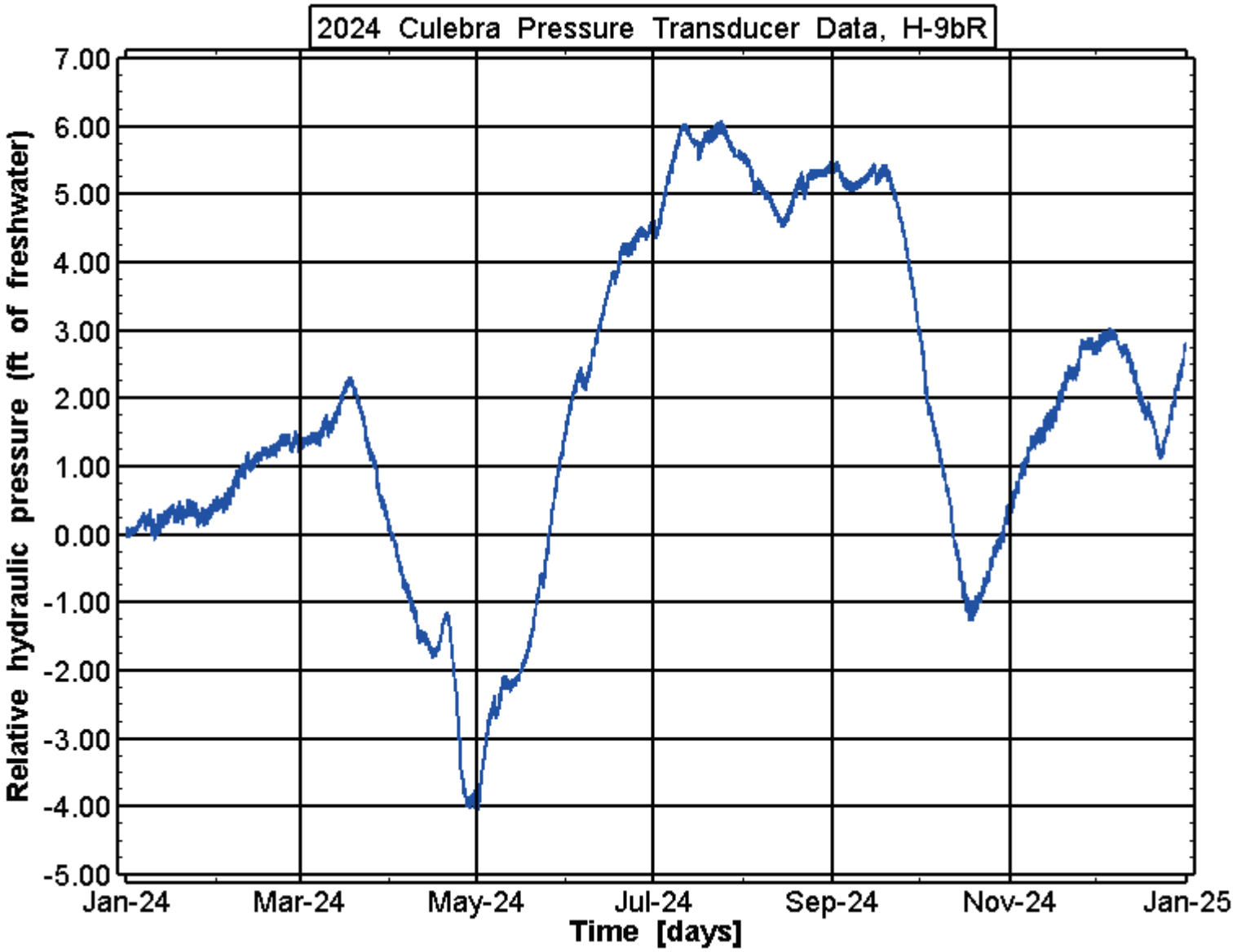
Appendix-Figure 13. Well H-5bR experienced a net change in pressure head of -1.00 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



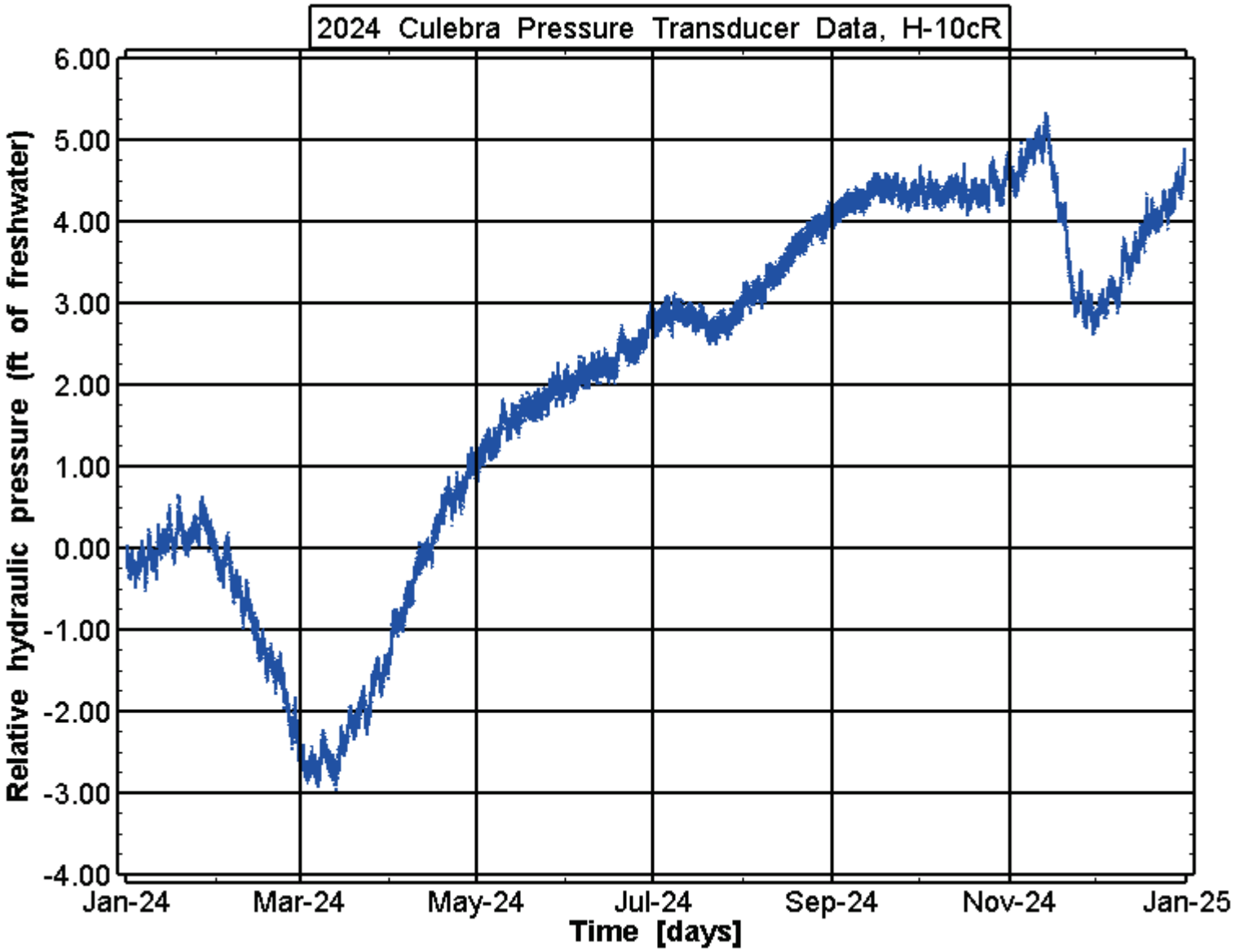
Appendix-Figure 14. Well H-6bR experienced a net change in pressure head of 0.85 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



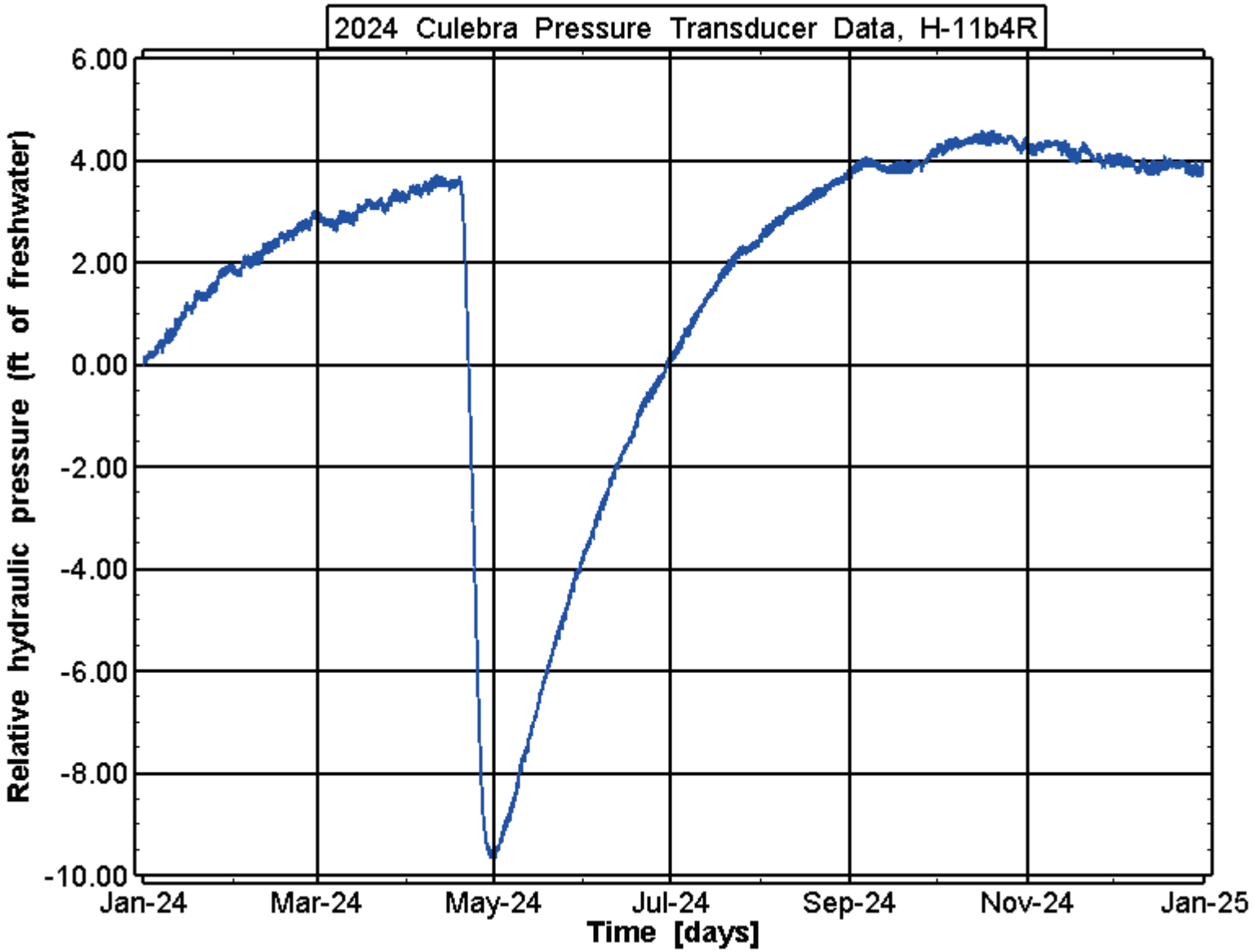
Appendix-Figure 15. Well H-9bR experienced a net change in pressure head of 2.70 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

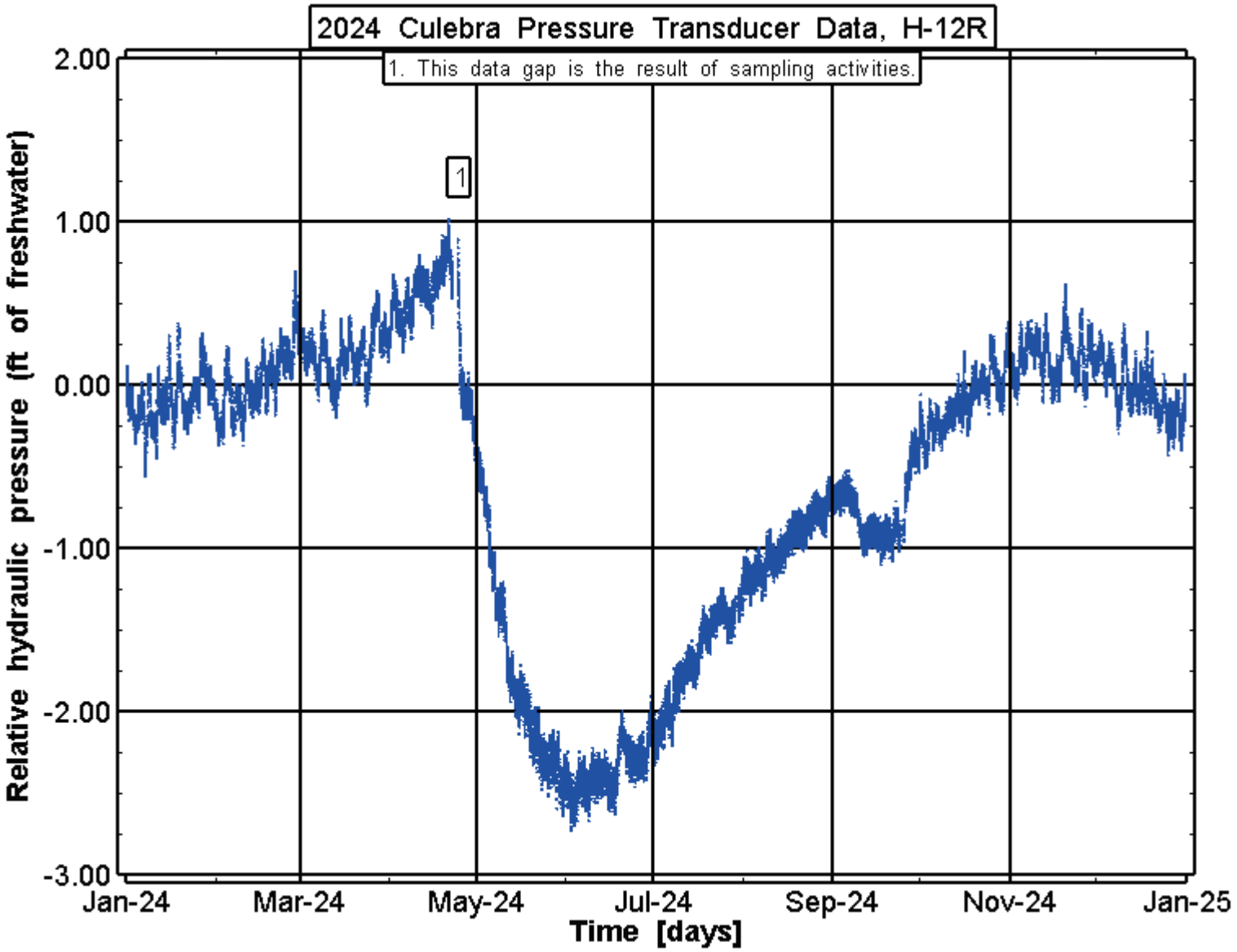


Appendix-Figure 16. Well H-10cR experienced a net change in pressure head of 4.73 ft fresh water in 2024. This well was affected by NWRA.

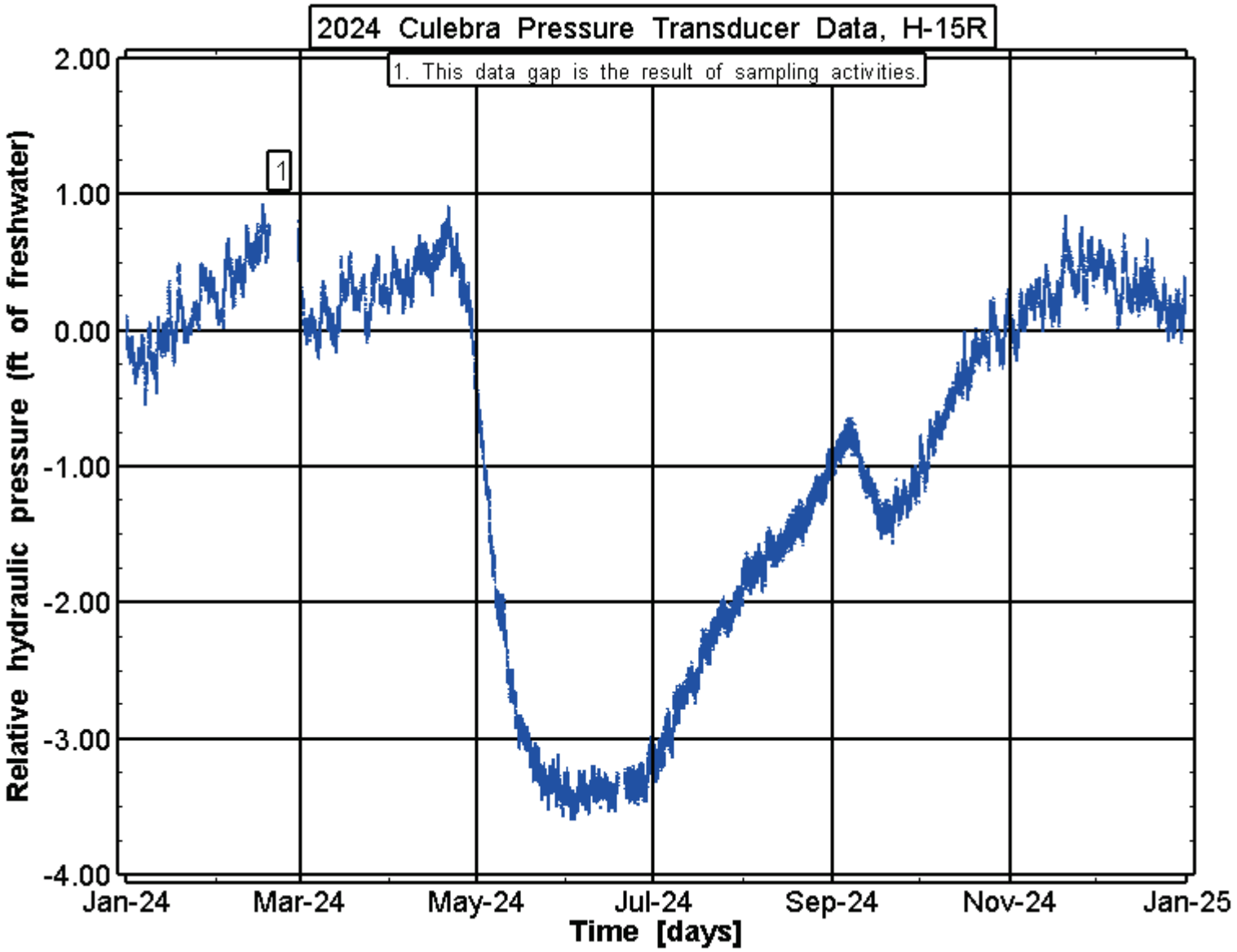
Exceptional Service in the National Interest
Information Only



Appendix-Figure 17. Well H-11b4R experienced a net change in pressure head of 3.74 ft fresh water in 2024. This well was affected by NWRA.

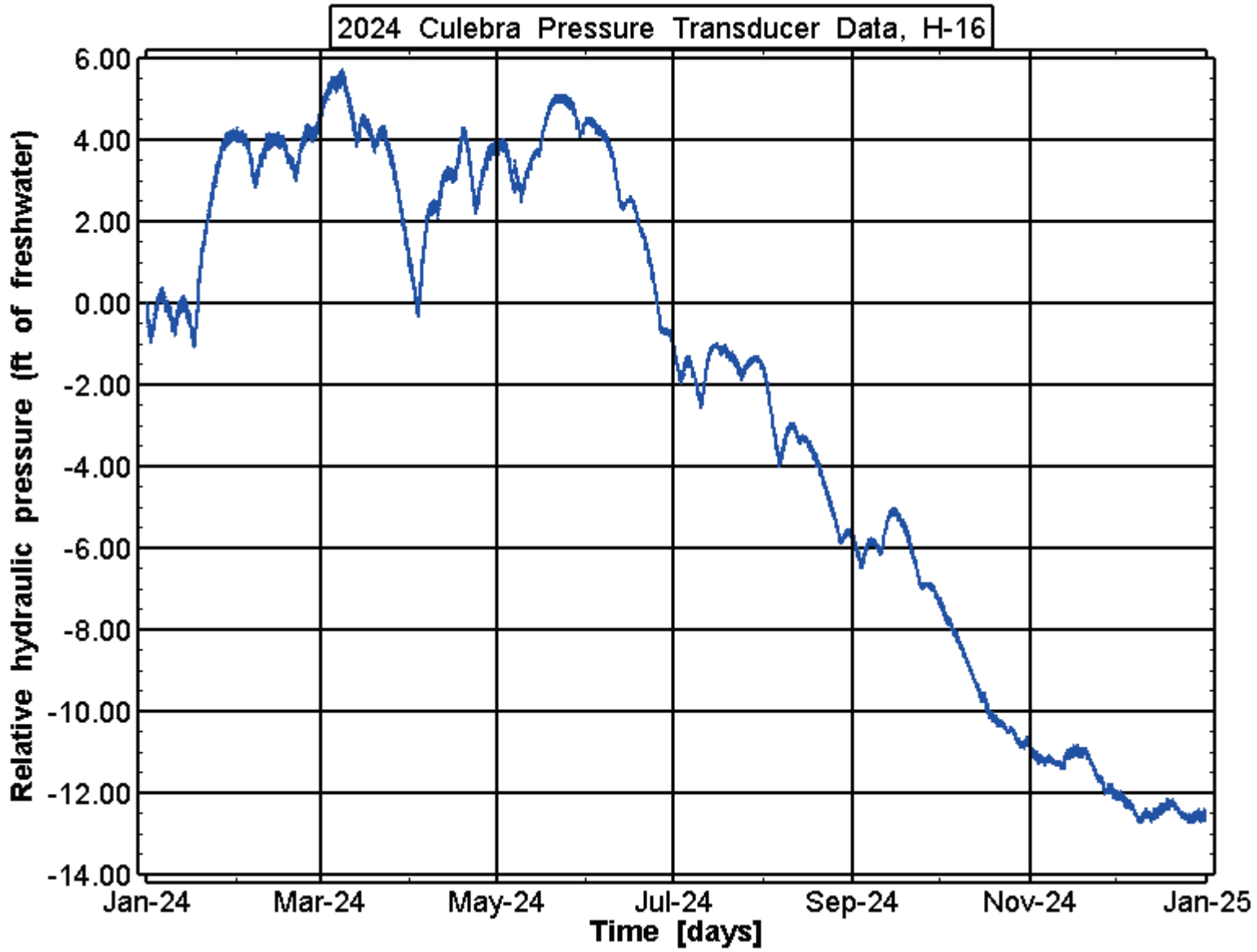


Appendix-Figure 18. Well H-12R experienced a net change in pressure head of -0.14 ft fresh water in 2024. This well was affected by NWRA.



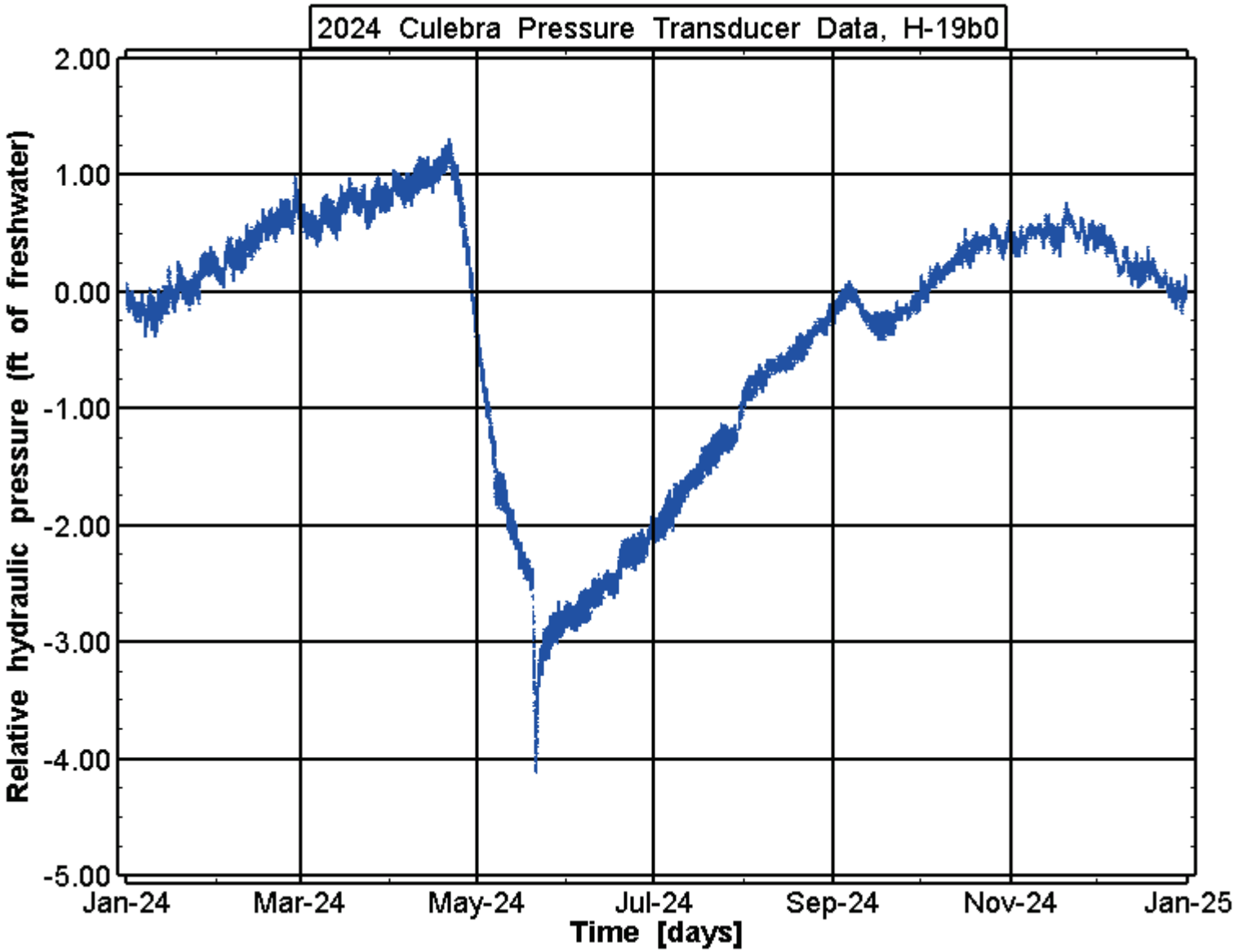
Appendix-Figure 19. Well H-15R experienced a net change in pressure head of 0.20 ft fresh water in 2024. This well was affected by NWRA.

Information Only



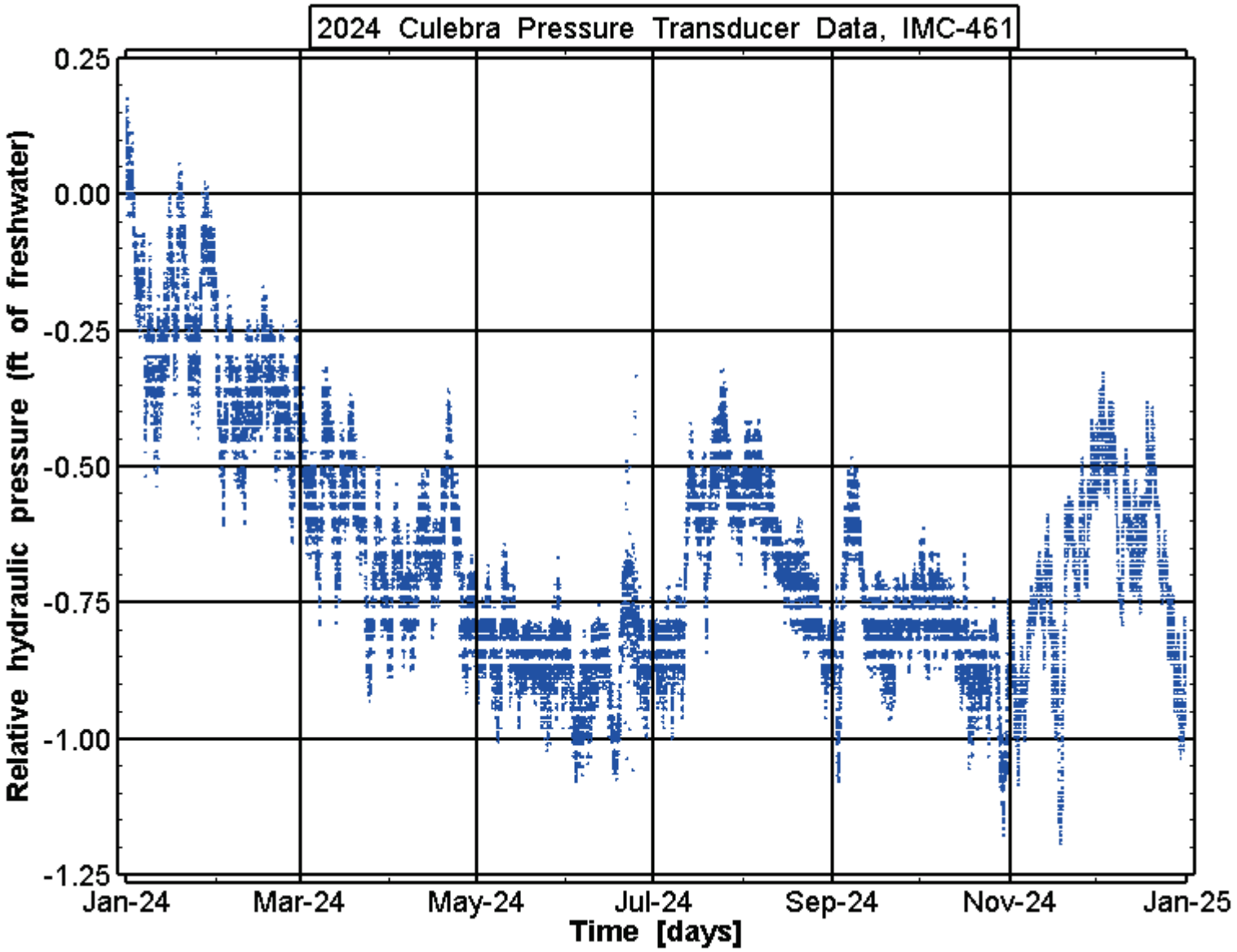
Appendix-Figure 20. H-16 experienced a net change in pressure head of -12.70 ft fresh water in 2024. This well was affected by shaft leakage.

Exceptional Service in the National Interest
Information Only



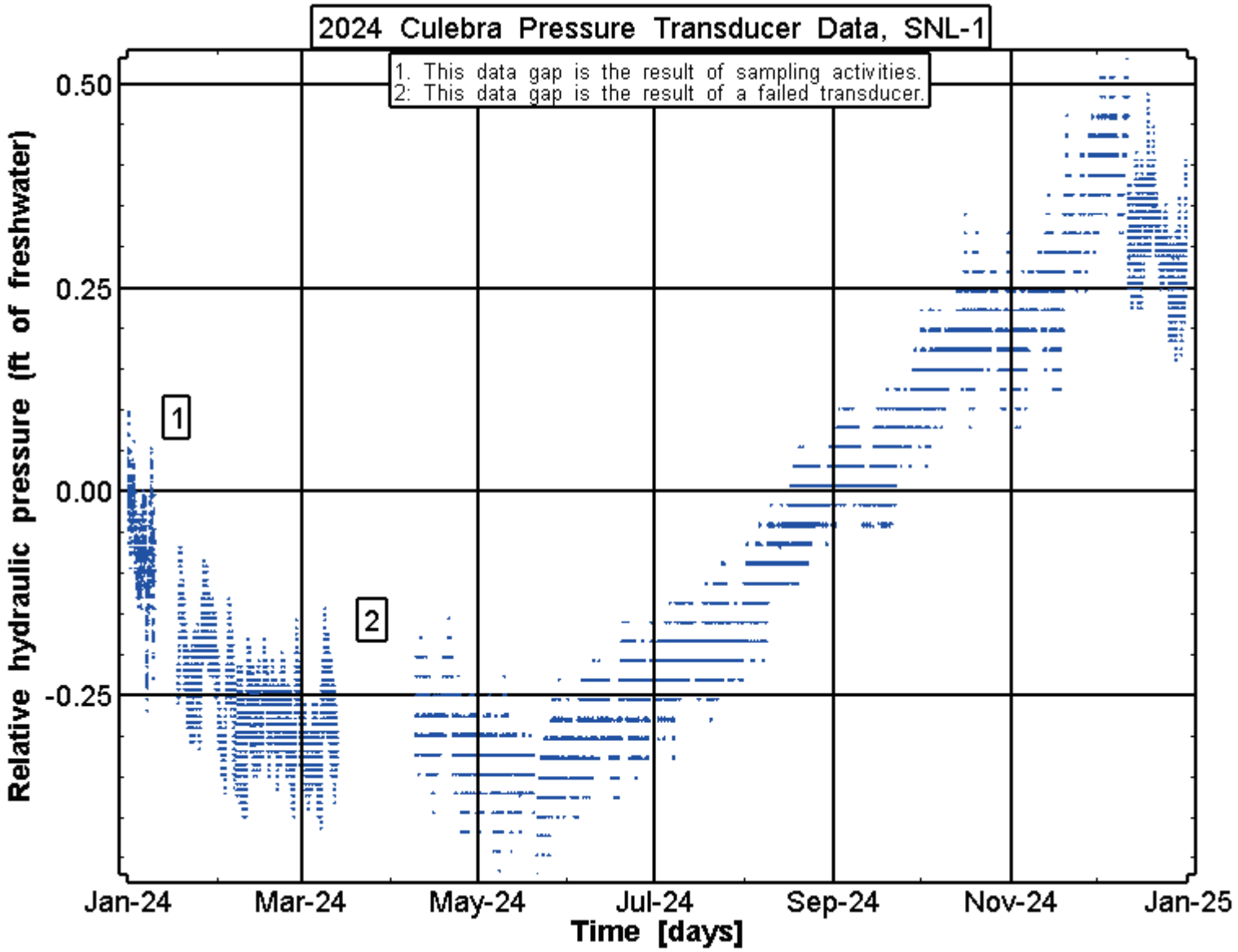
Appendix-Figure 21. Well H-19b0 experienced a net change in pressure head of -0.07 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only



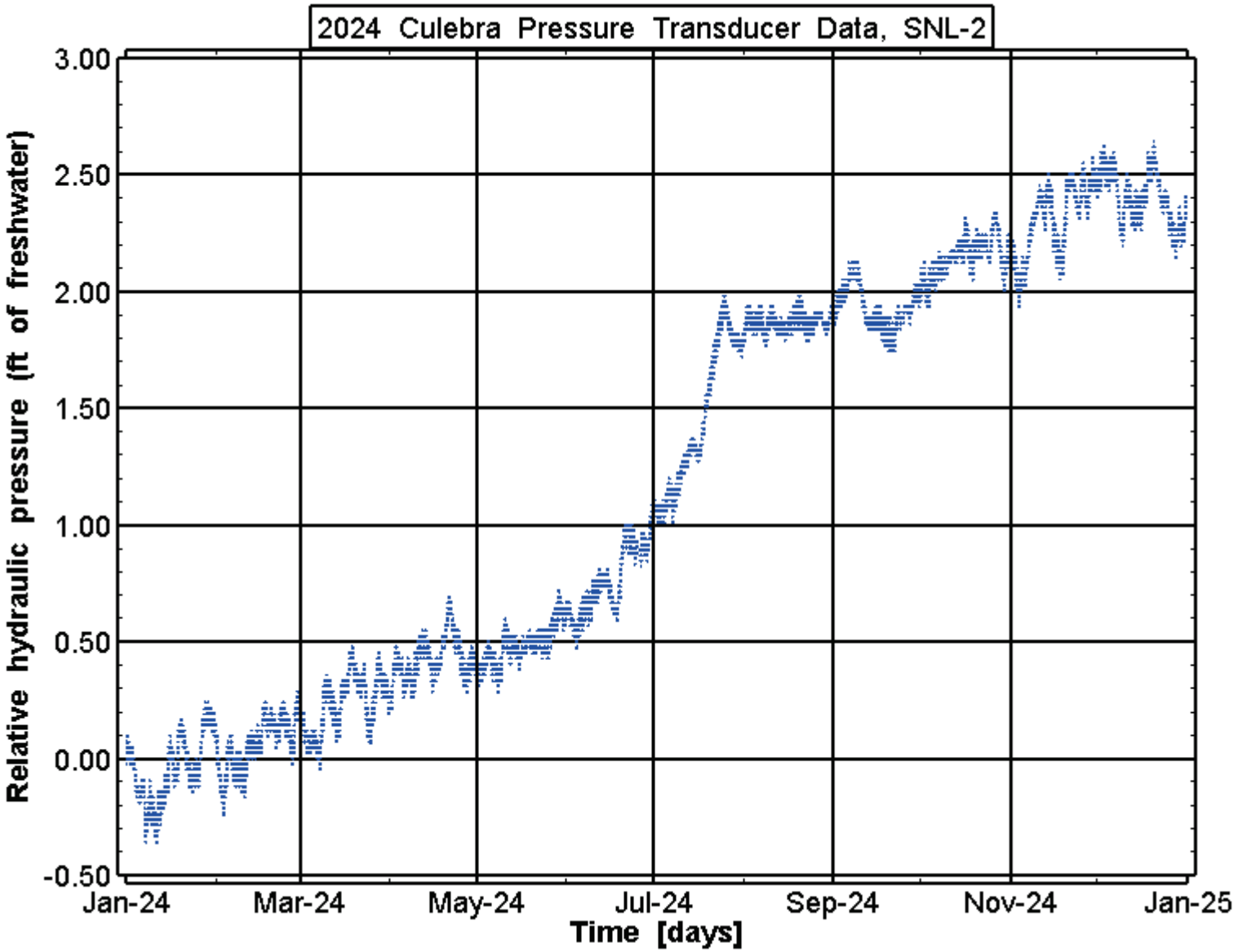
Appendix-Figure 22. Well IMC-461 experienced a net change in pressure head of -0.97 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



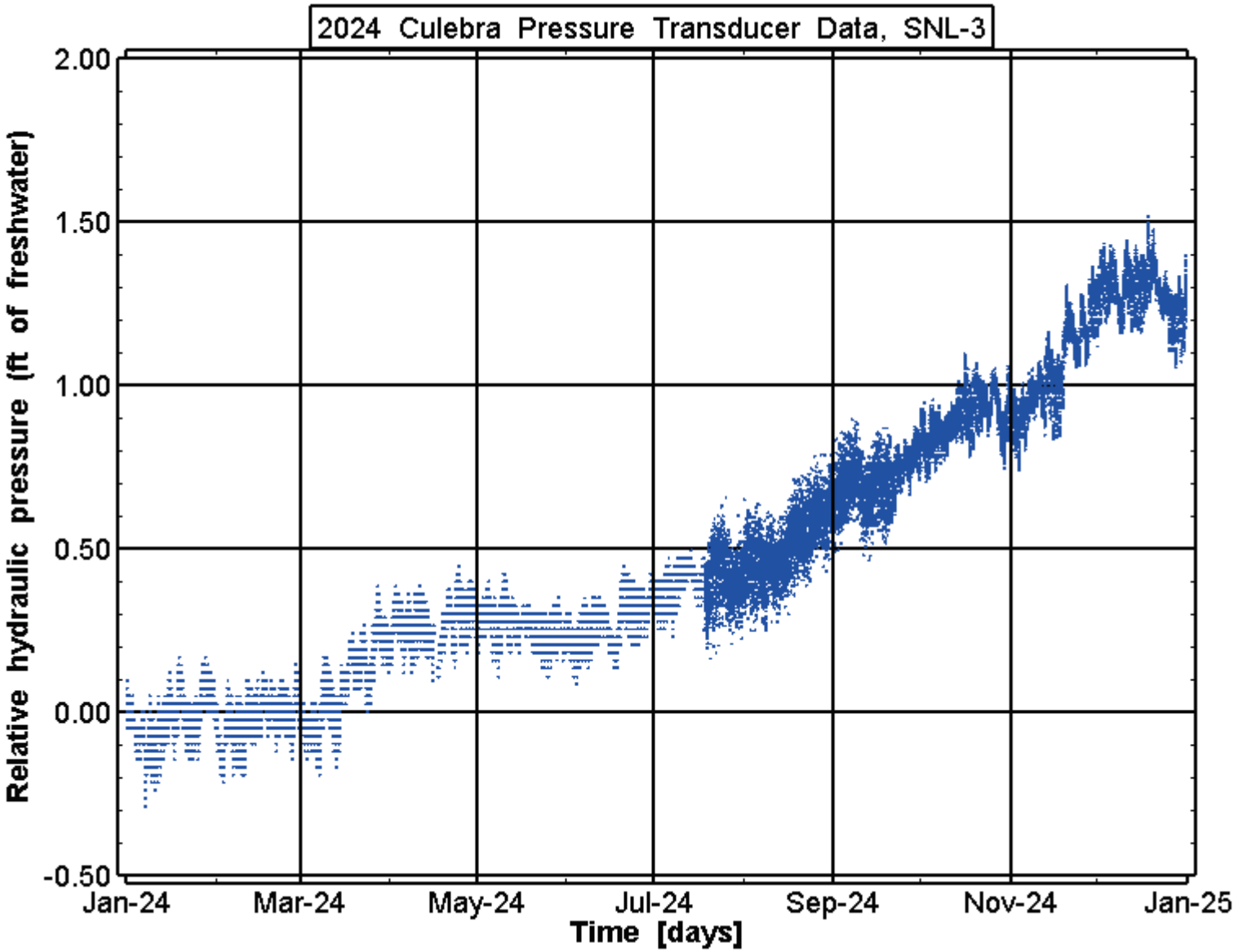
Appendix-Figure 23. Well SNL-1 experienced a net change in pressure head of 0.24 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



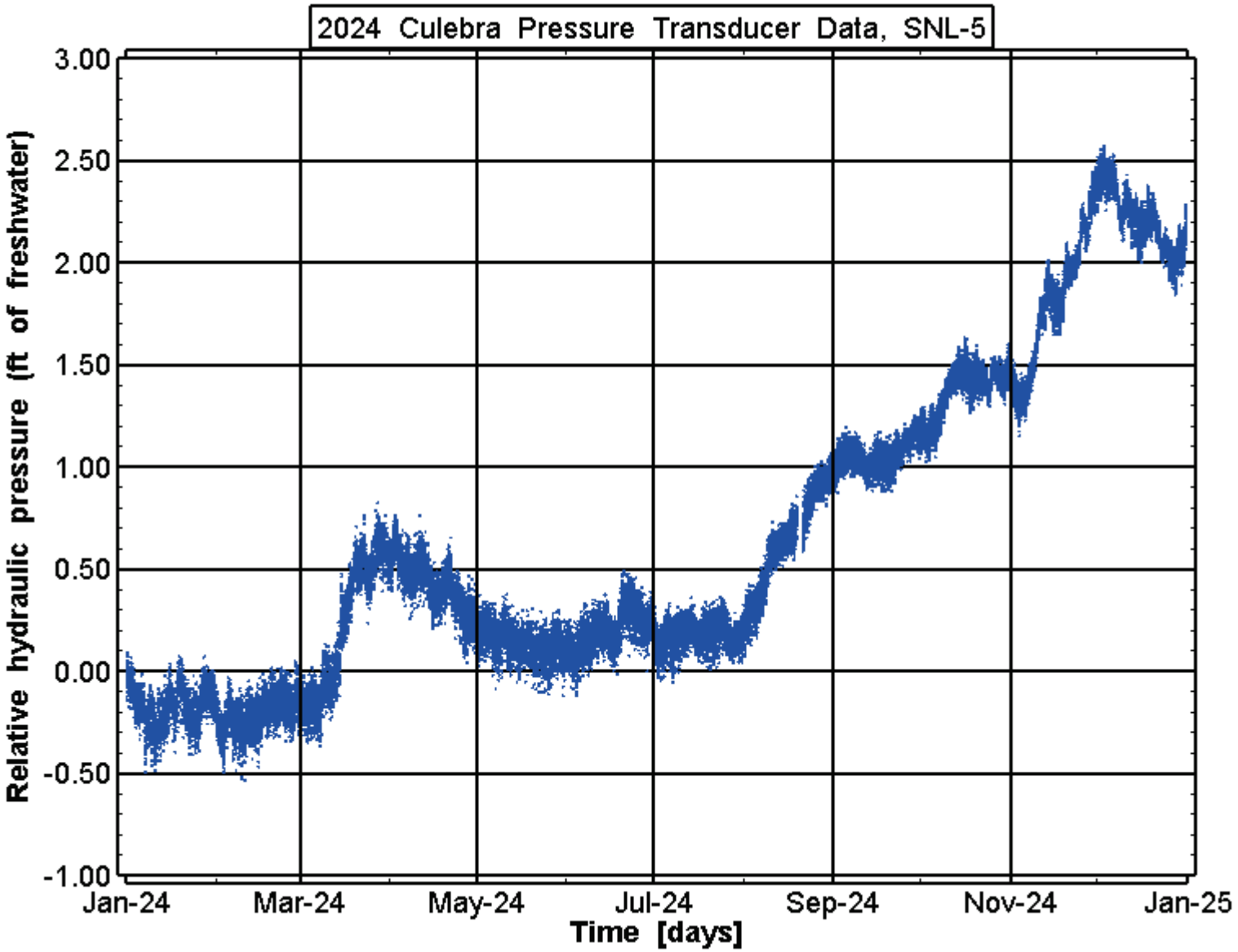
Appendix-Figure 24. Well SNL-2 experienced a net change in pressure head of 2.31 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



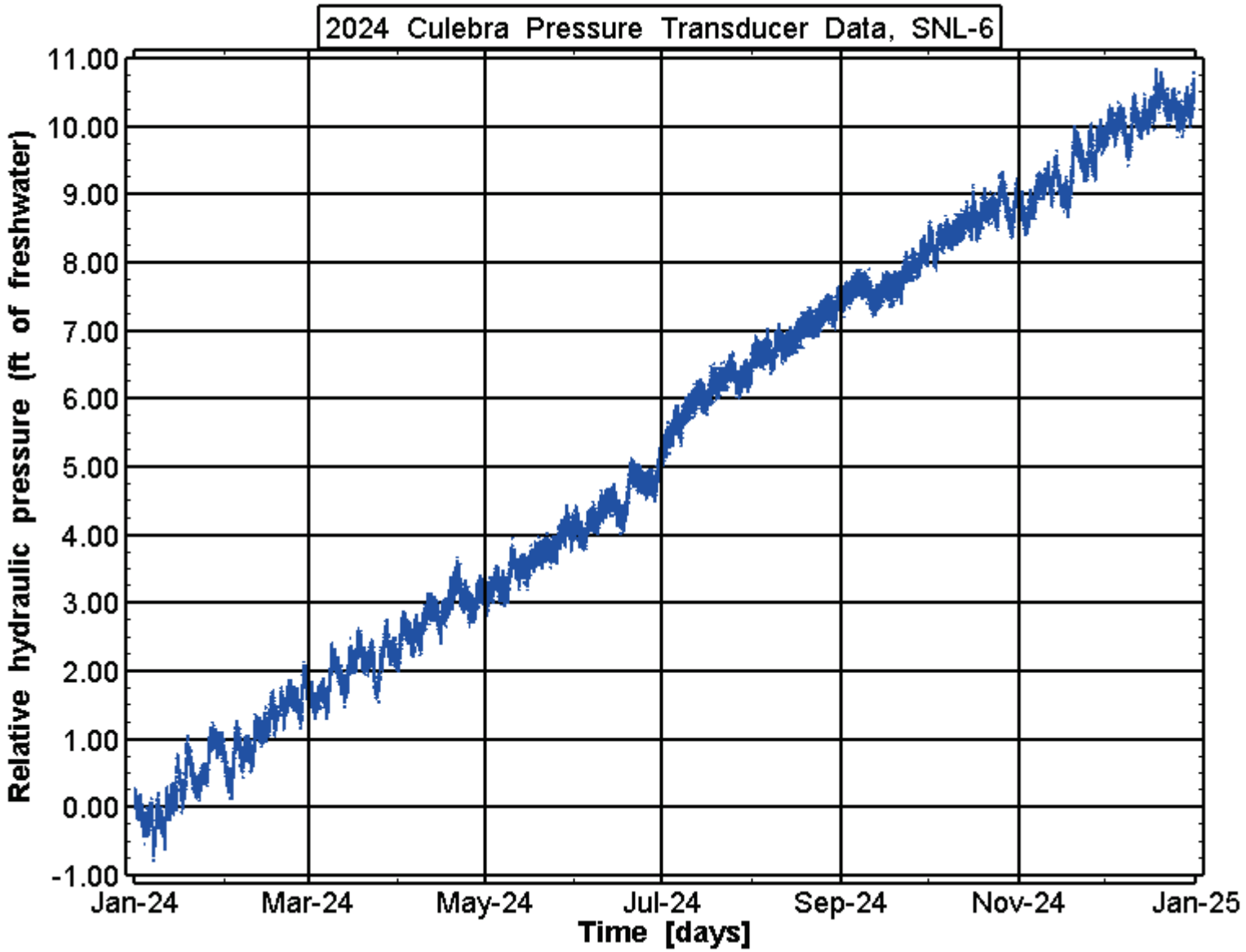
Appendix-Figure 25. Well SNL-3 experienced a net change in pressure head of 1.18 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



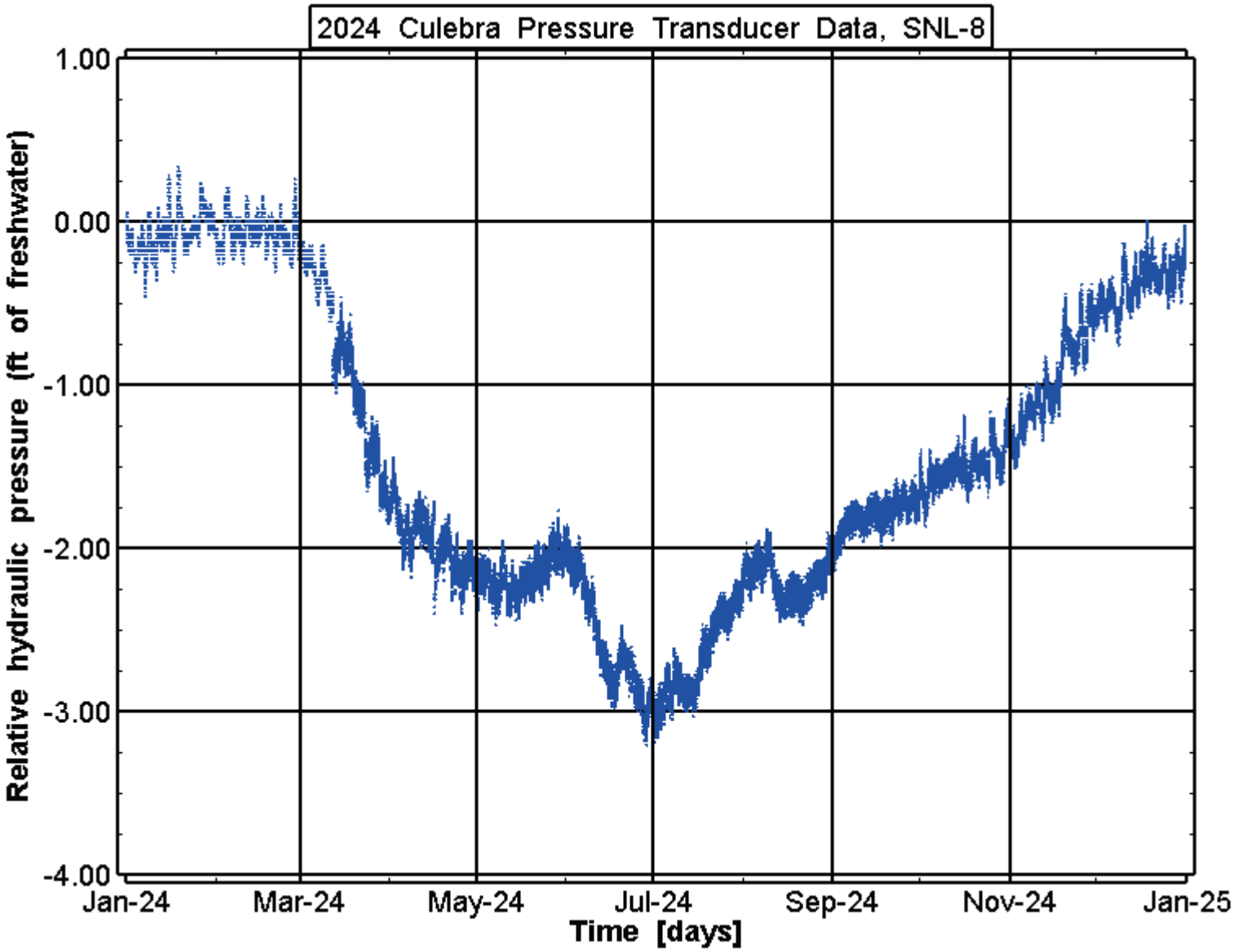
Appendix-Figure 26. Well SNL-5 experienced a net change in pressure head of 2.07 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

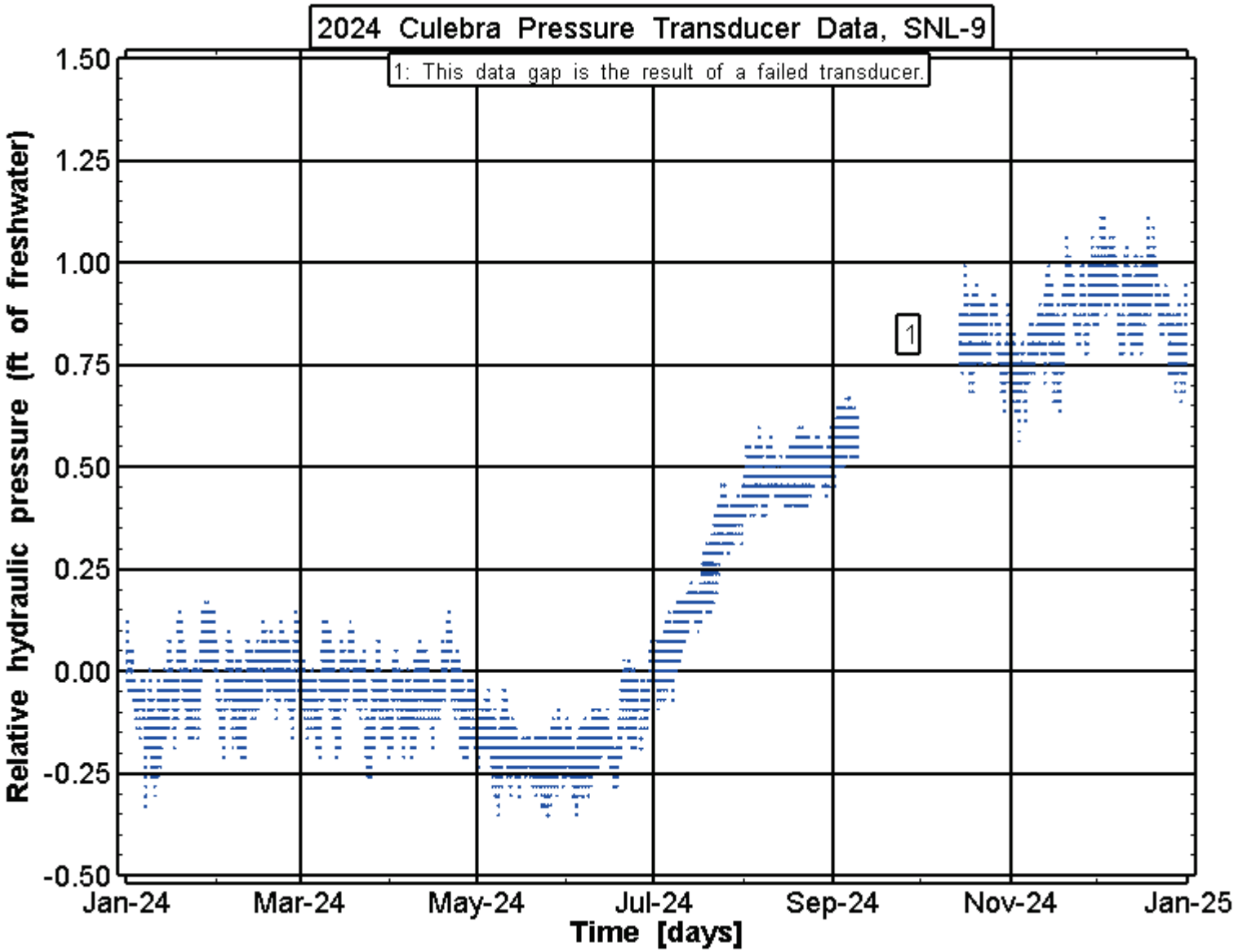


Appendix-Figure 27. Well SNL-6 experienced a net change in pressure head of 10.52 ft fresh water in 2024. The well is in long-term recovery from well development.

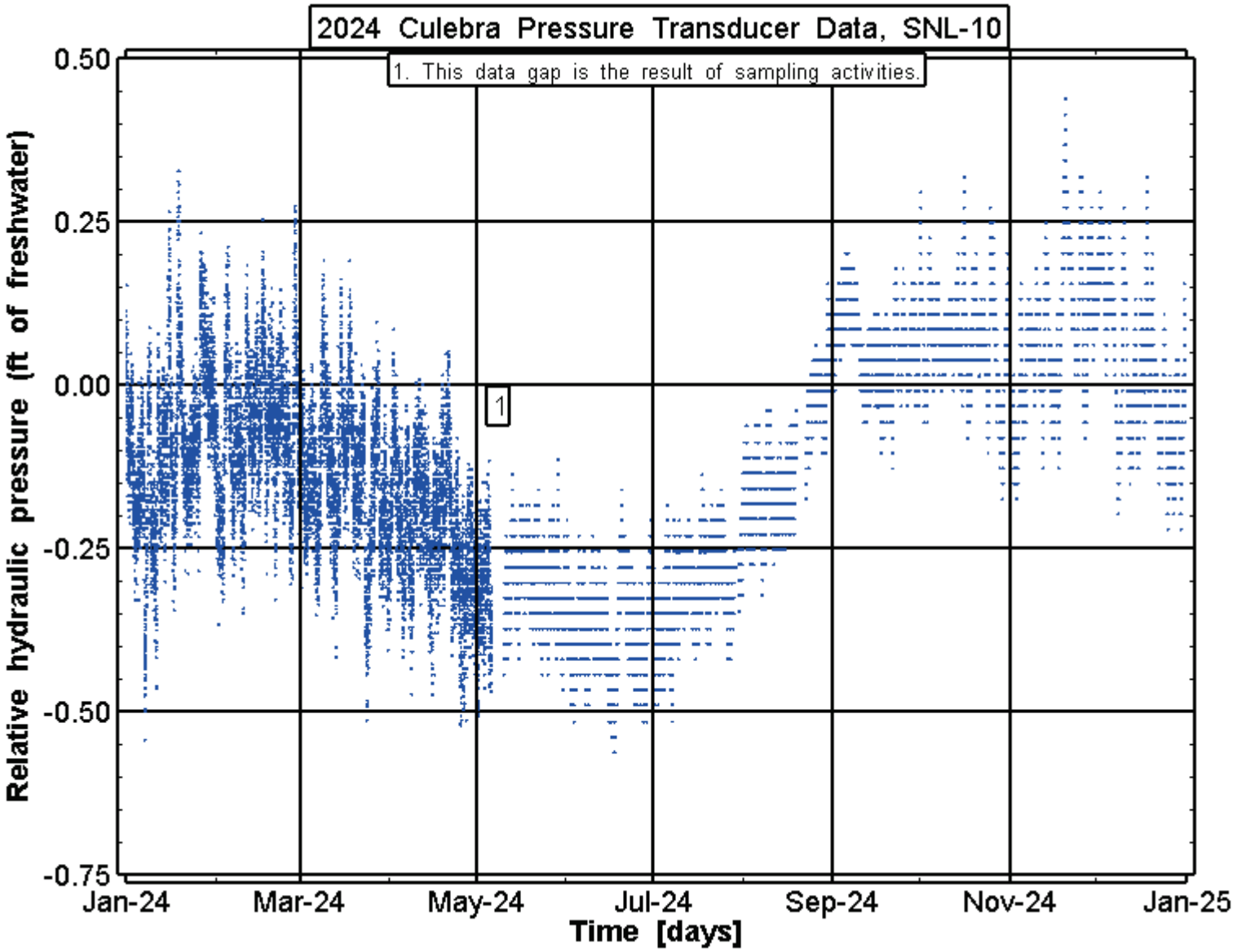
Exceptional Service in the National Interest
Information Only



Appendix-Figure 28. Well SNL-8 experienced a net change in pressure head of -0.22 ft fresh water in 2024. This well was affected by NWRA.

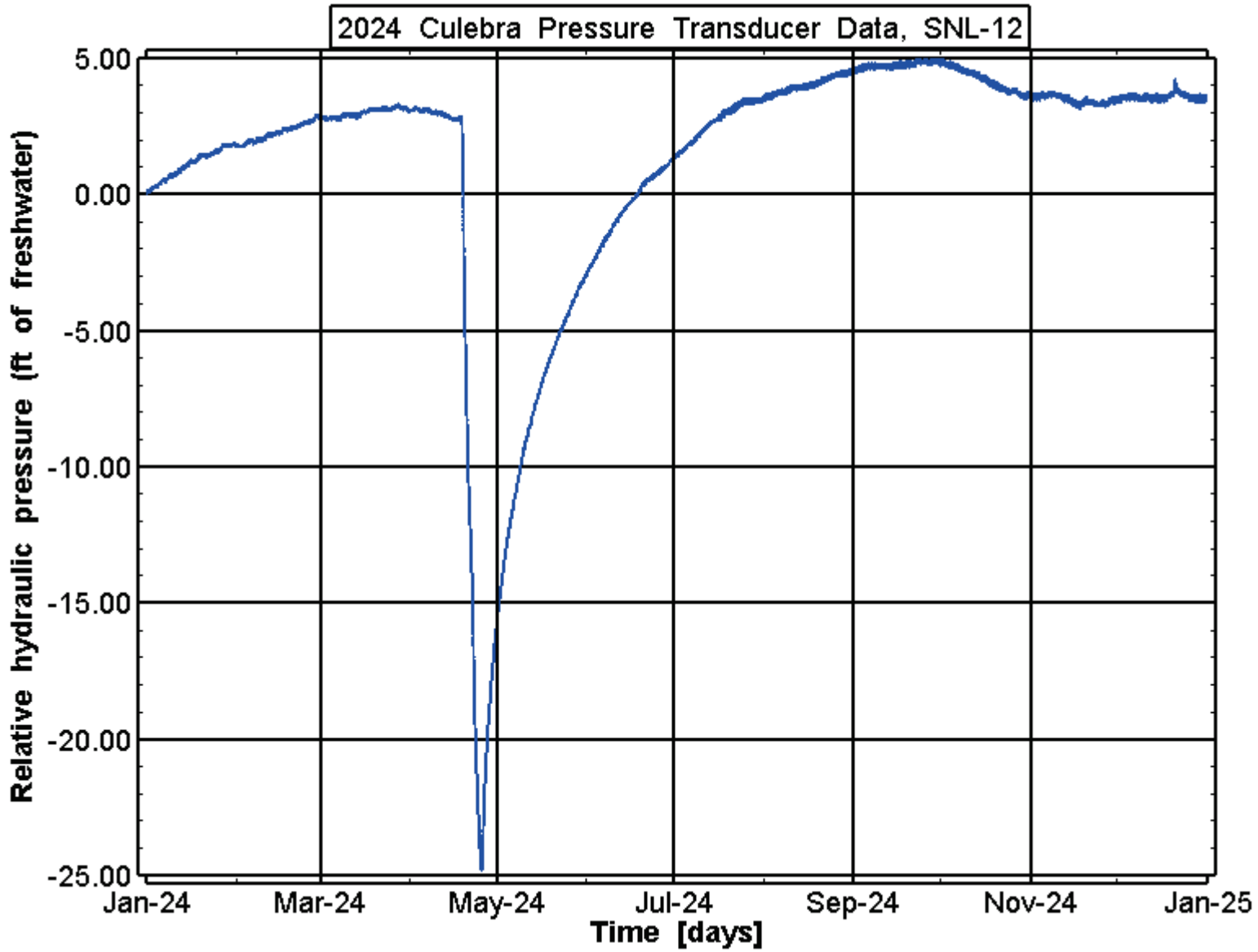


Appendix-Figure 29. Well SNL-9 experienced a net change in pressure head of 0.73 ft fresh water in 2024.



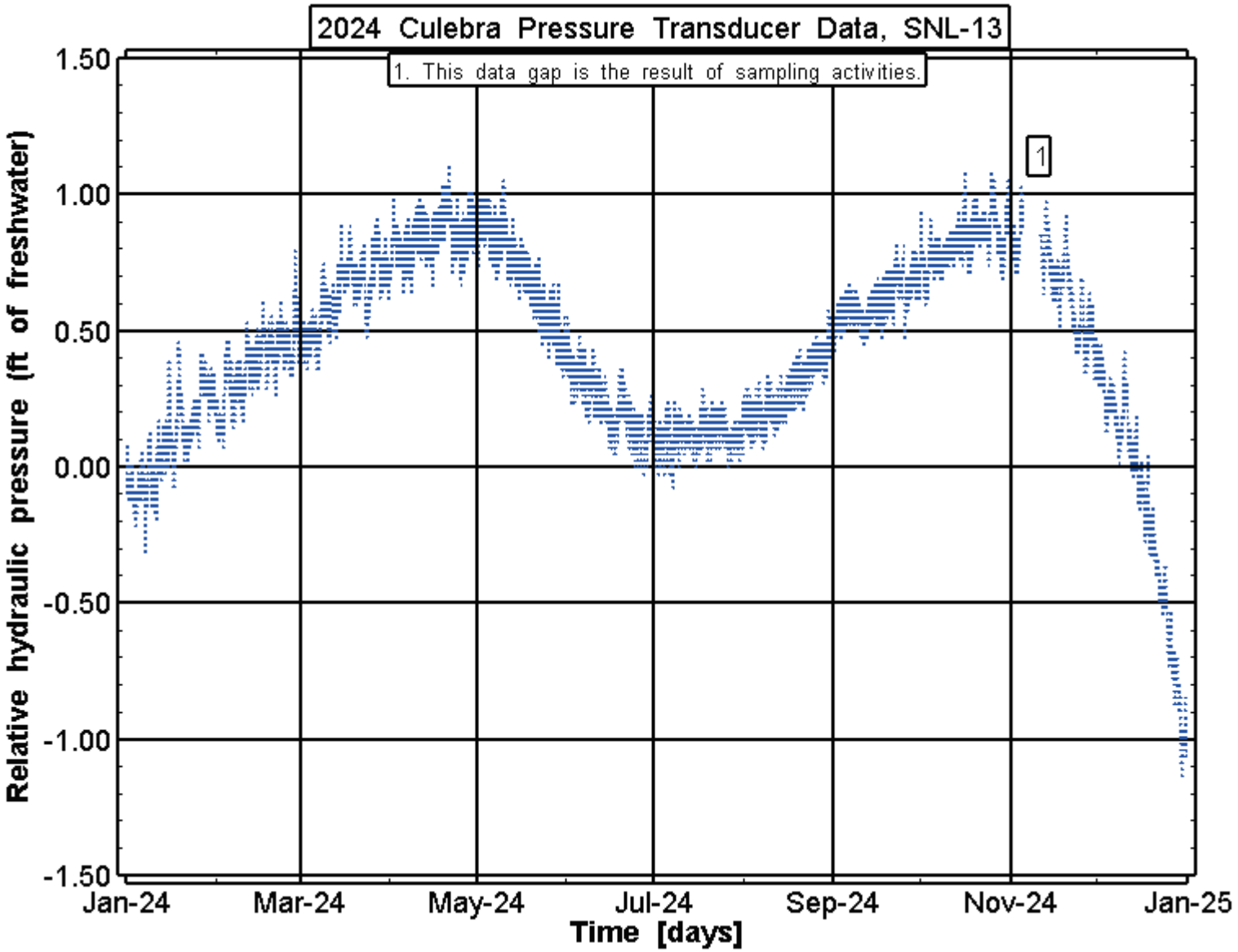
Appendix-Figure 30. Well SNL-10 experienced a net change in pressure head of -0.03 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

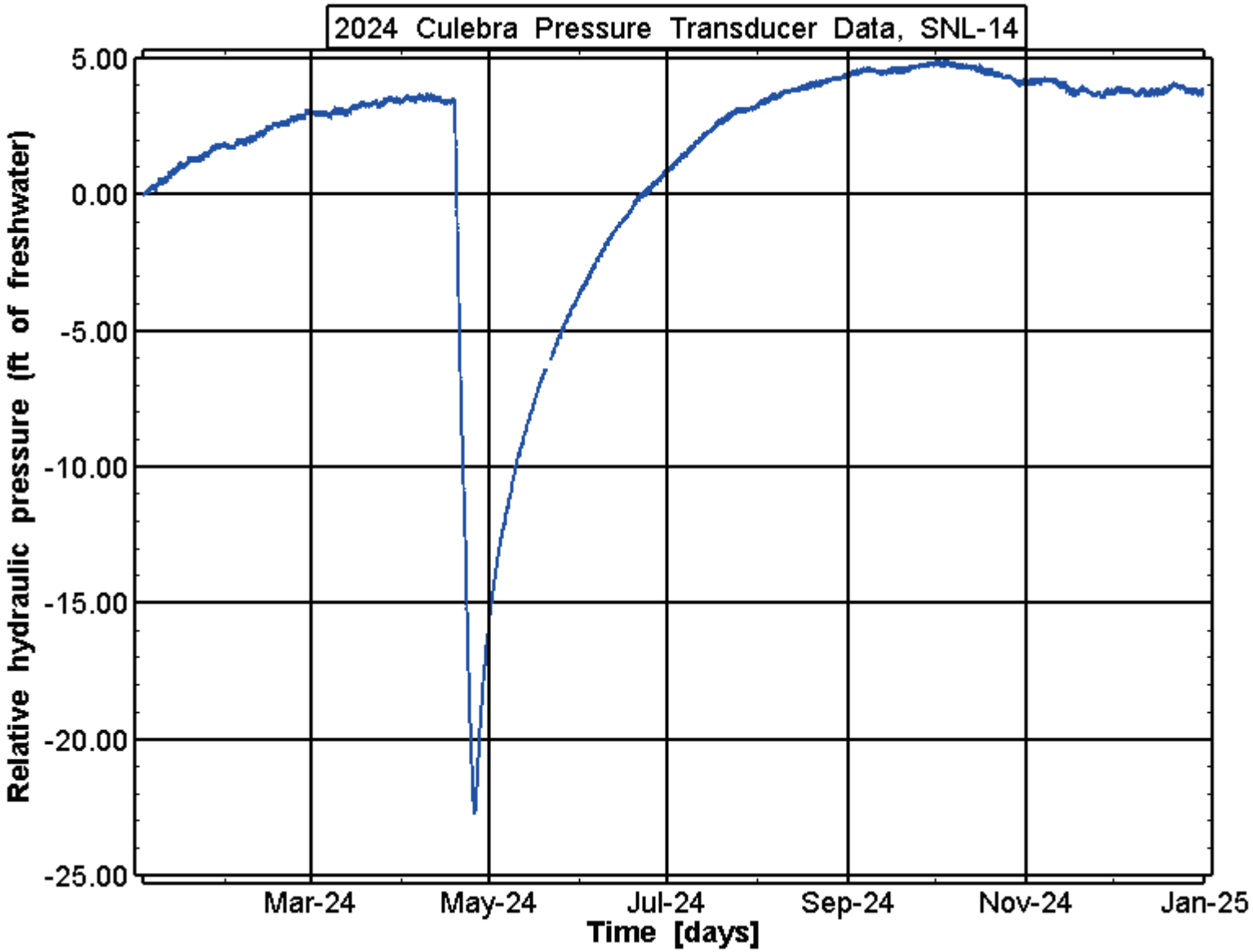


Appendix-Figure 31. Well SNL-12 experienced a net change in pressure head of 3.51 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only

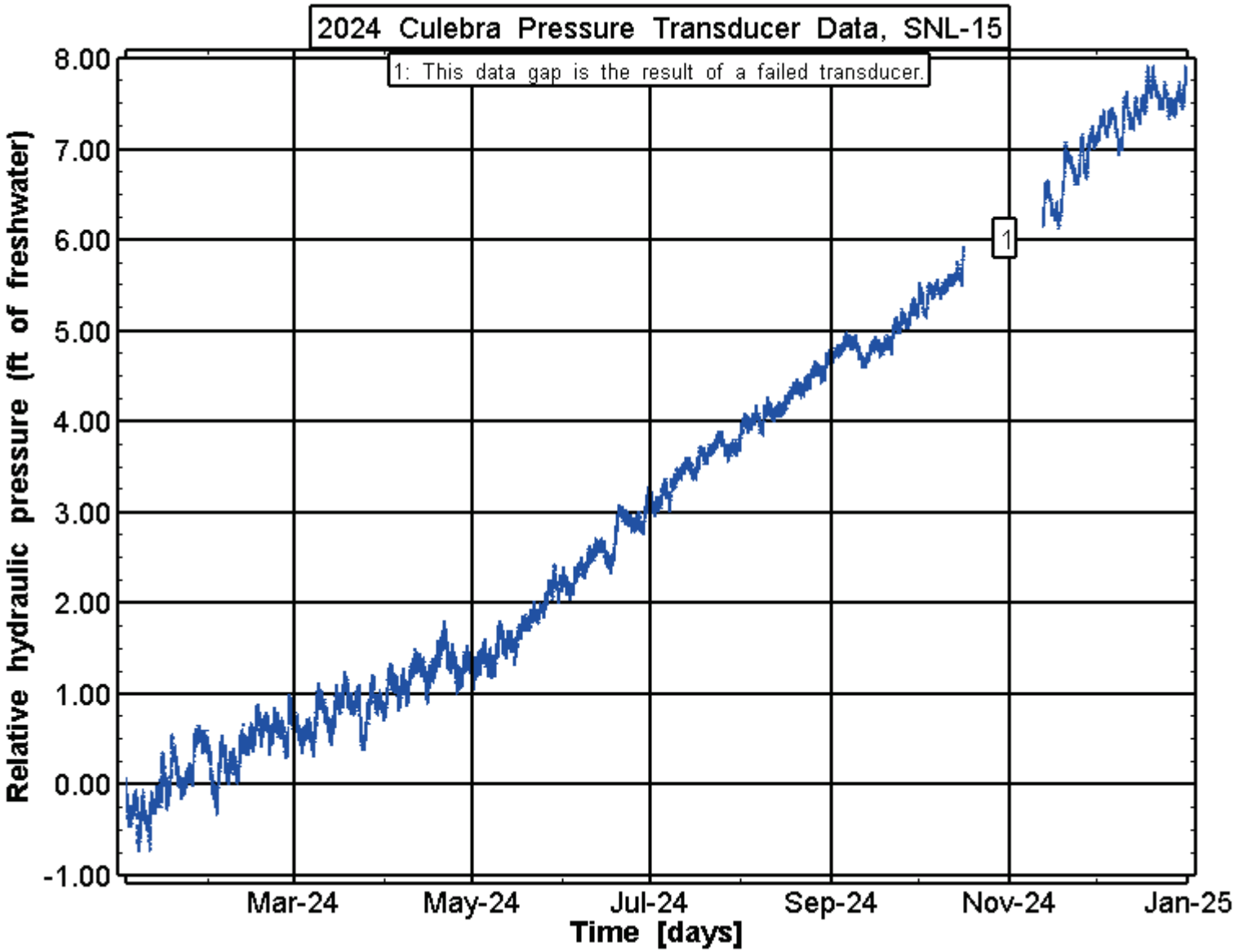


Appendix-Figure 32. Well SNL-13 experienced a net change in pressure head of -1.06 ft fresh water in 2024.



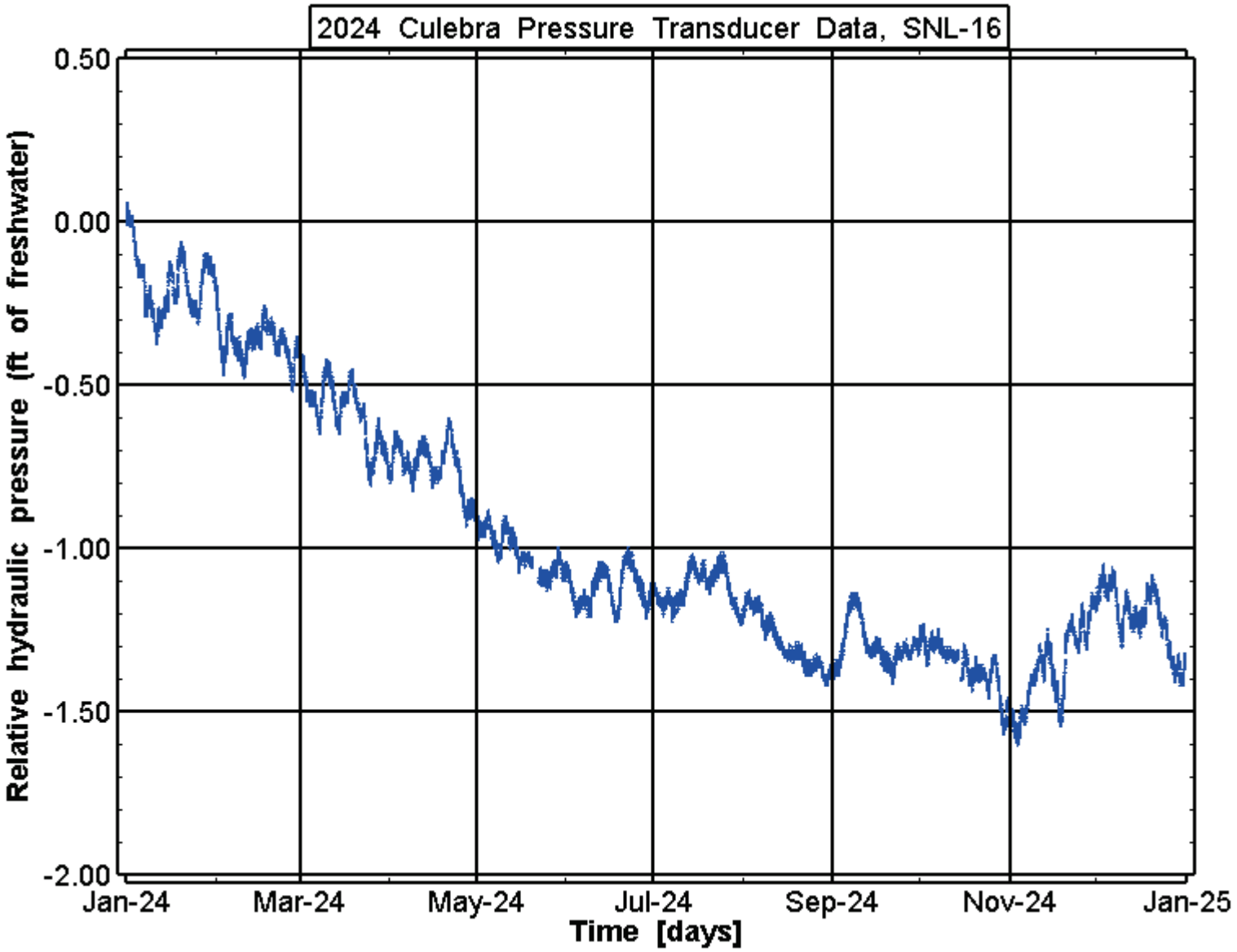
Appendix-Figure 33. Well SNL-14 experienced a net change in pressure head of 3.69 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only



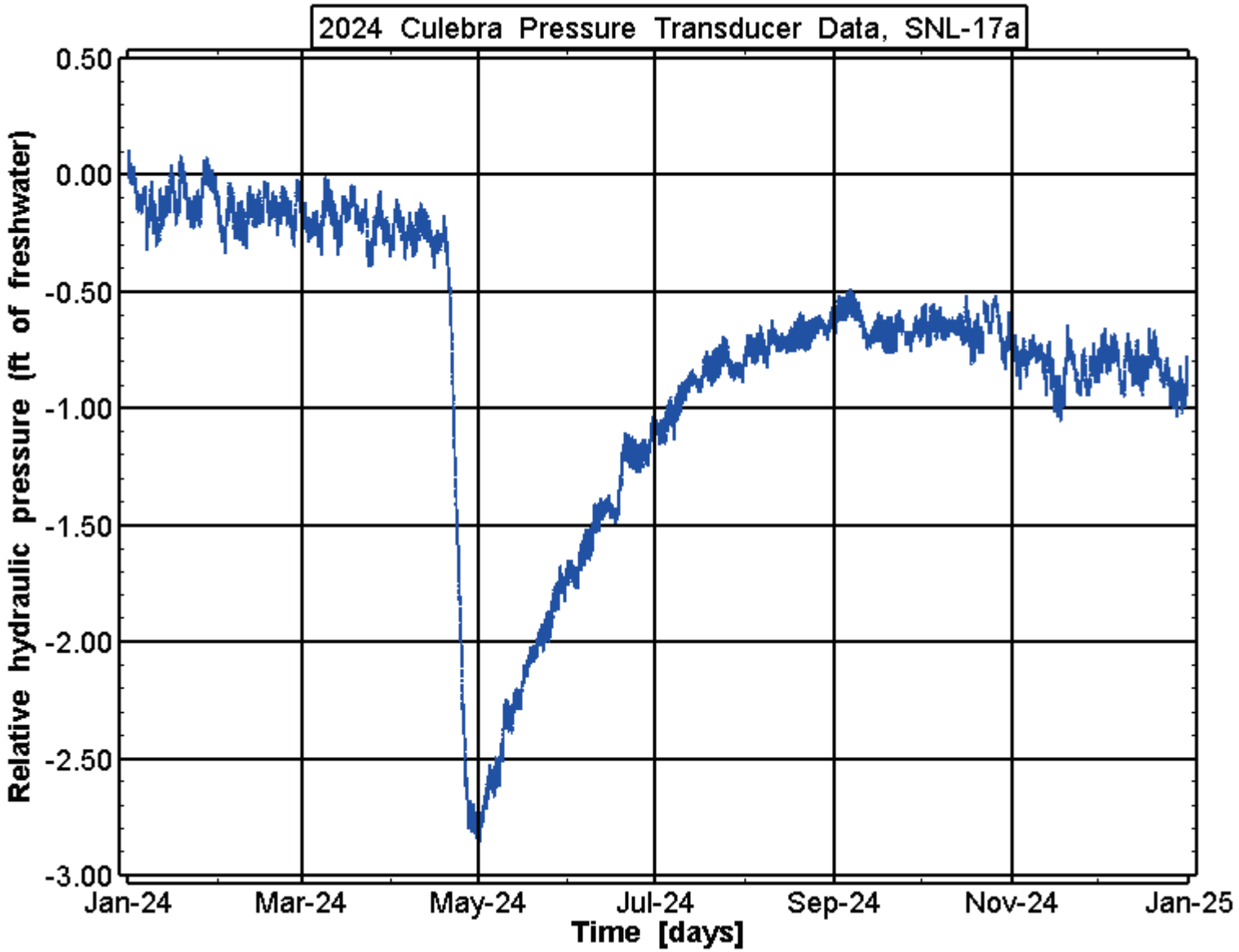
Appendix-Figure 34. Well SNL-15 experienced a net change in pressure head of 7.79 ft fresh water in 2024. The well is in long-term recovery from well development.

Information Only



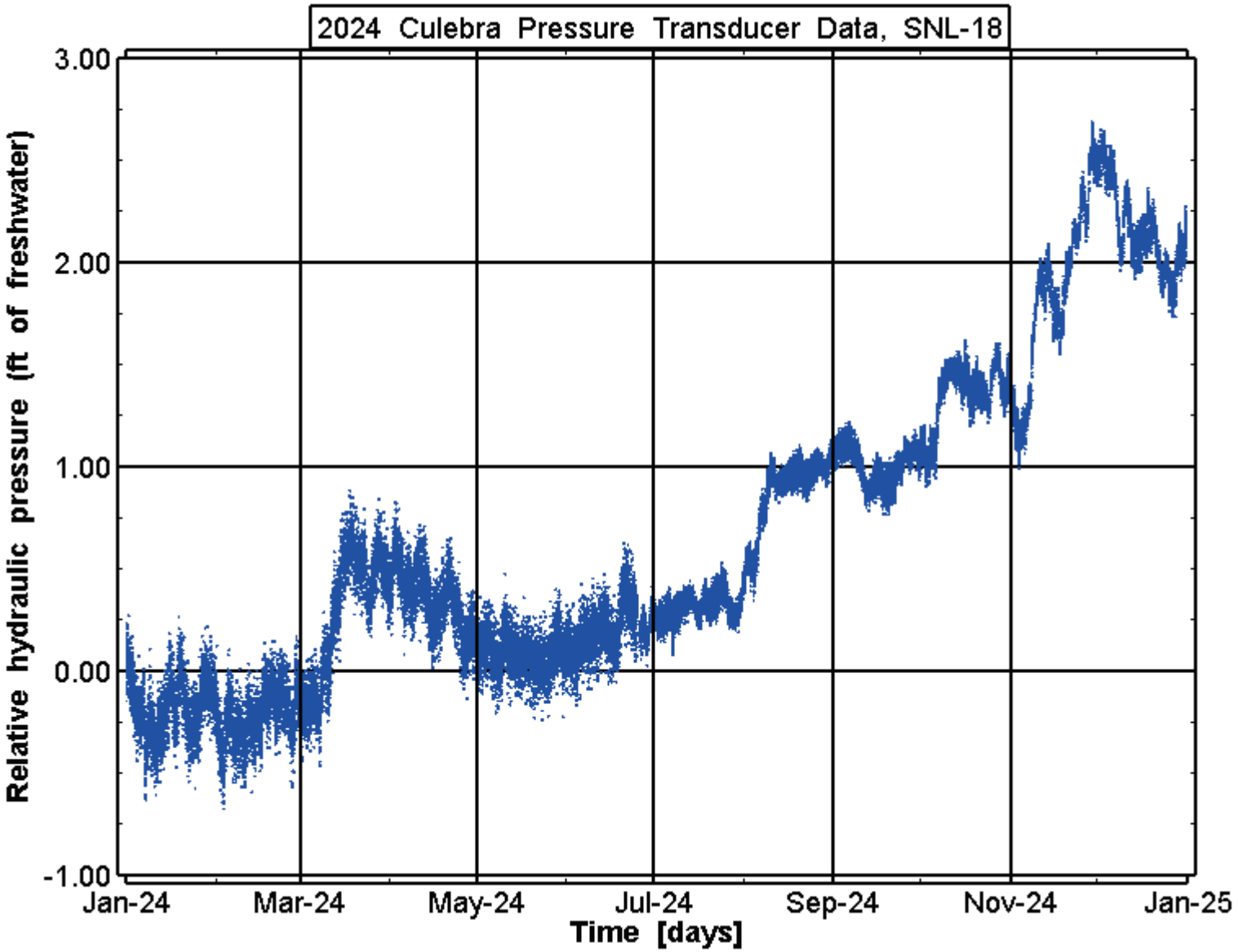
Appendix-Figure 35. Well SNL-16 experienced a net change in pressure head of -1.37 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



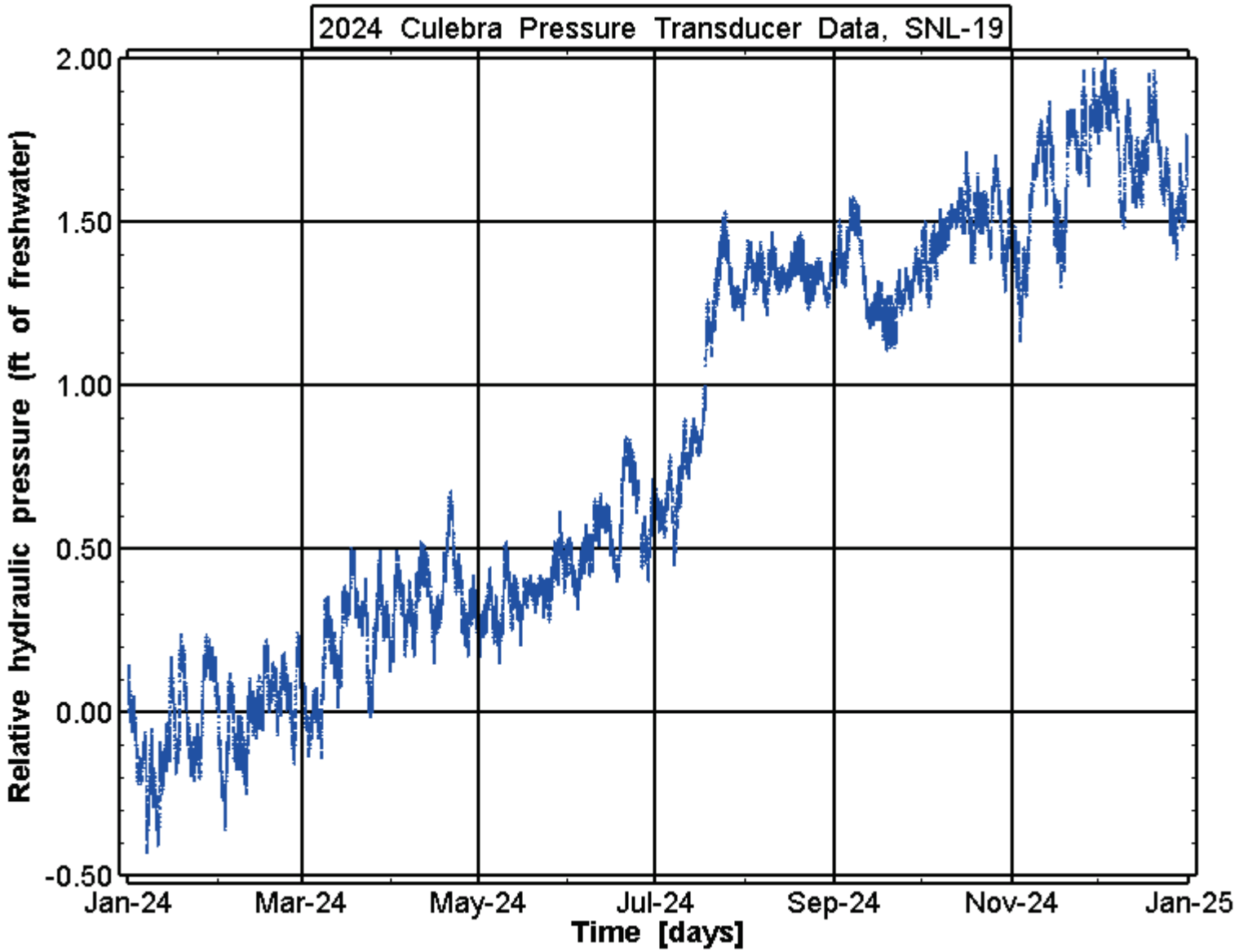
Appendix-Figure 36. Well SNL-17A experienced a net change in pressure head of -0.94 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only



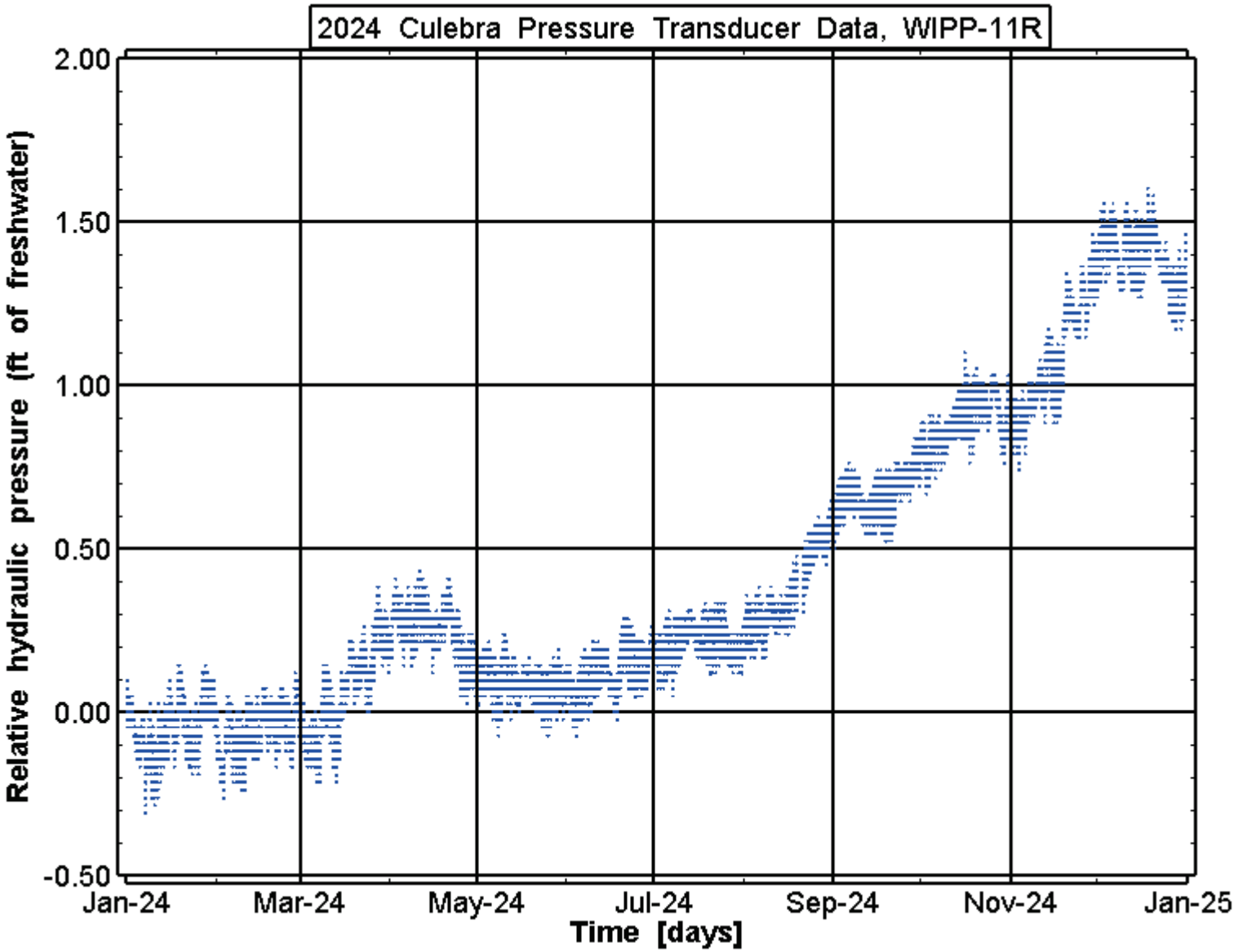
Appendix-Figure 37. Well SNL-18 experienced a net change in pressure head of 2.03 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



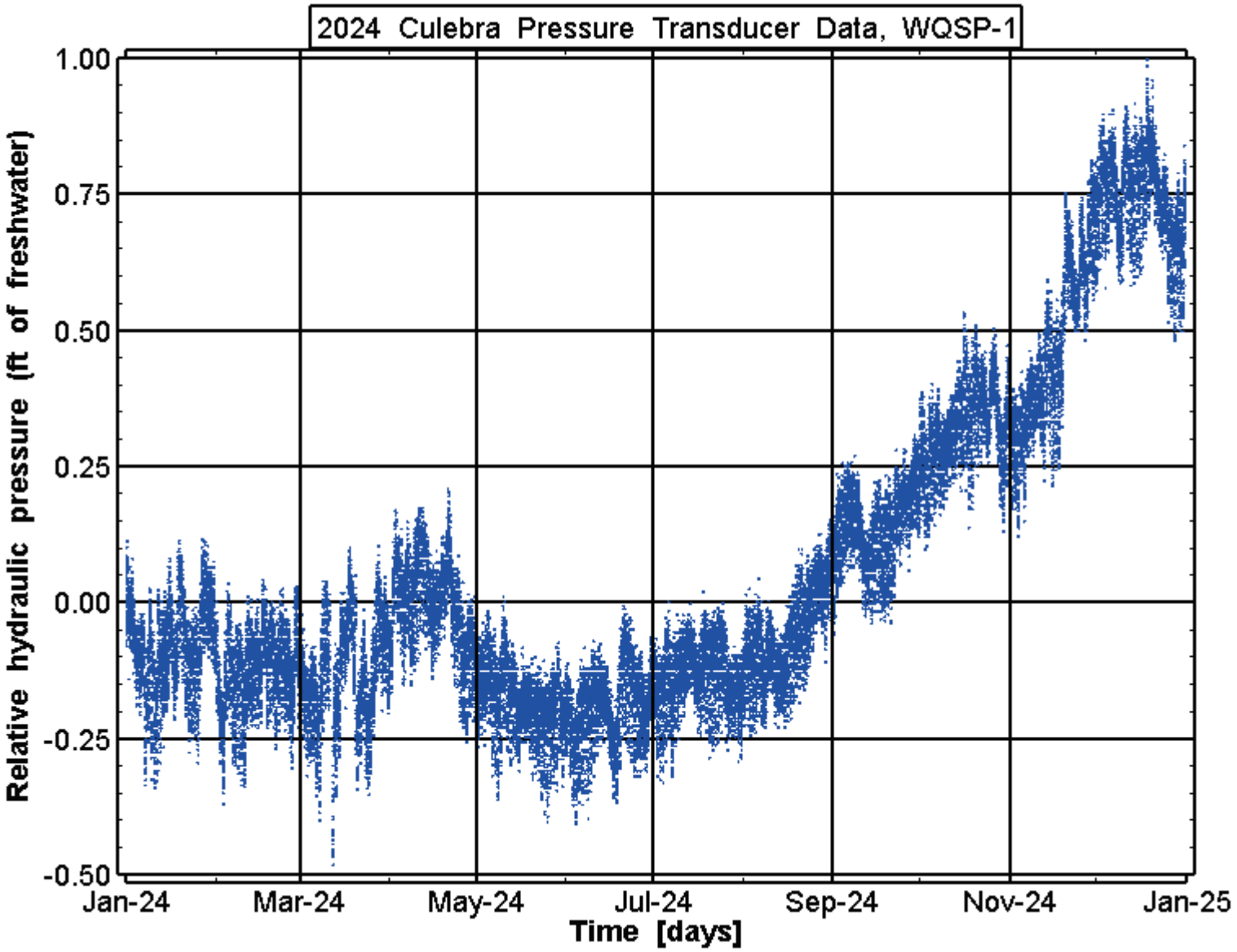
Appendix-Figure 38. Well SNL-19 experienced a net change in pressure head of 1.61 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



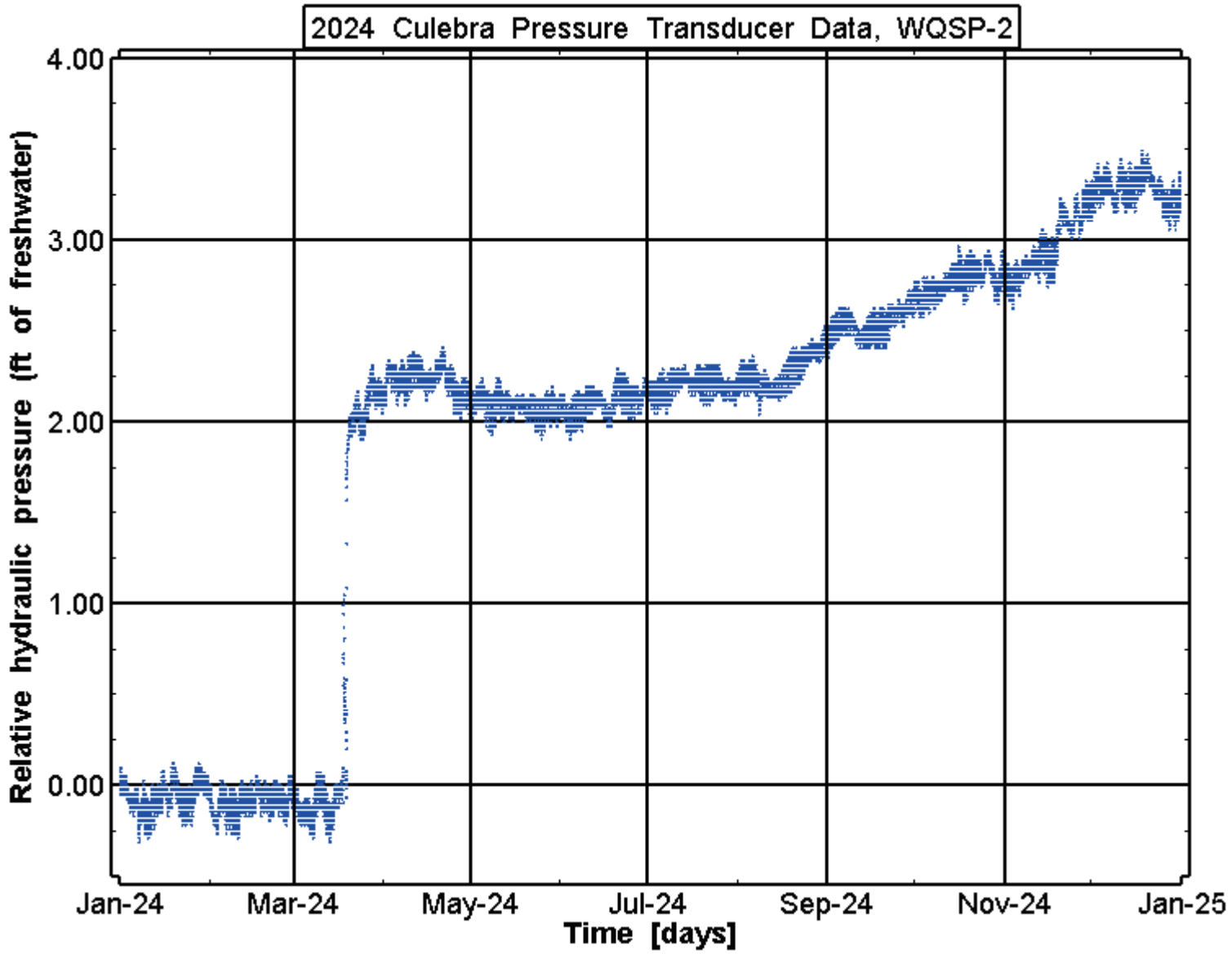
Appendix-Figure 39. Well WIPP-11R experienced a net change in pressure head of 1.27 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



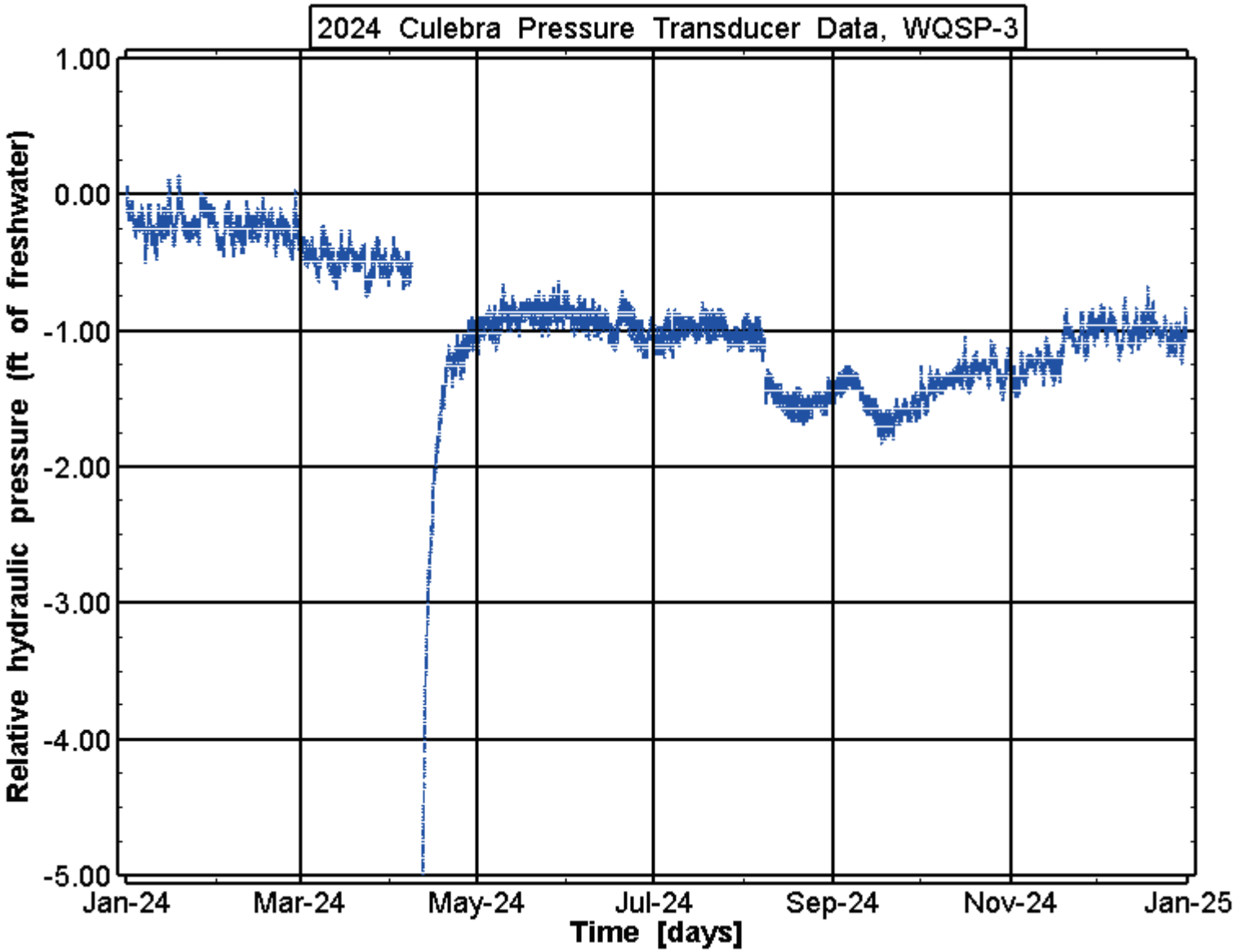
Appendix-Figure 40. Well WQSP-1 experienced a net change in pressure head of 0.62 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



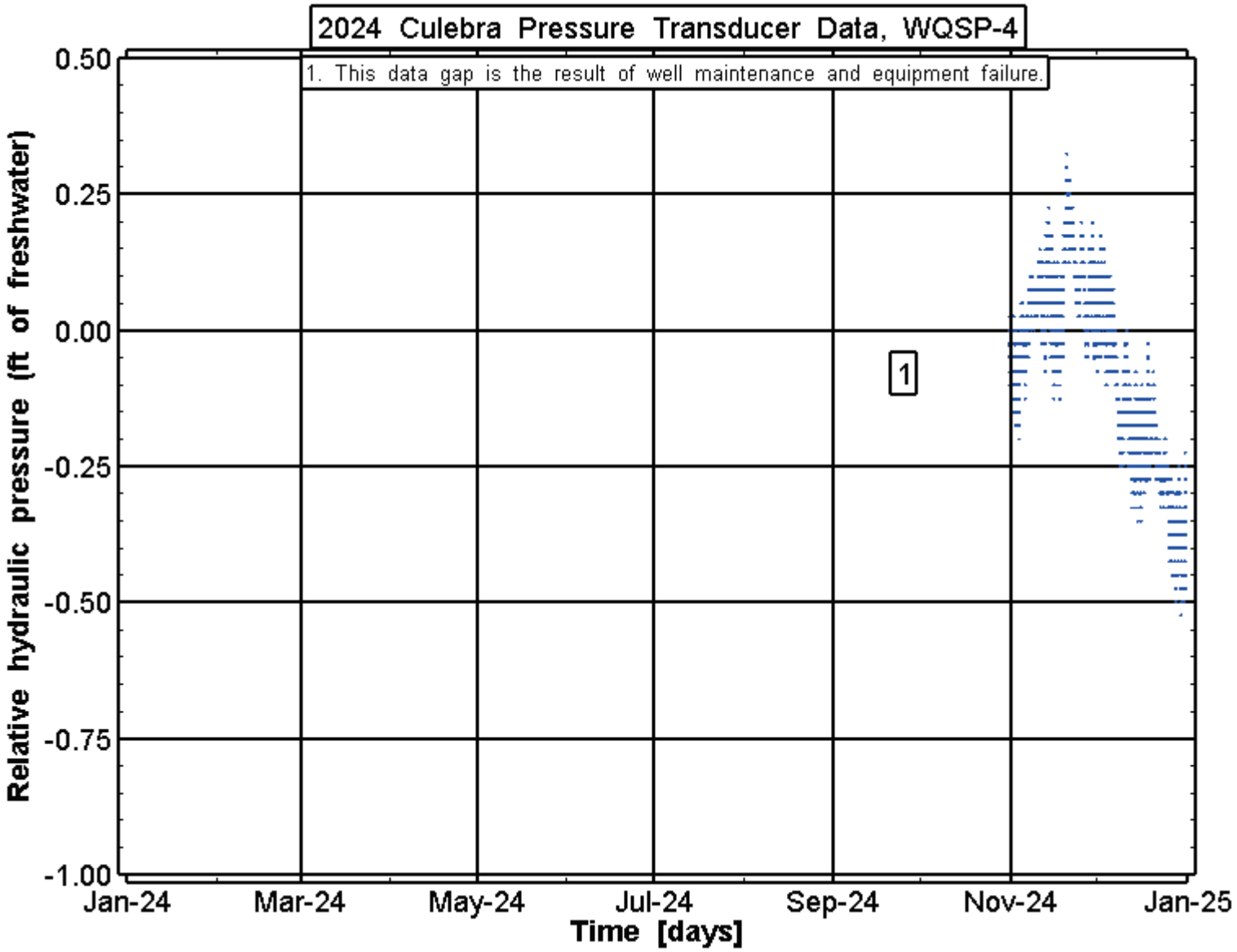
Appendix-Figure 41. Well WQSP-2 experienced a net change in pressure head of 3.15 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

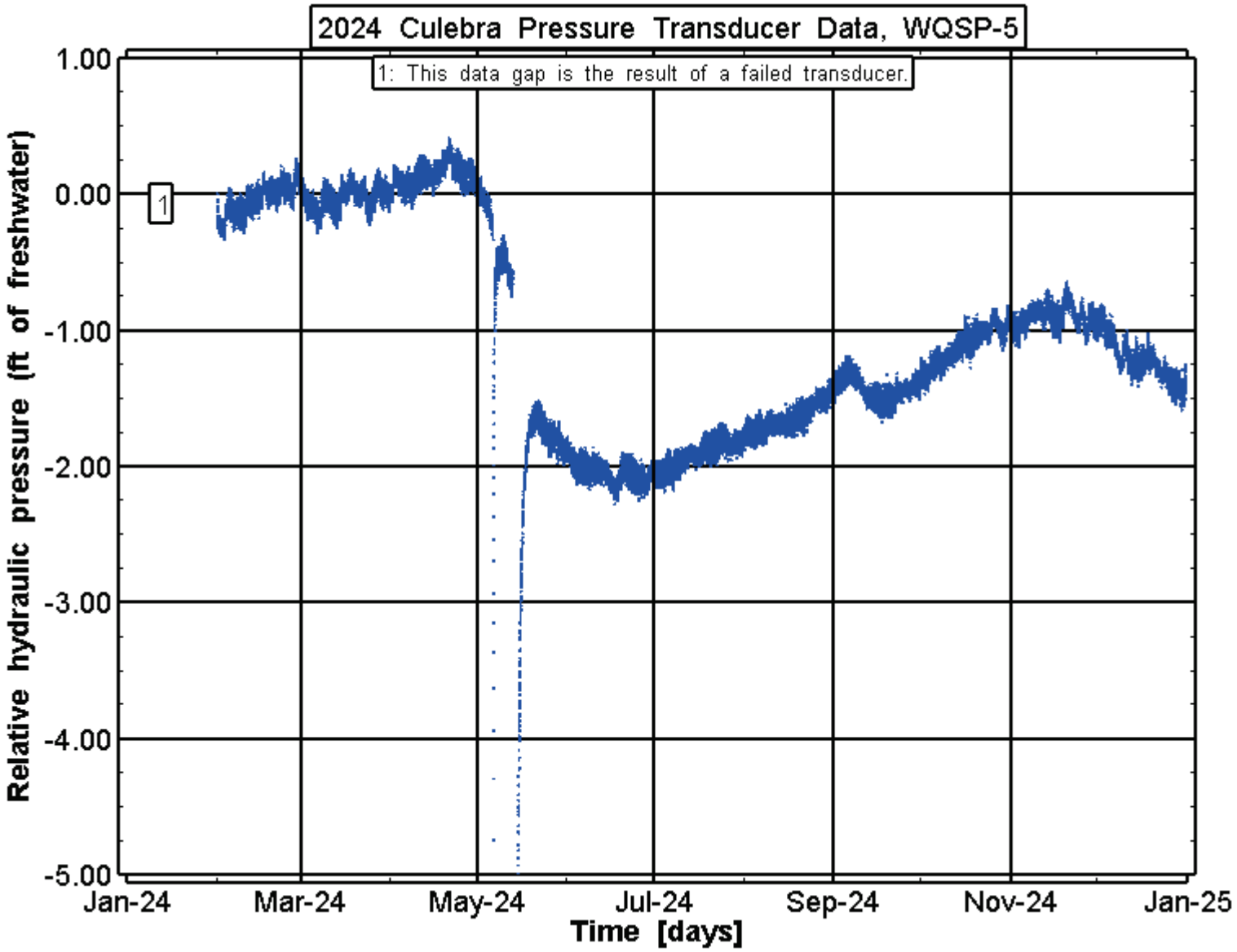


Appendix-Figure 42. Well WQSP-3 experienced a net change in pressure head of -1.03 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

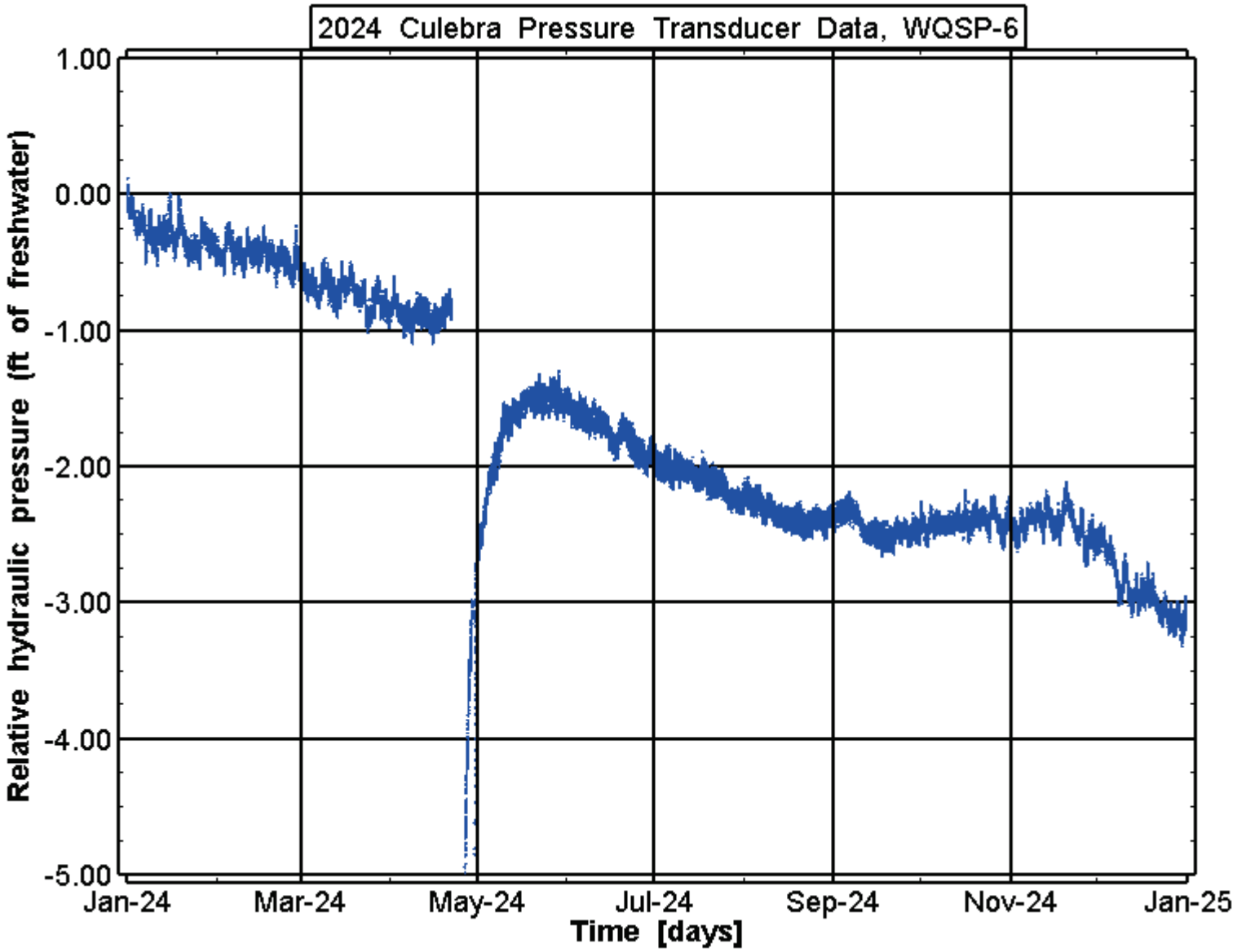


Appendix-Figure 43. Well WQSP-4 experienced a net change in pressure head of -0.47 ft fresh water in 2024.



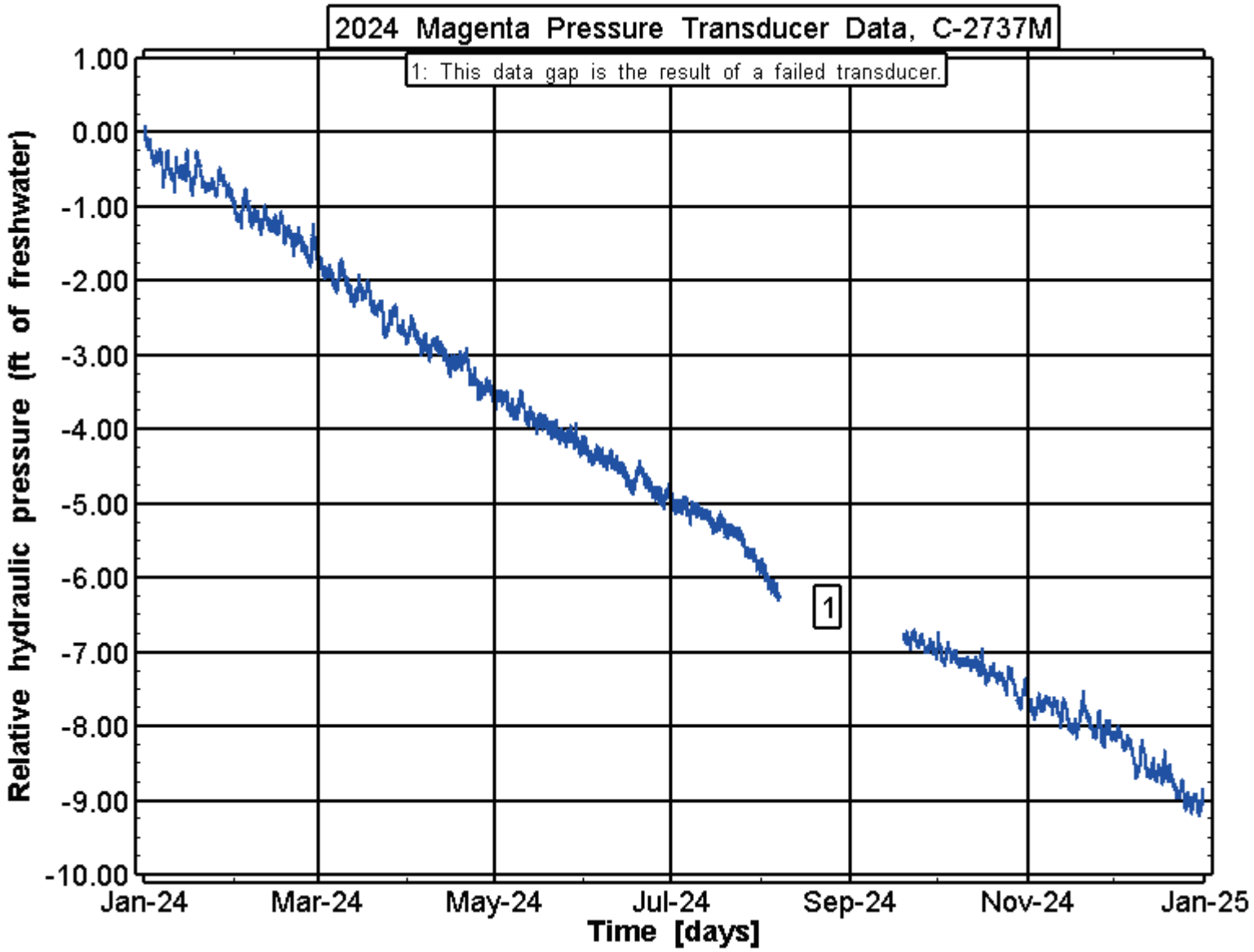
Appendix-Figure 44. Well WQSP-5 experienced a net change in pressure head of -1.51 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



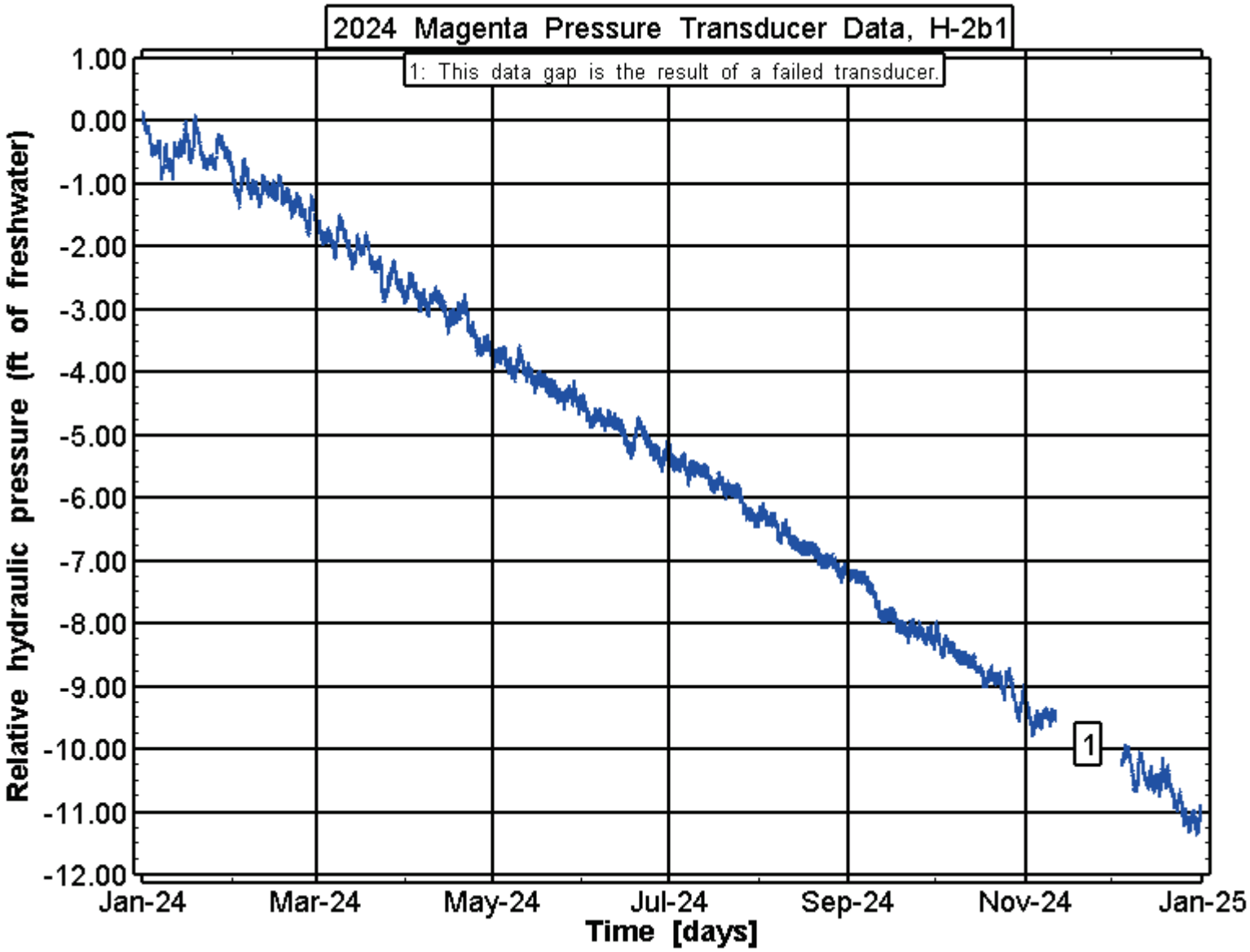
Appendix-Figure 45. Well WQSP-6 experienced a net change in pressure head of -3.14 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



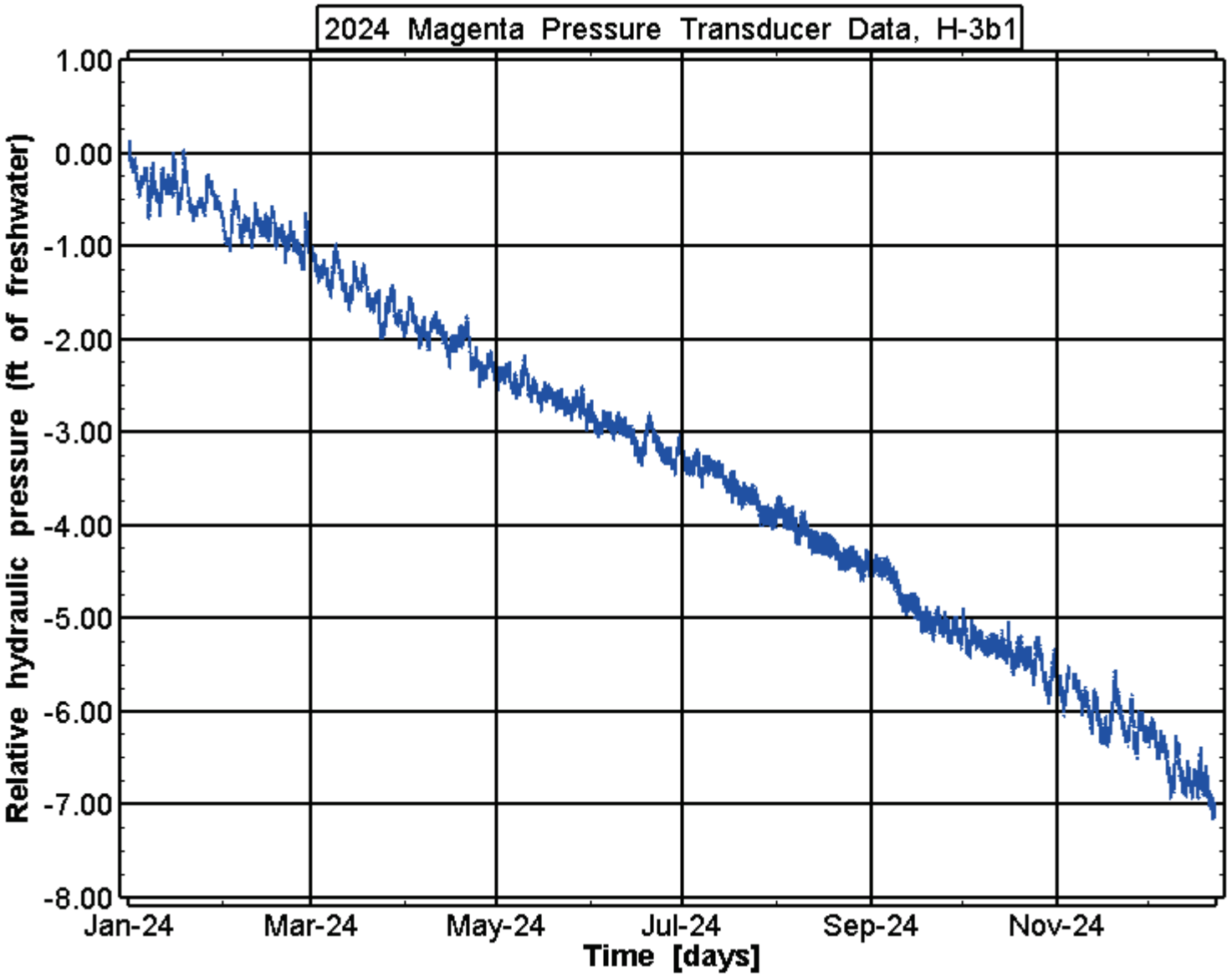
Appendix-Figure 46. Well C-2737M experienced a net pressure head of -9.04 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



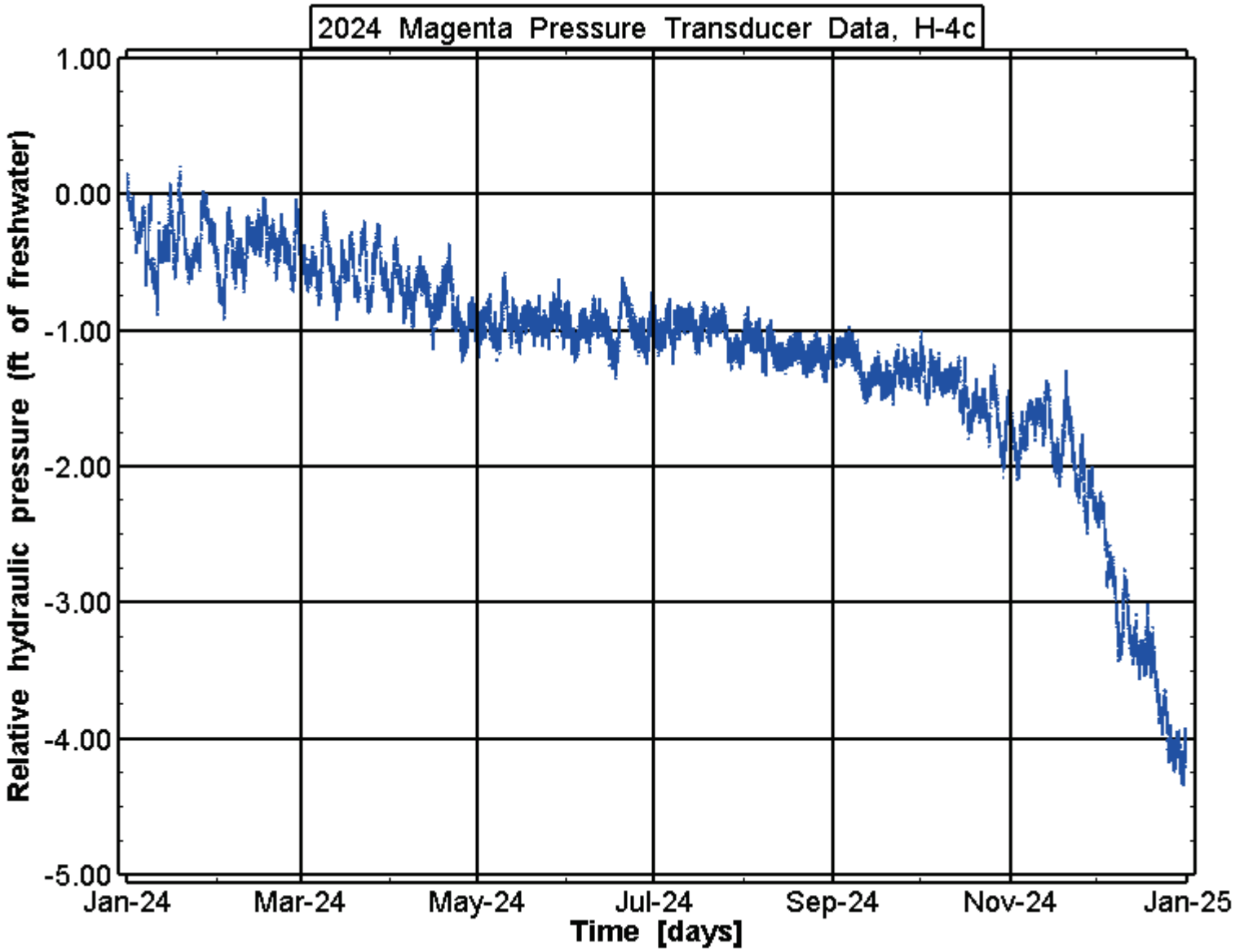
Appendix-Figure 47. Well H-2b1 experienced a net pressure head of -11.25 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



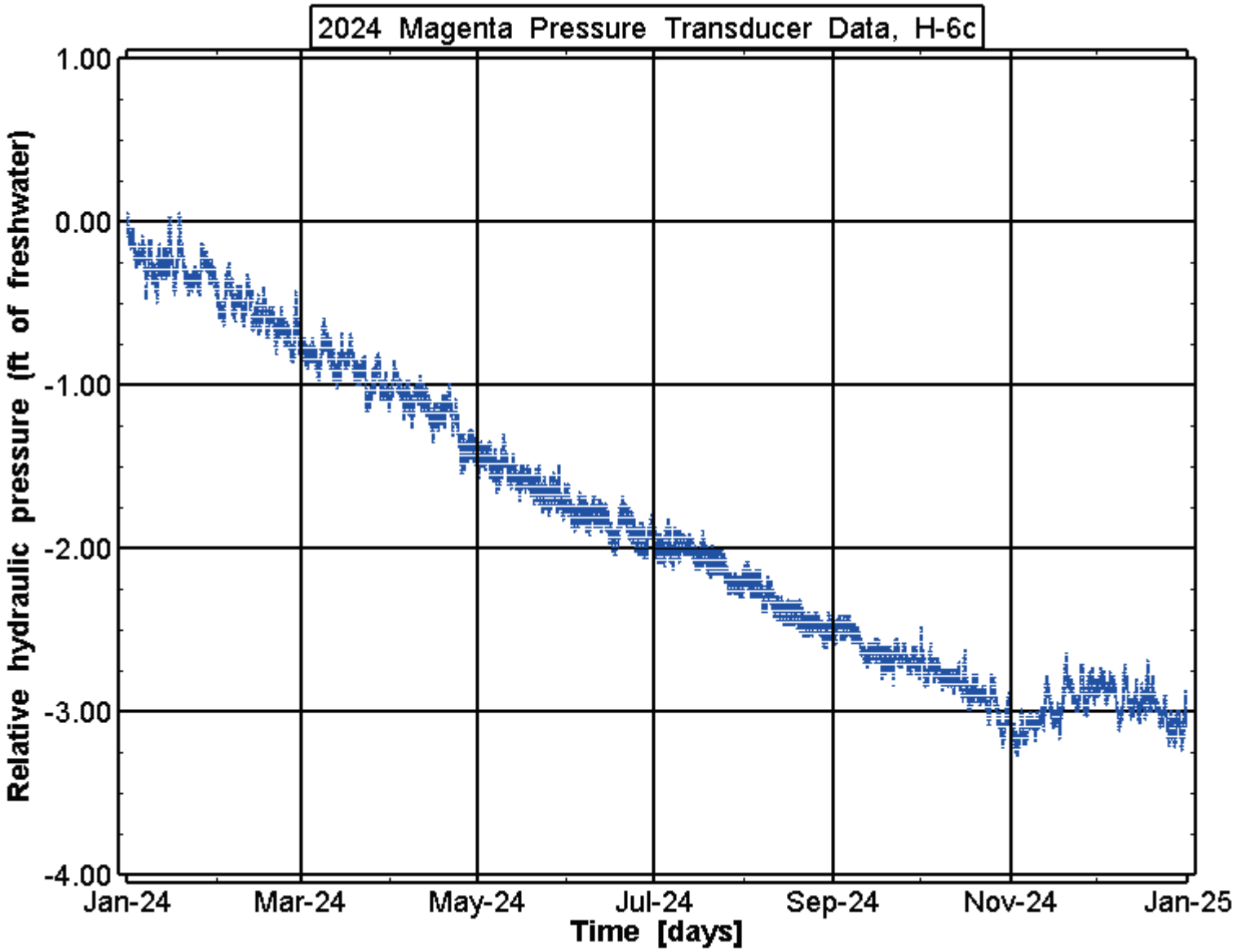
Appendix-Figure 48. Well H-3b1 experienced a net pressure head of -7.08 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



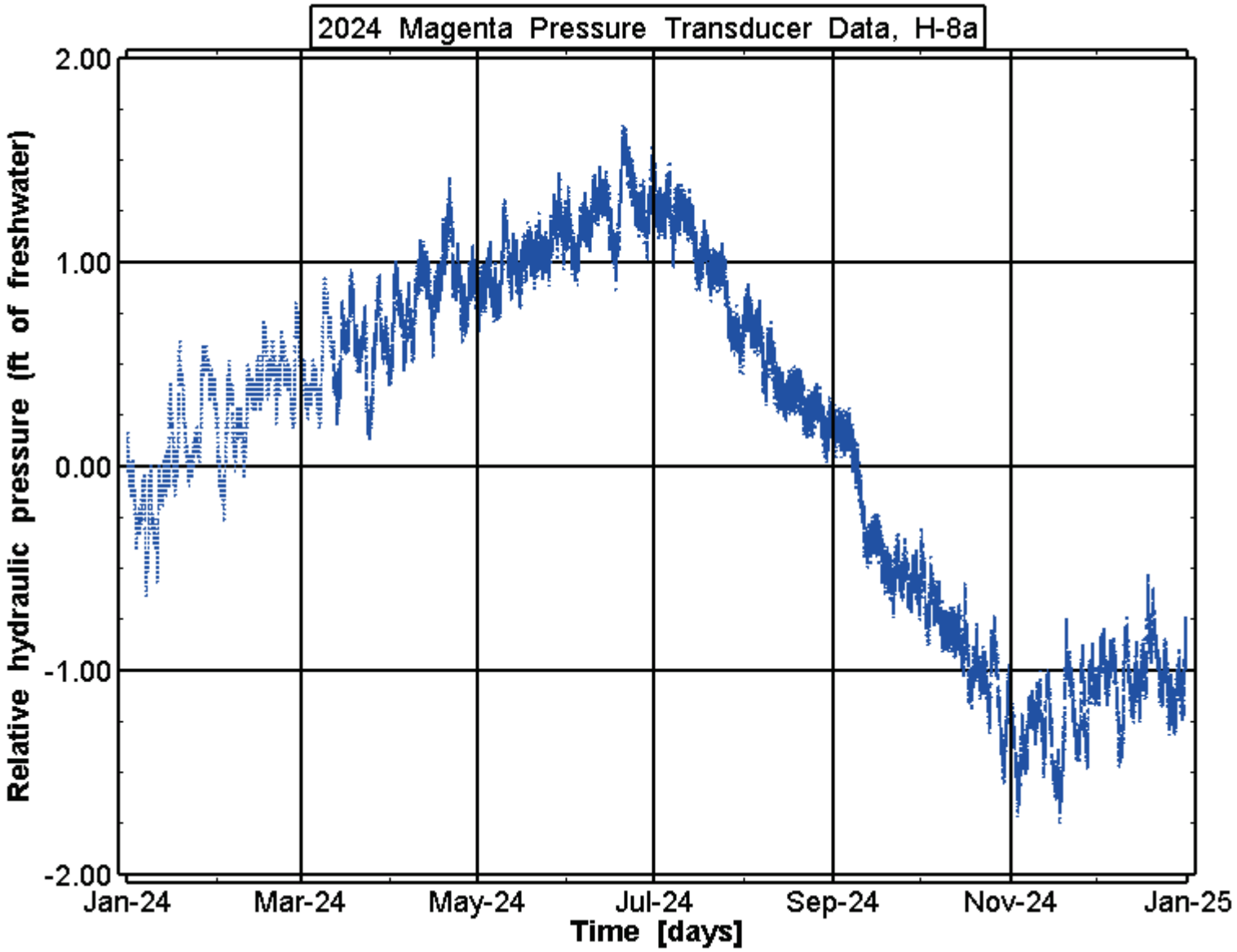
Appendix-Figure 49. Well H-4c experienced a net pressure head of -4.16 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



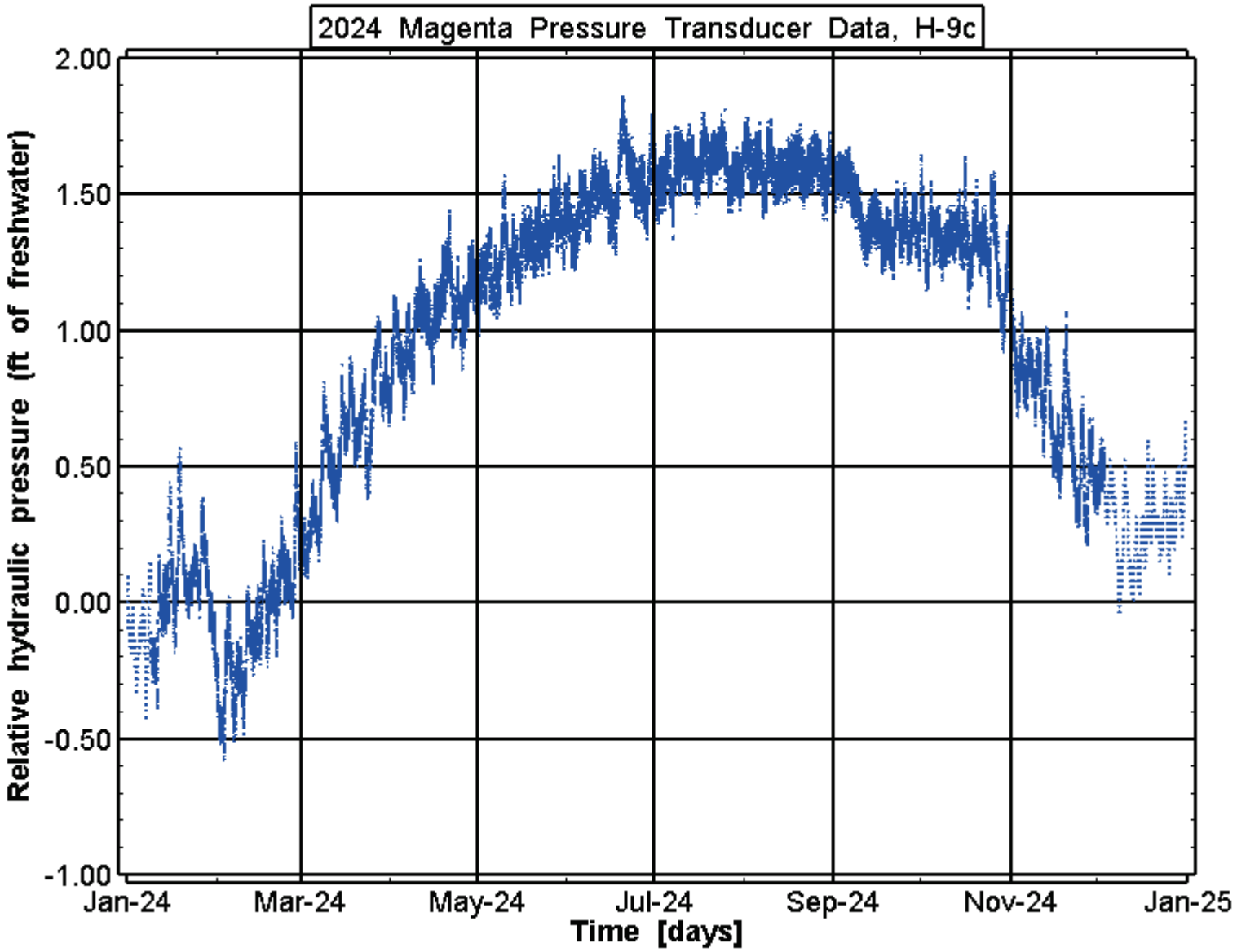
Appendix-Figure 50. Well H-6c experienced a net pressure head of -3.02 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



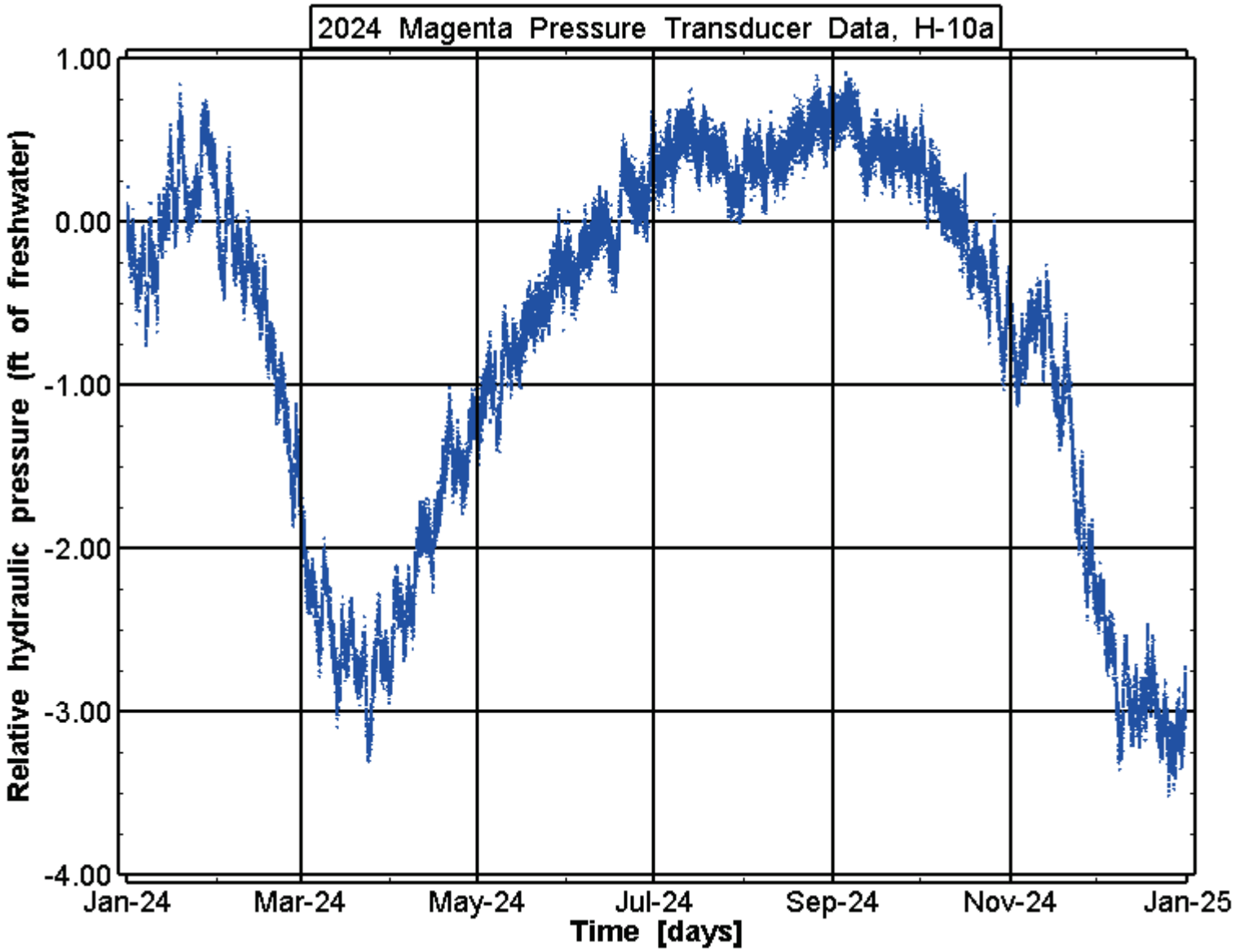
Appendix-Figure 51. Well H-8a experienced a net pressure head of -0.92 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only



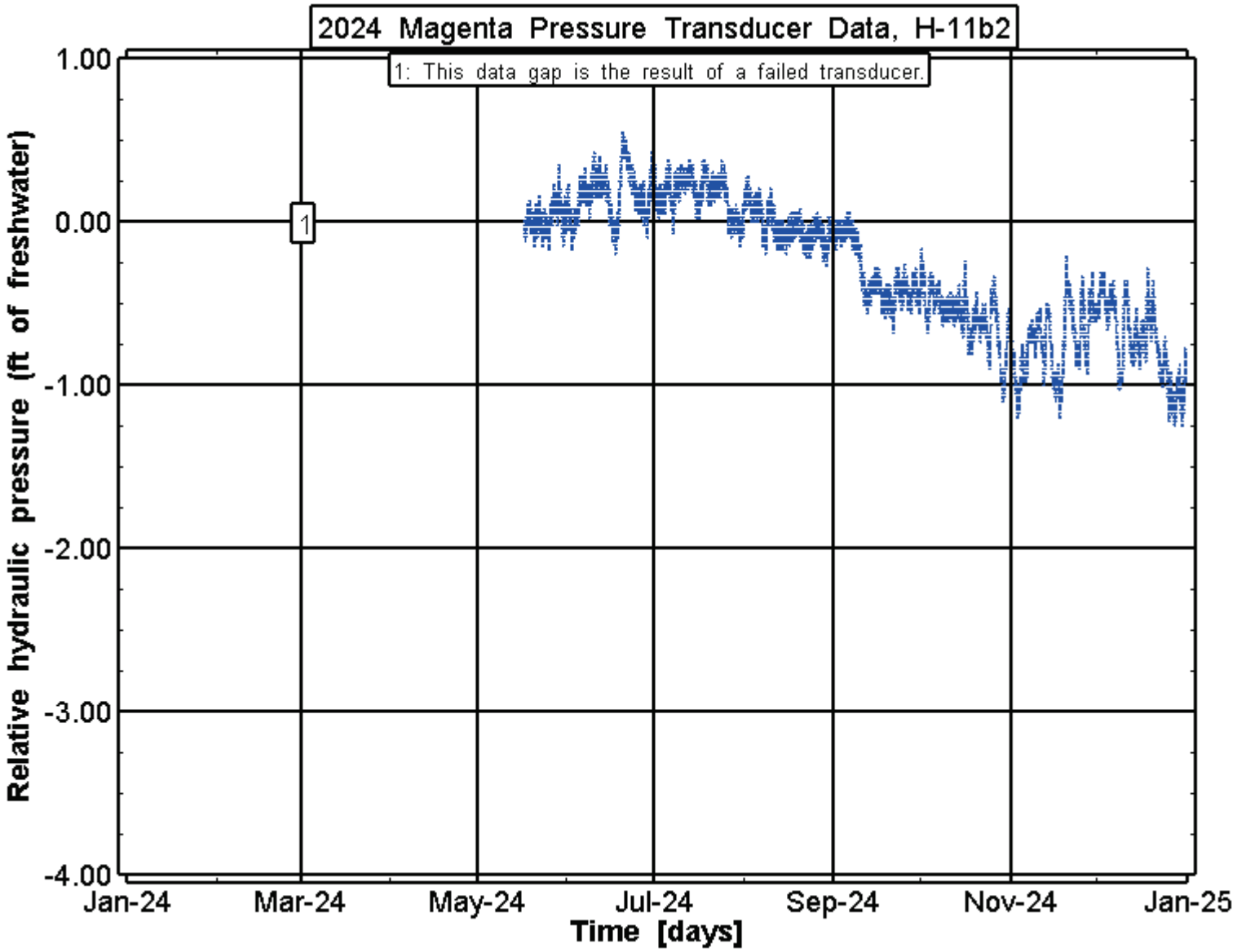
Appendix-Figure 52. Well H-9c experienced a net pressure head of 0.52 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only

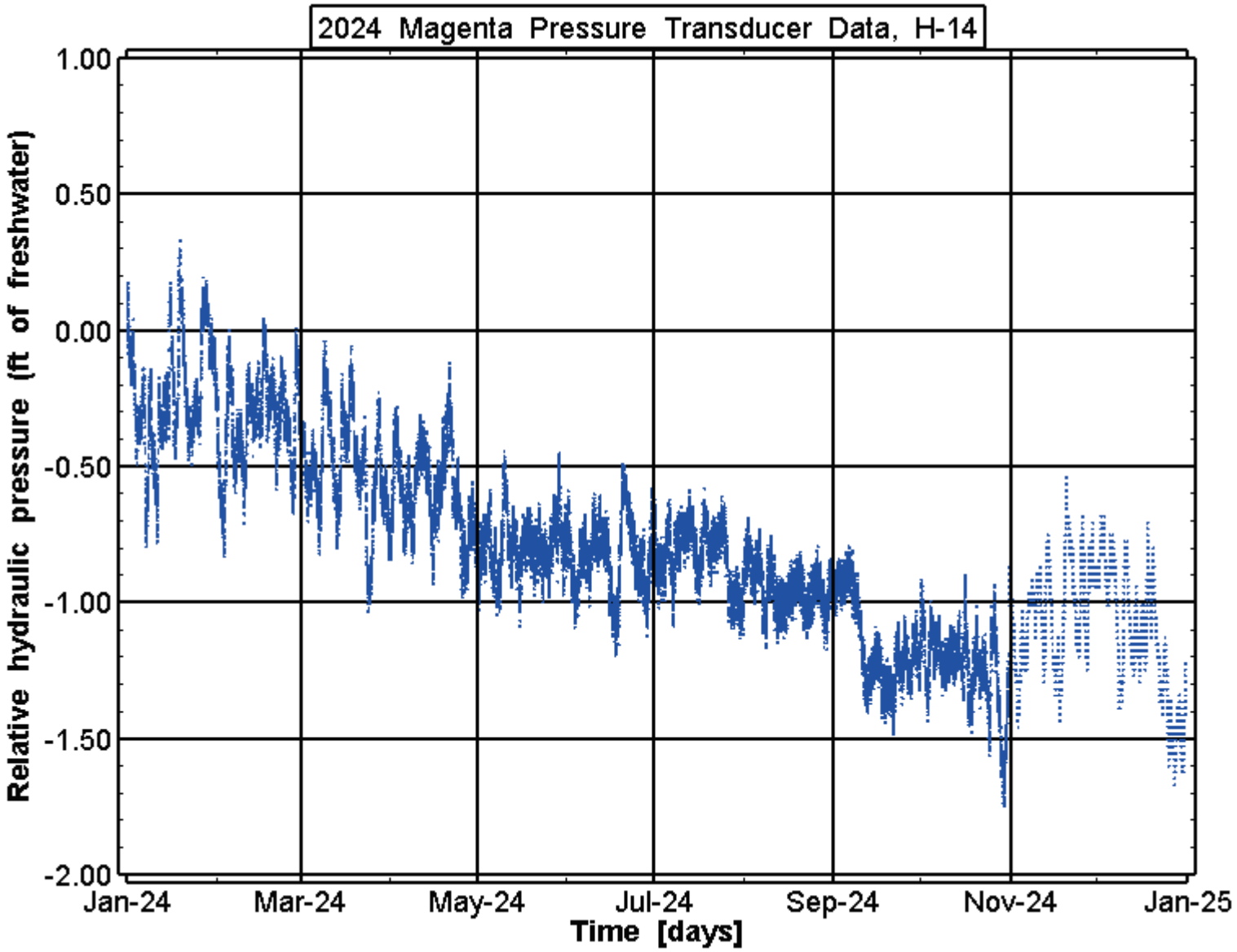


Appendix-Figure 53. Well H-10a experienced a net pressure head of -2.95 ft fresh water in 2024. This well was affected by NWRA.

Exceptional Service in the National Interest
Information Only

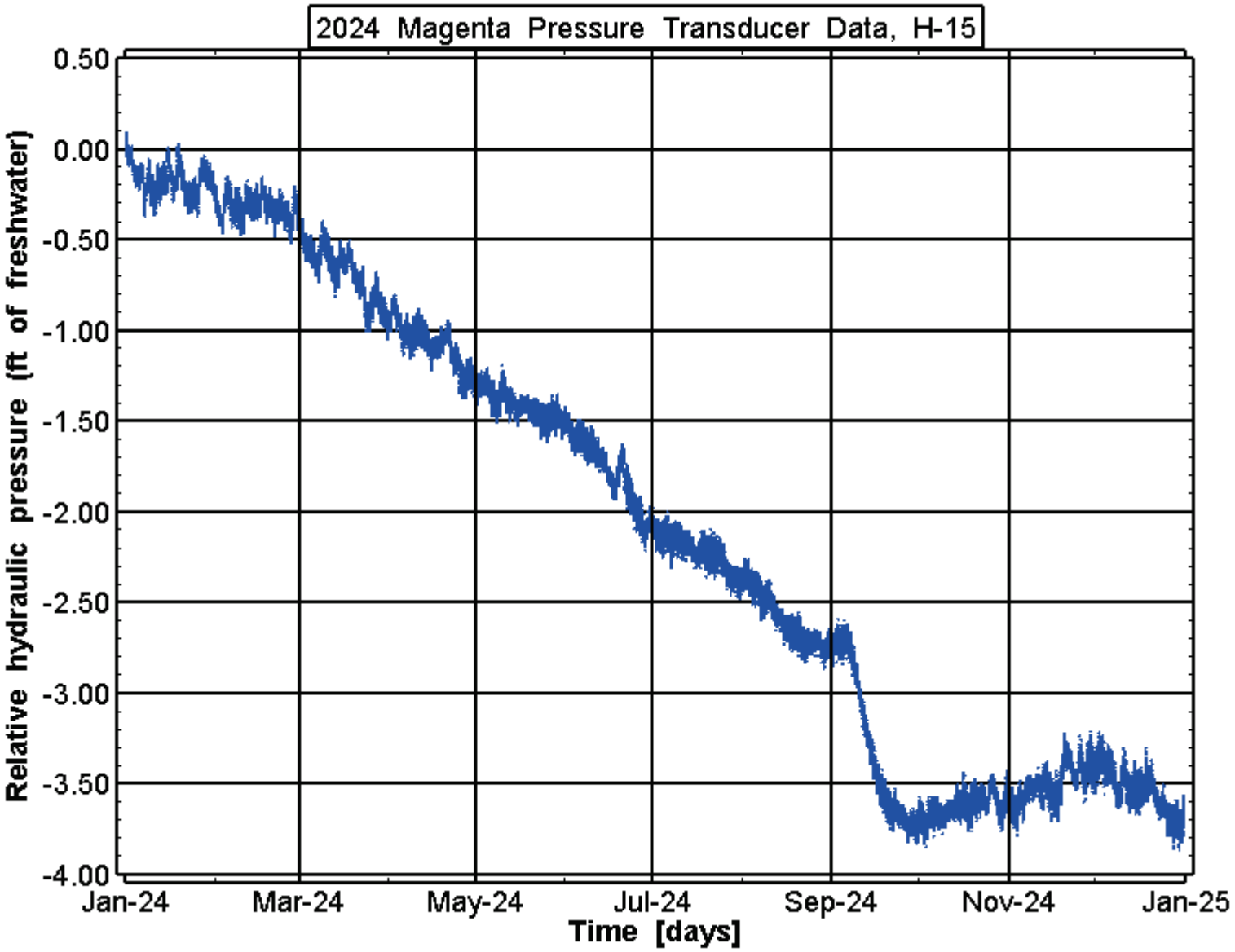


Appendix-Figure 54. Well H-11b2 experienced a net pressure head of -0.93 ft fresh water in 2024.



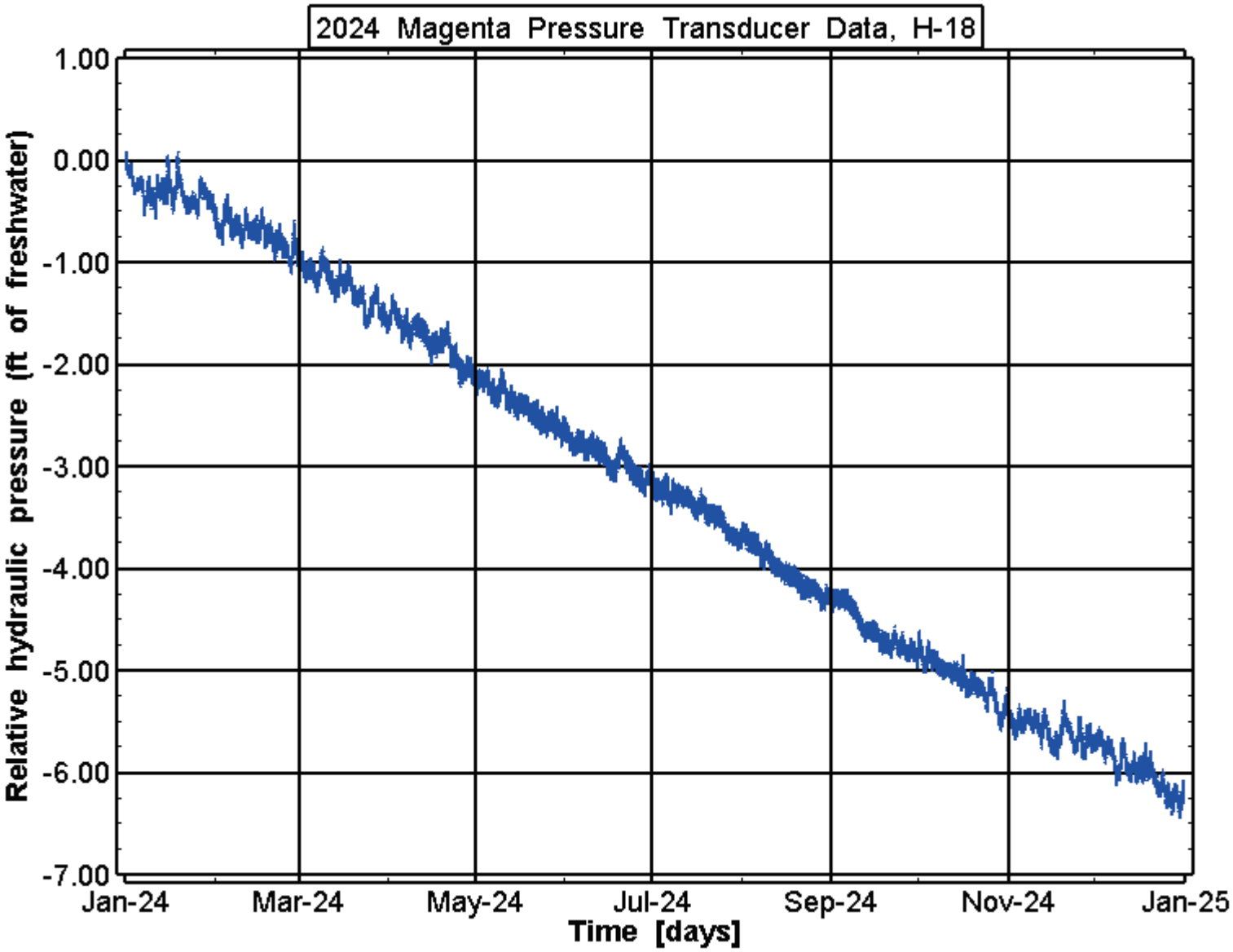
Appendix-Figure 55. Well H-14 experienced a net pressure head of -1.37 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



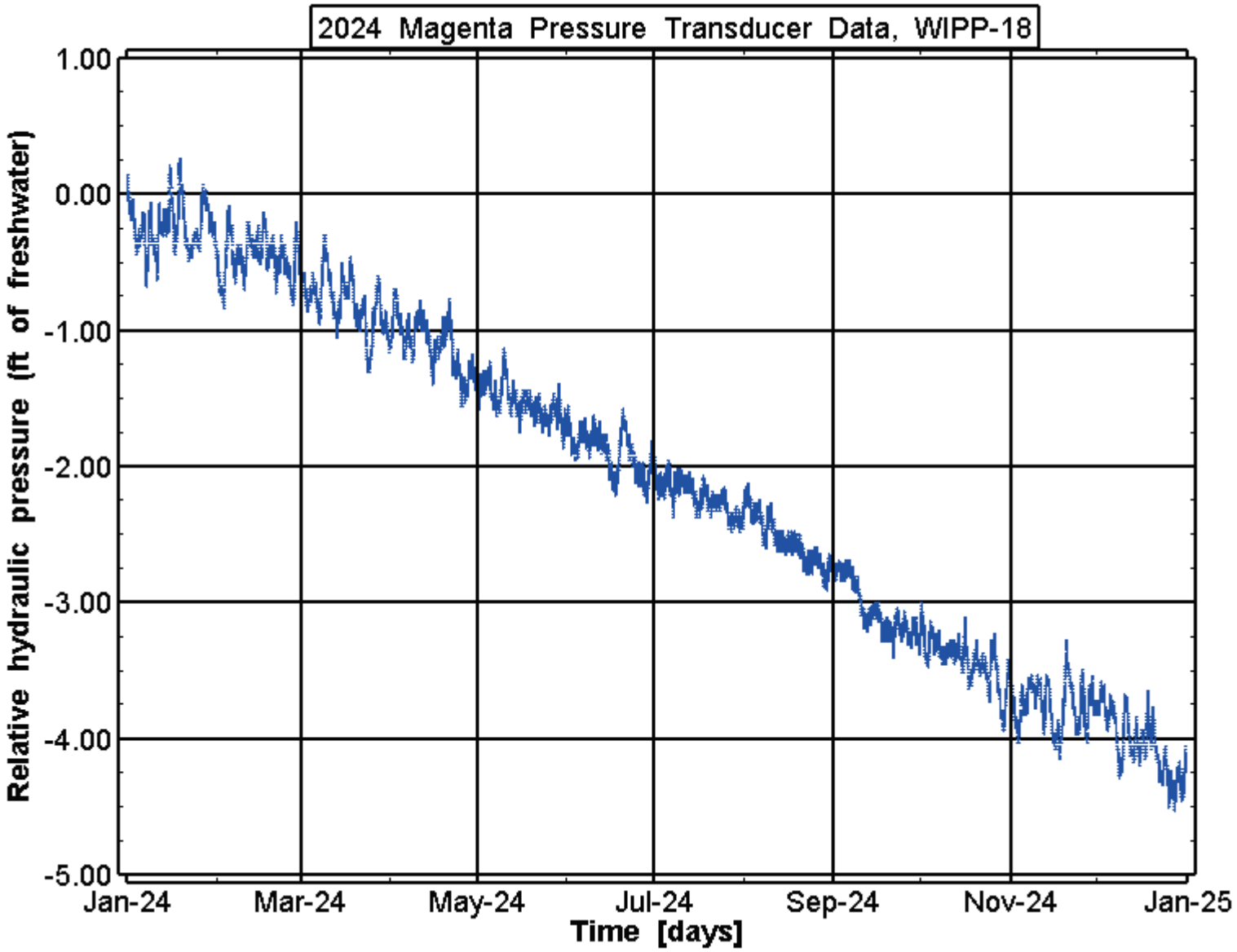
Appendix-Figure 56. Well H-15 experienced a net pressure head of -3.78 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only



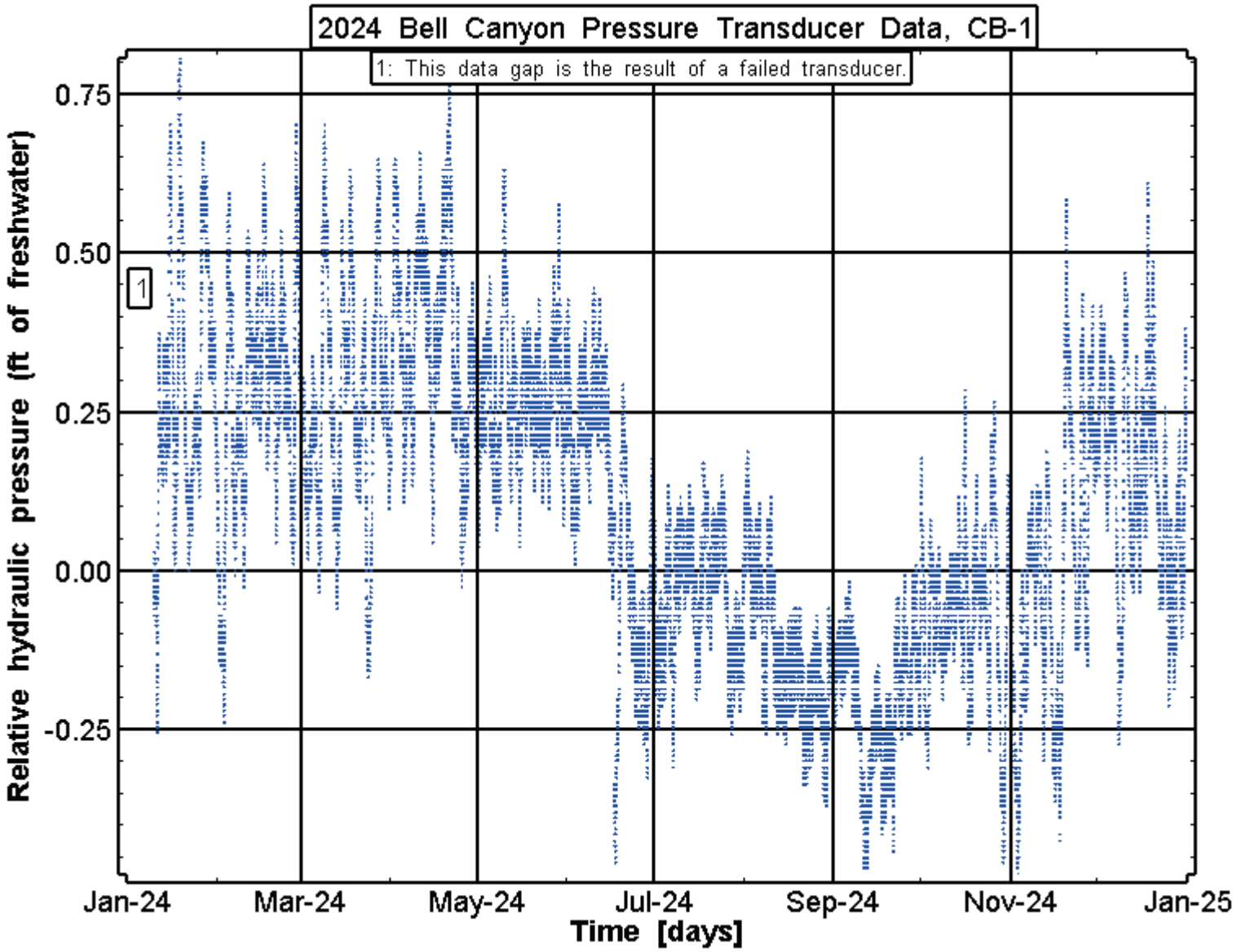
Appendix-Figure 57. Well H-18 experienced a net pressure head of -6.26 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

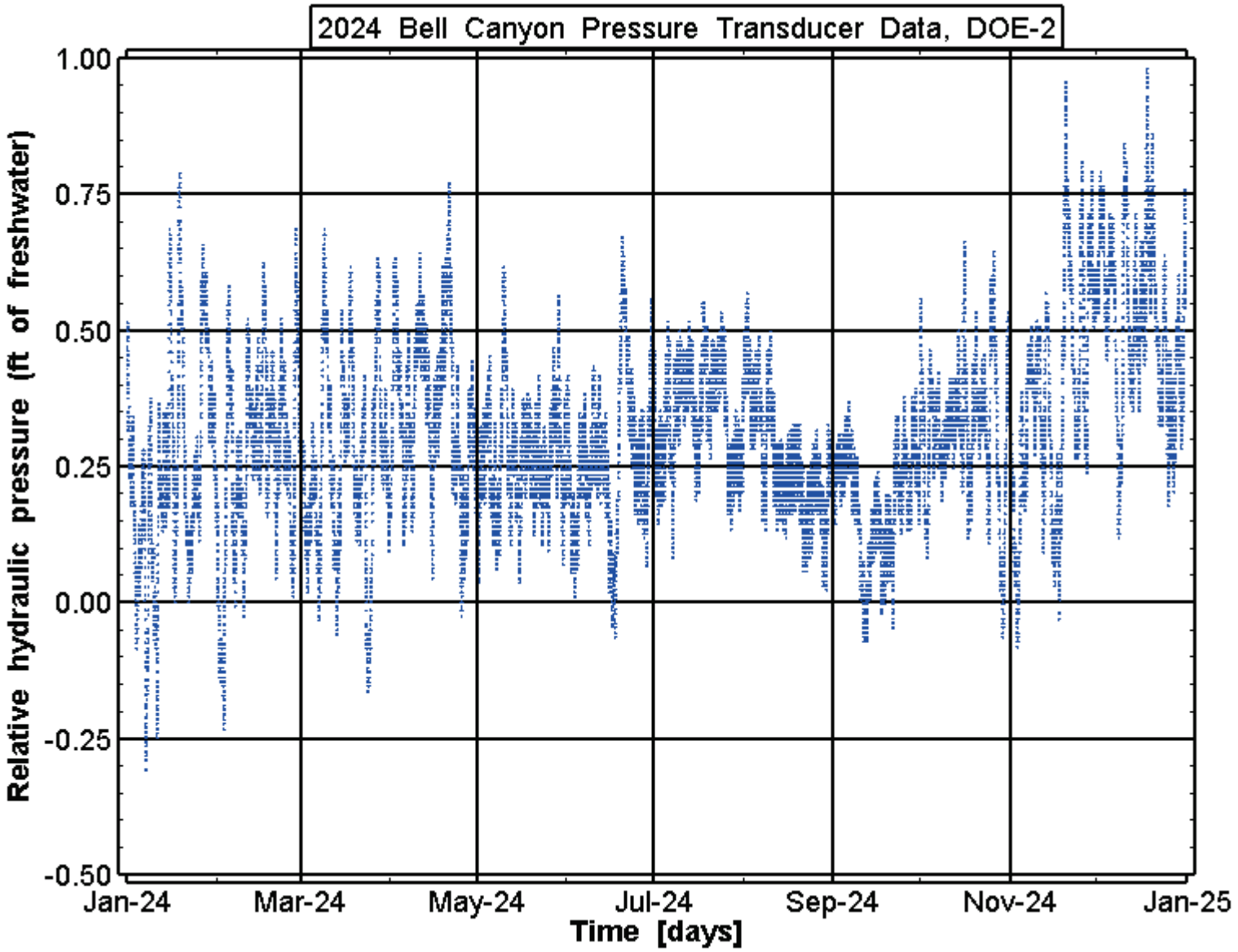


Appendix-Figure 58. Well WIPP-18 experienced a net pressure head of -4.20 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

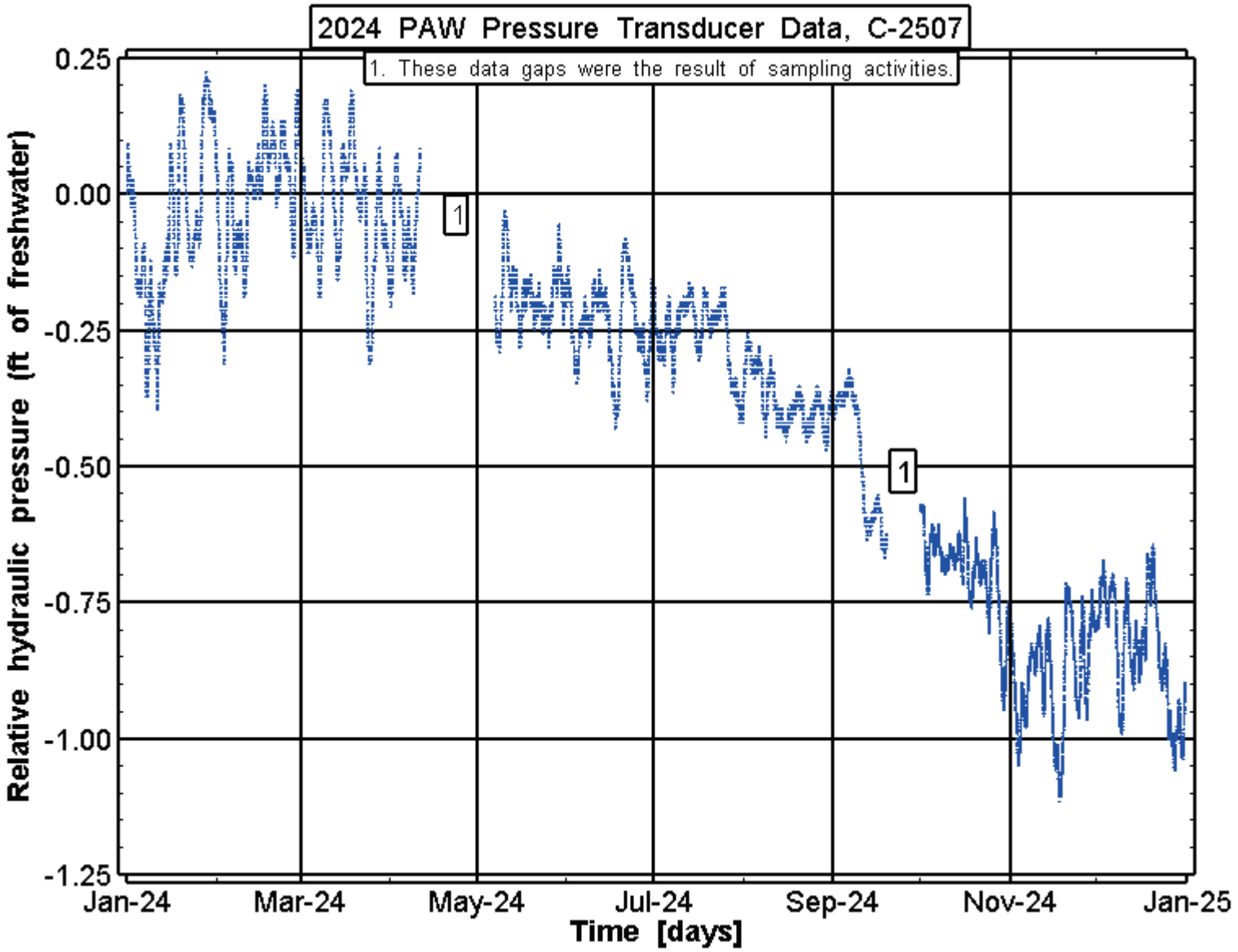


Appendix-Figure 59. Well CB-1 experienced a net pressure head of 0.21 ft fresh water in 2024.



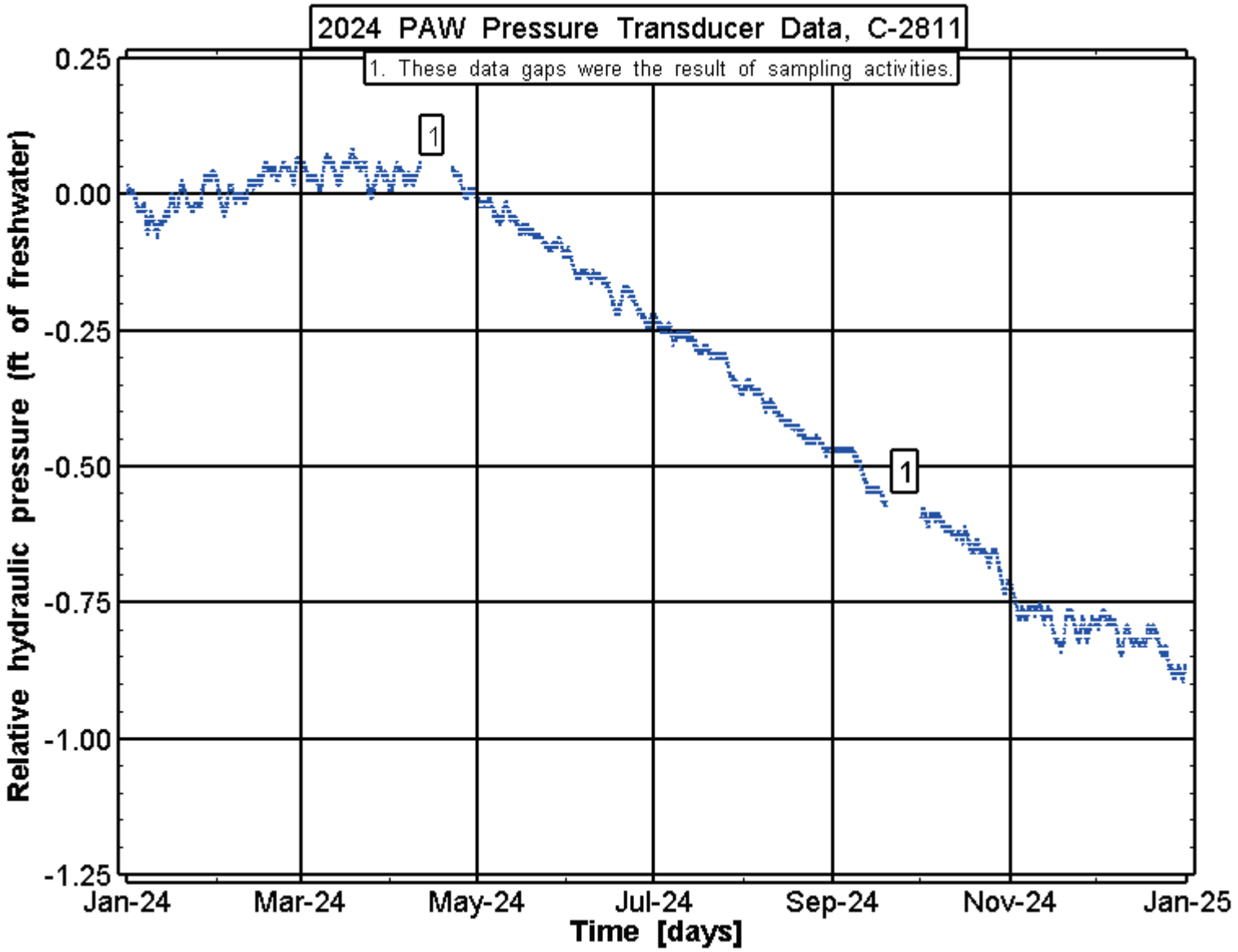
Appendix-Figure 60. Well DOE-2 experienced a net pressure head of 0.09 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

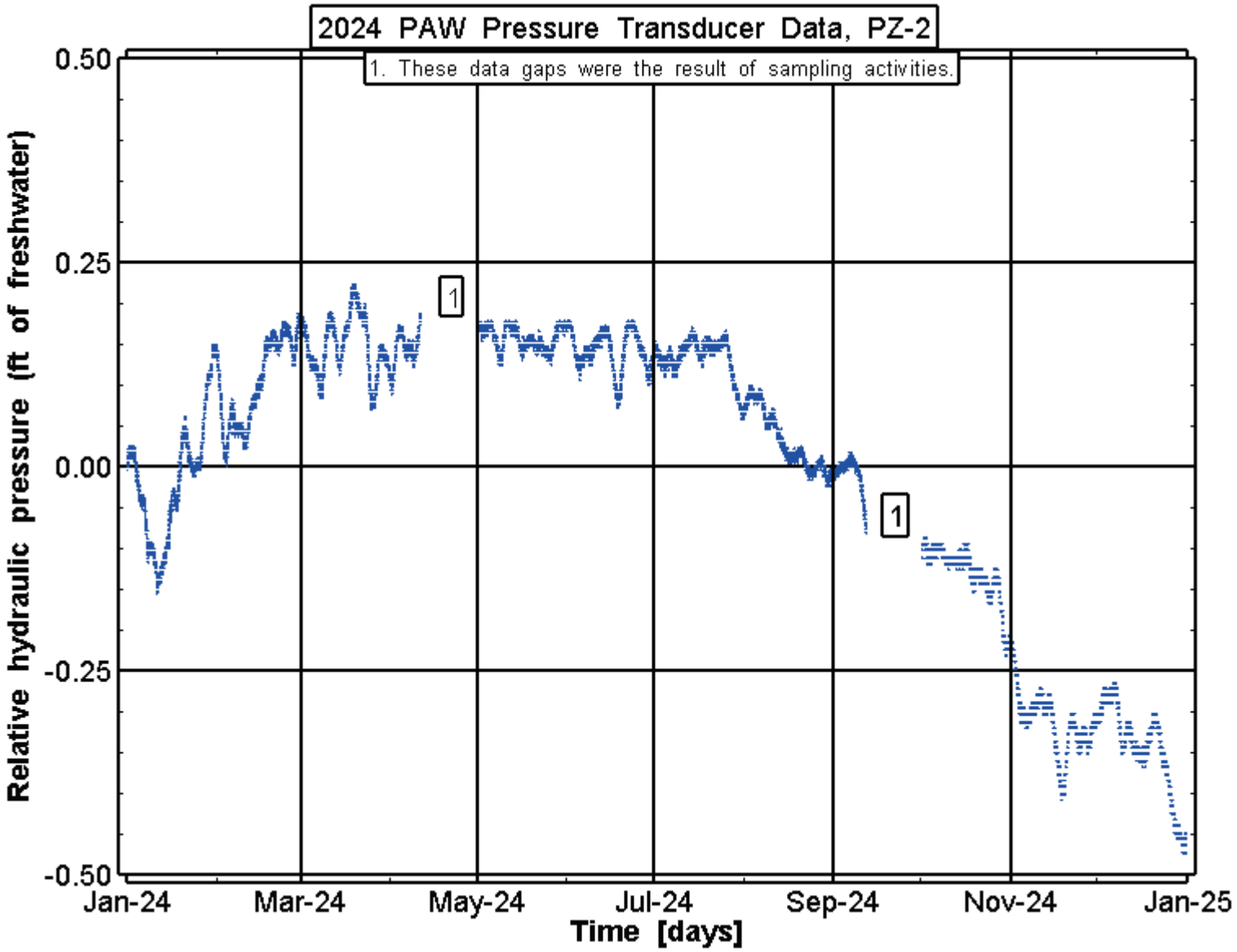


Appendix-Figure 61. Well C-2507 experienced a net pressure head of -0.91 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

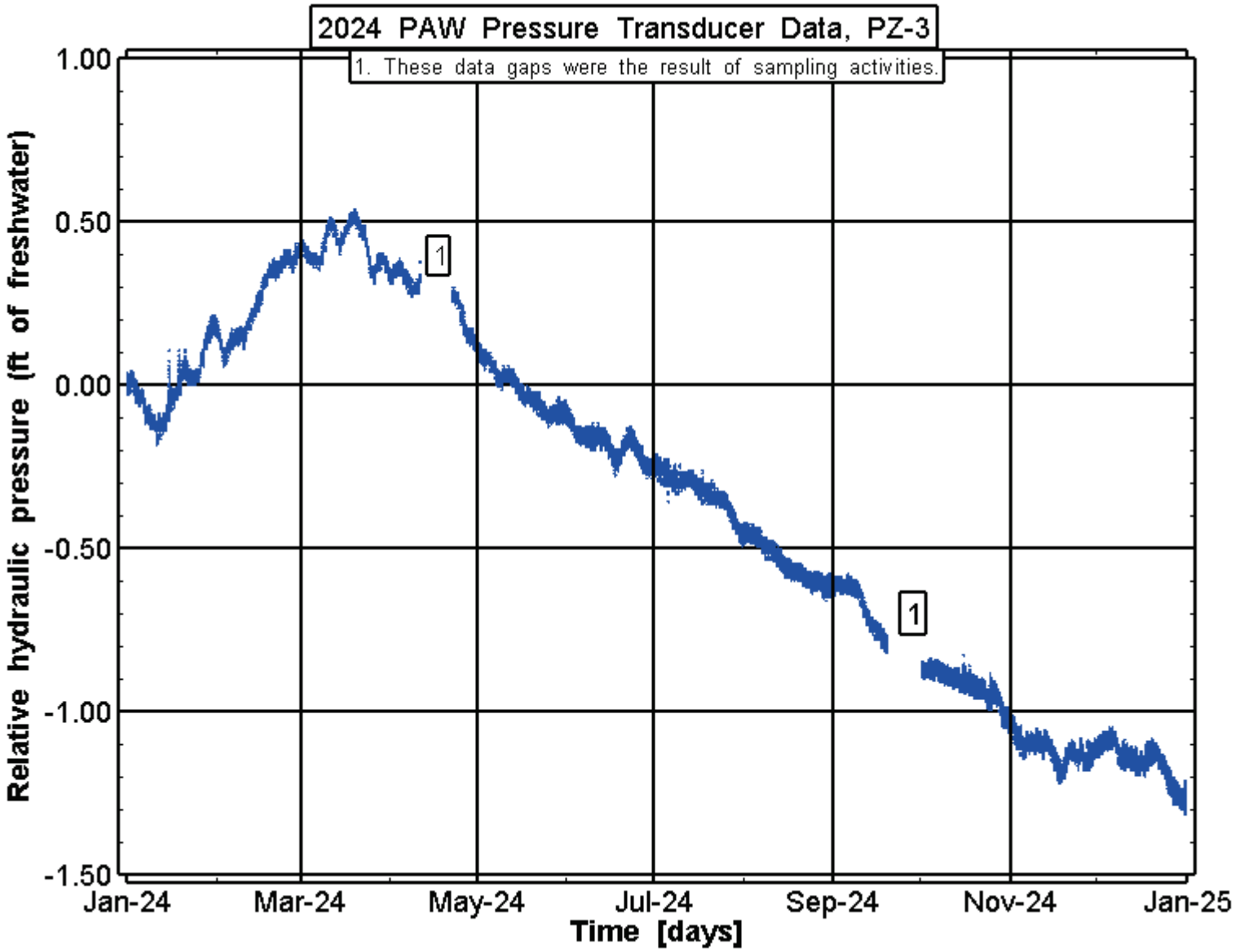


Appendix-Figure 62. Well C-2811 experienced a net pressure head of -0.87 ft fresh water in 2024.



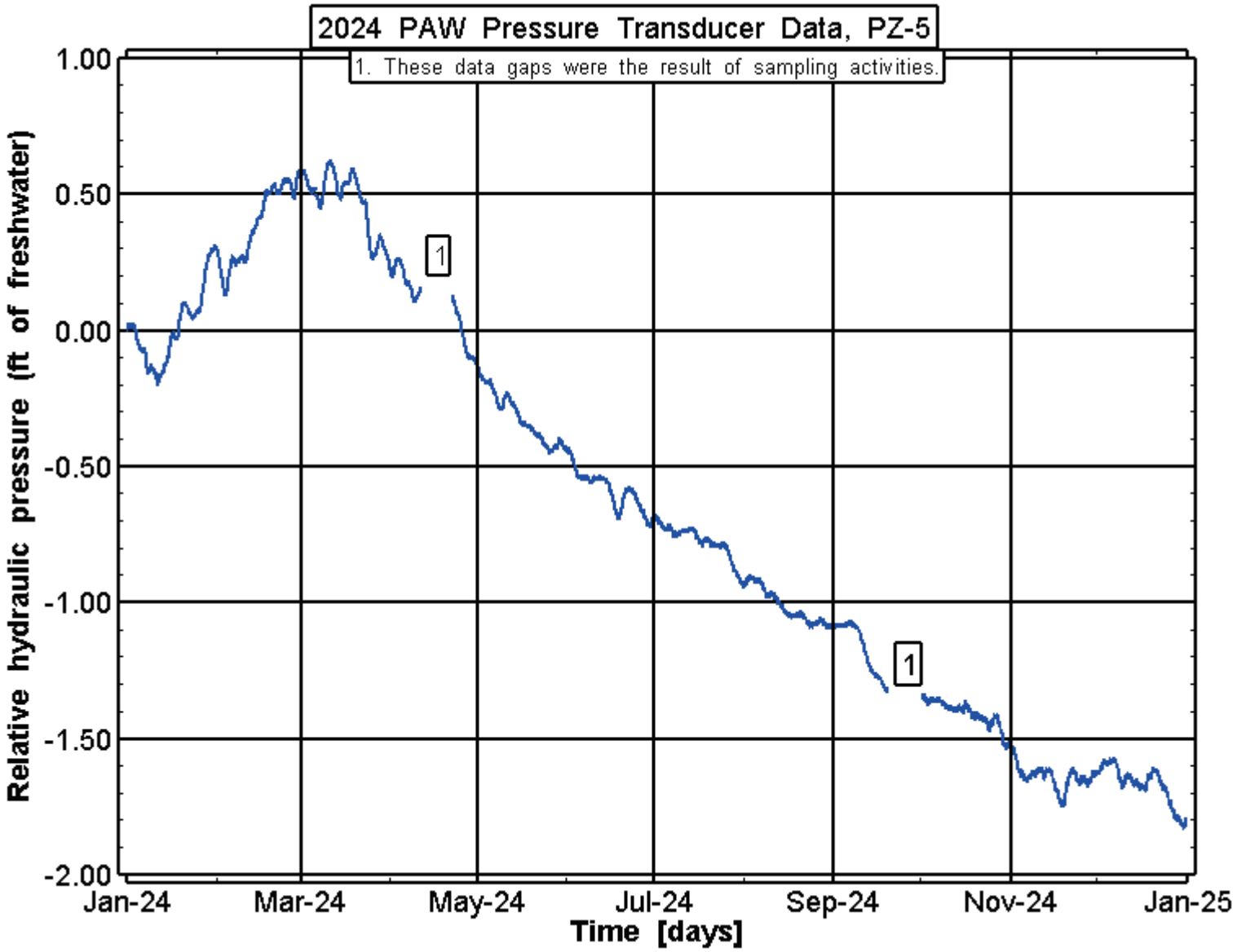
Appendix-Figure 63. Well PZ-2 experienced a net pressure head of -0.46 ft fresh water in 2024.

Information Only

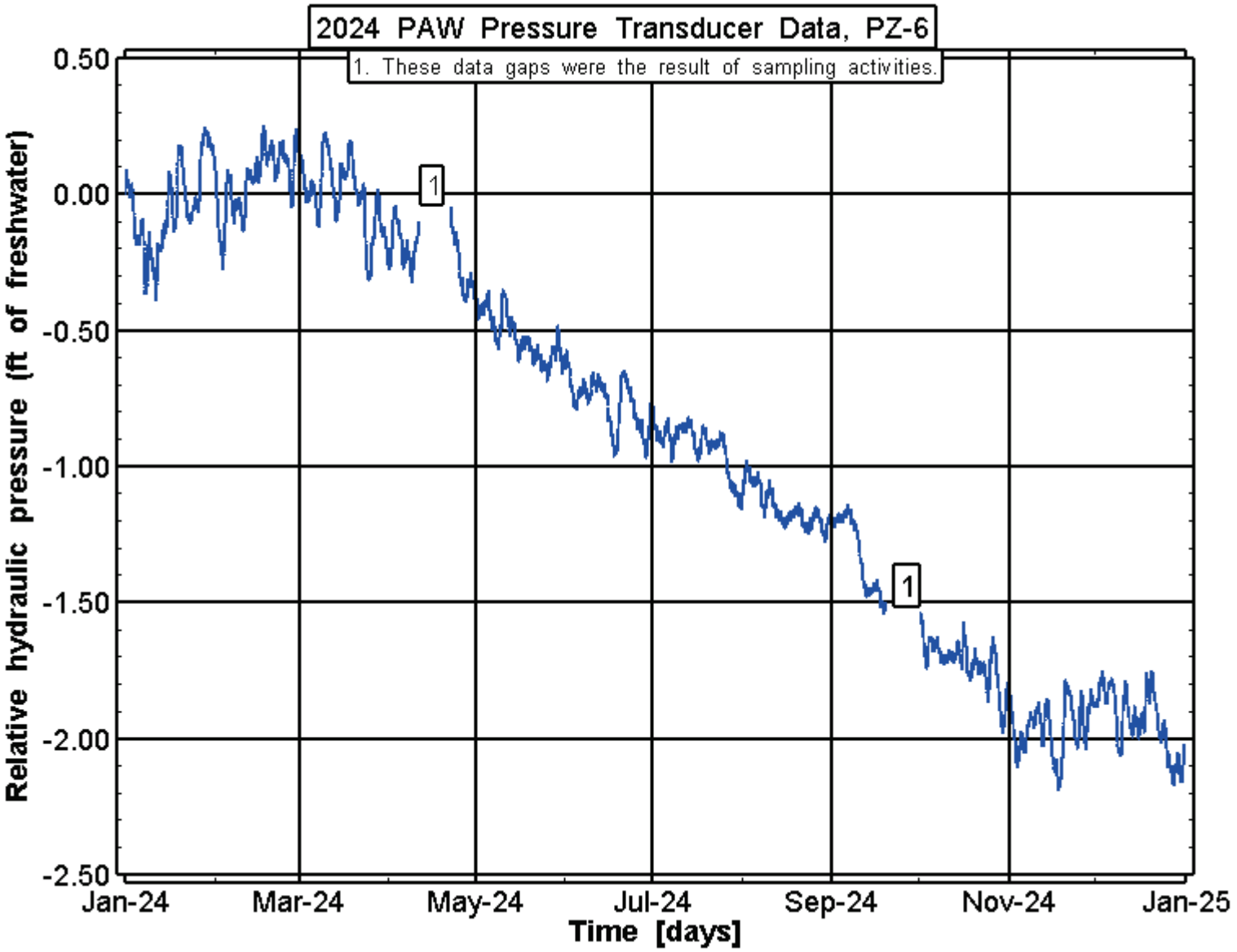


Appendix-Figure 64. Well PZ-3 experienced a net pressure head of -1.27 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

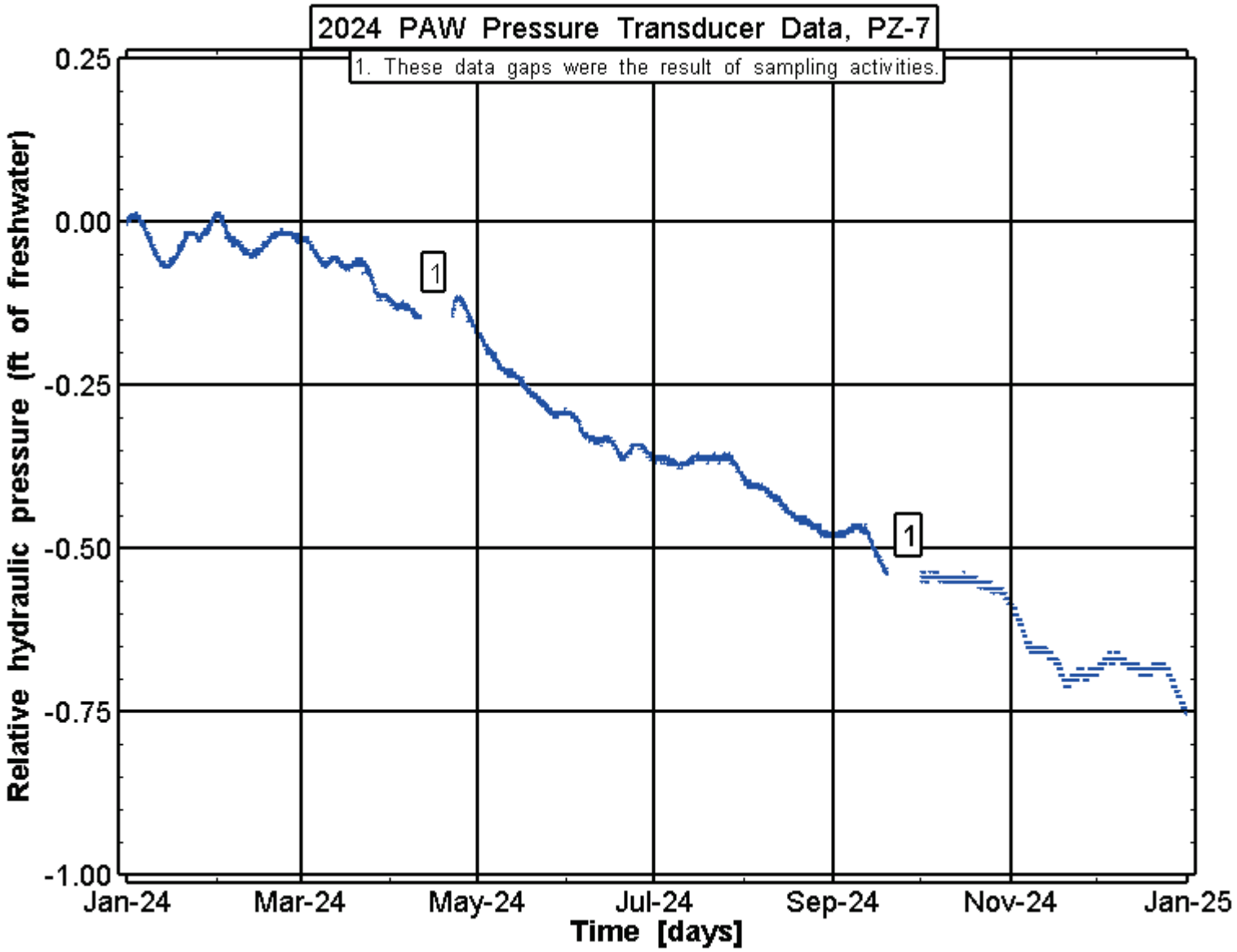


Appendix-Figure 65. Well PZ-5 experienced a net pressure head of -1.81 ft fresh water in 2024.

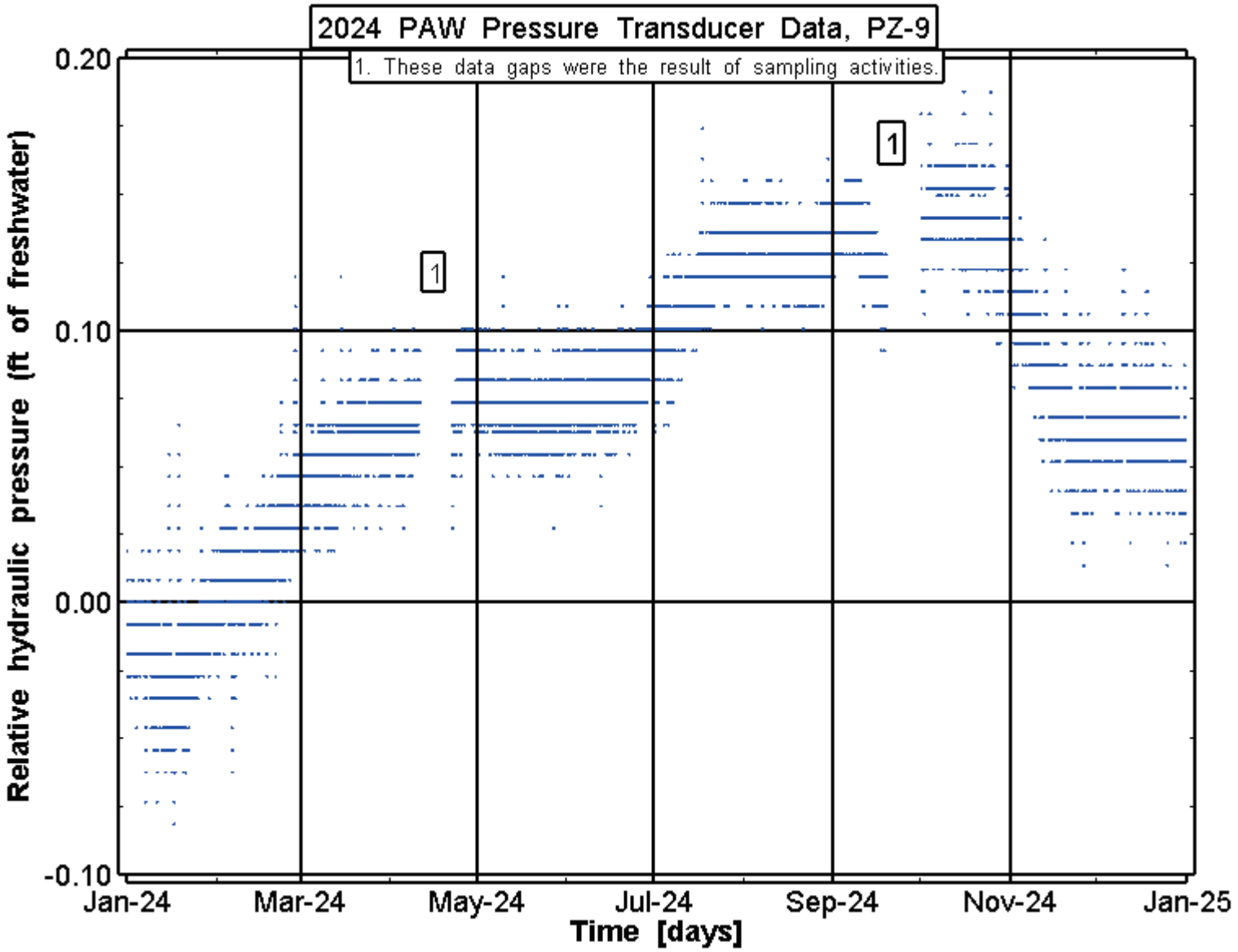


Appendix-Figure 66. Well PZ-6 experienced a net pressure head of -2.05 ft fresh water in 2024.

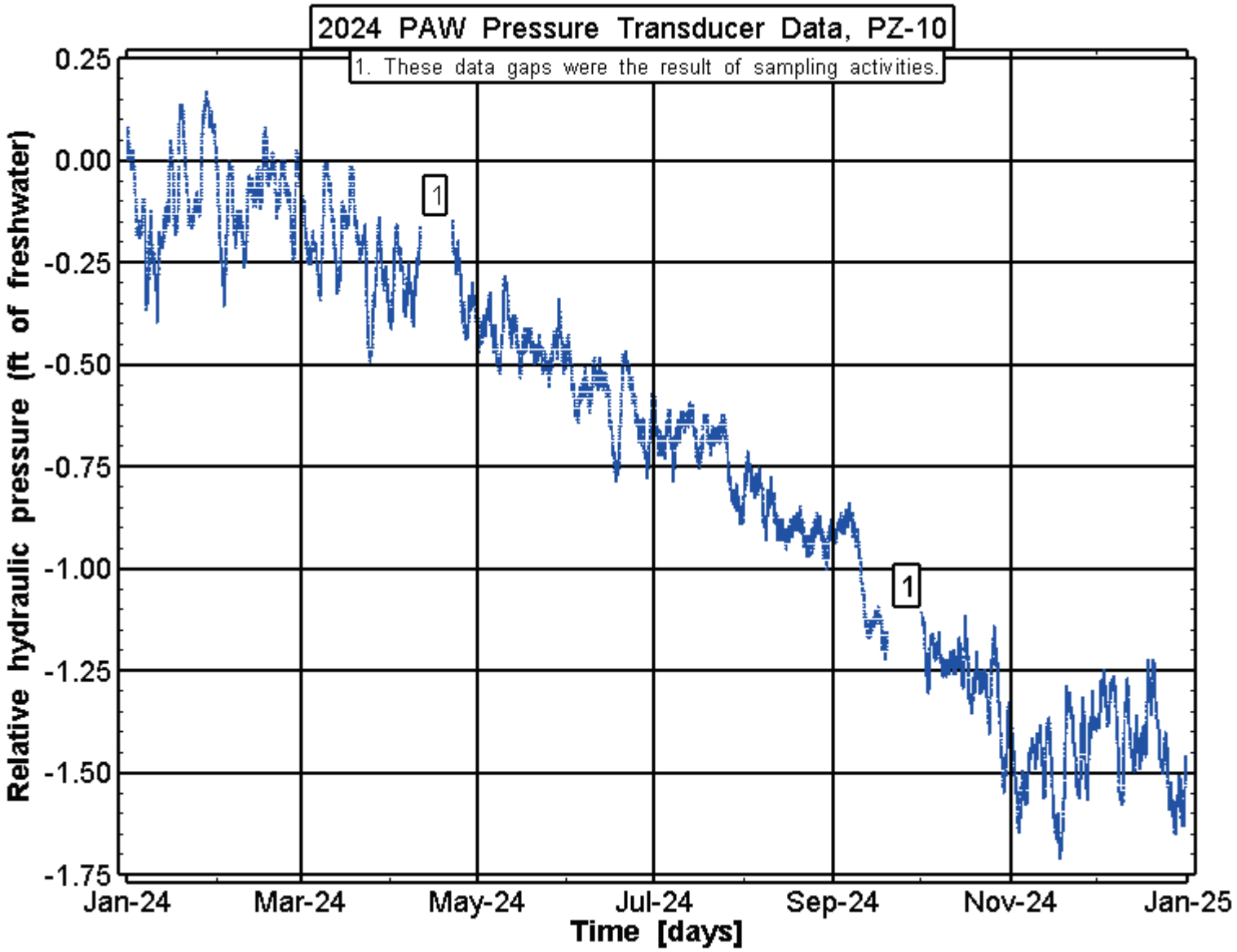
Exceptional Service in the National Interest
Information Only



Appendix-Figure 67. Well PZ-7 experienced a net pressure head of -0.75 ft fresh water in 2024.

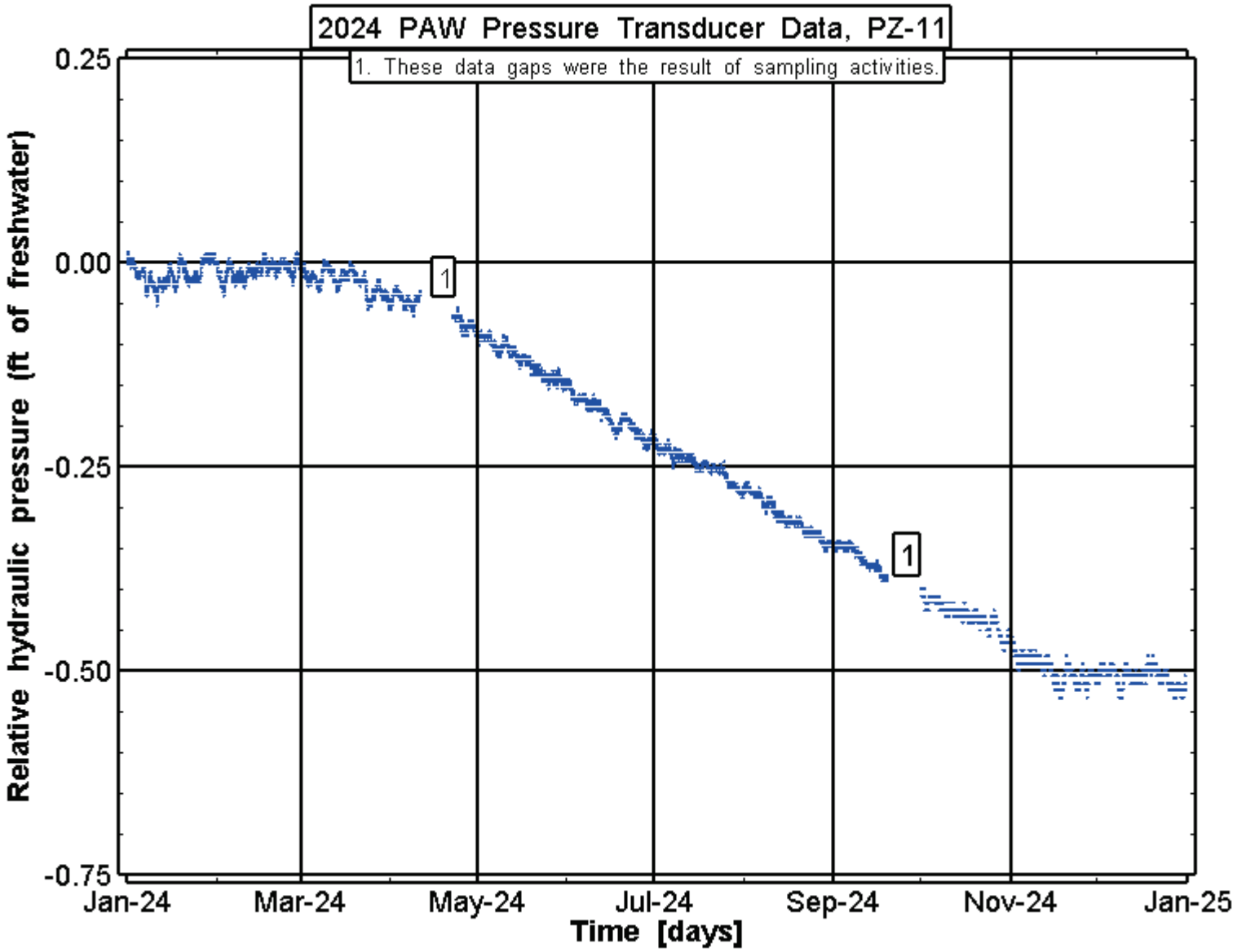


Appendix-Figure 68. Well PZ-9 experienced a net pressure head of 0.03 ft fresh water in 2024.

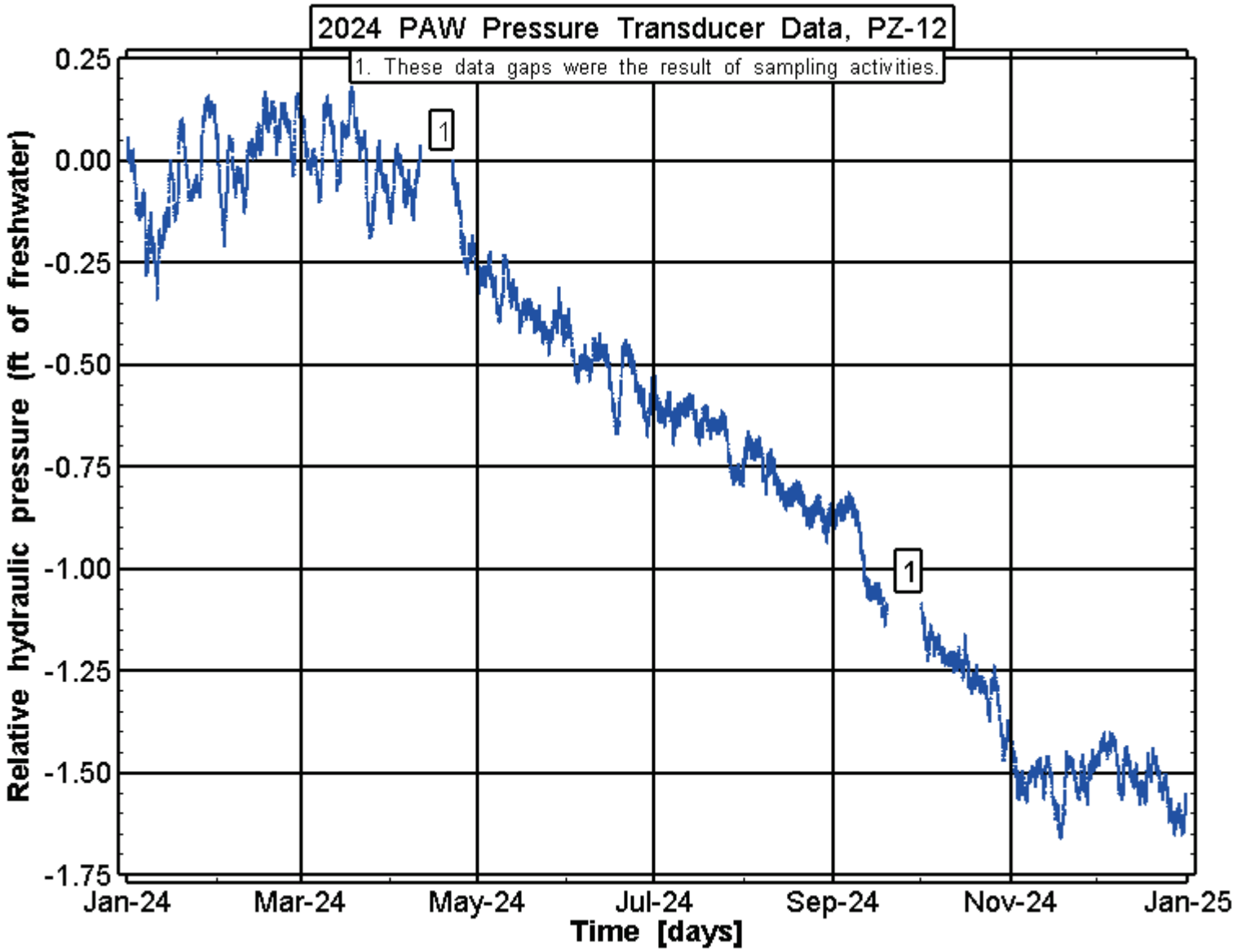


Appendix-Figure 69. Well PZ-10 experienced a net pressure head of -1.49 ft fresh water in 2024.

Exceptional Service in the National Interest
Information Only

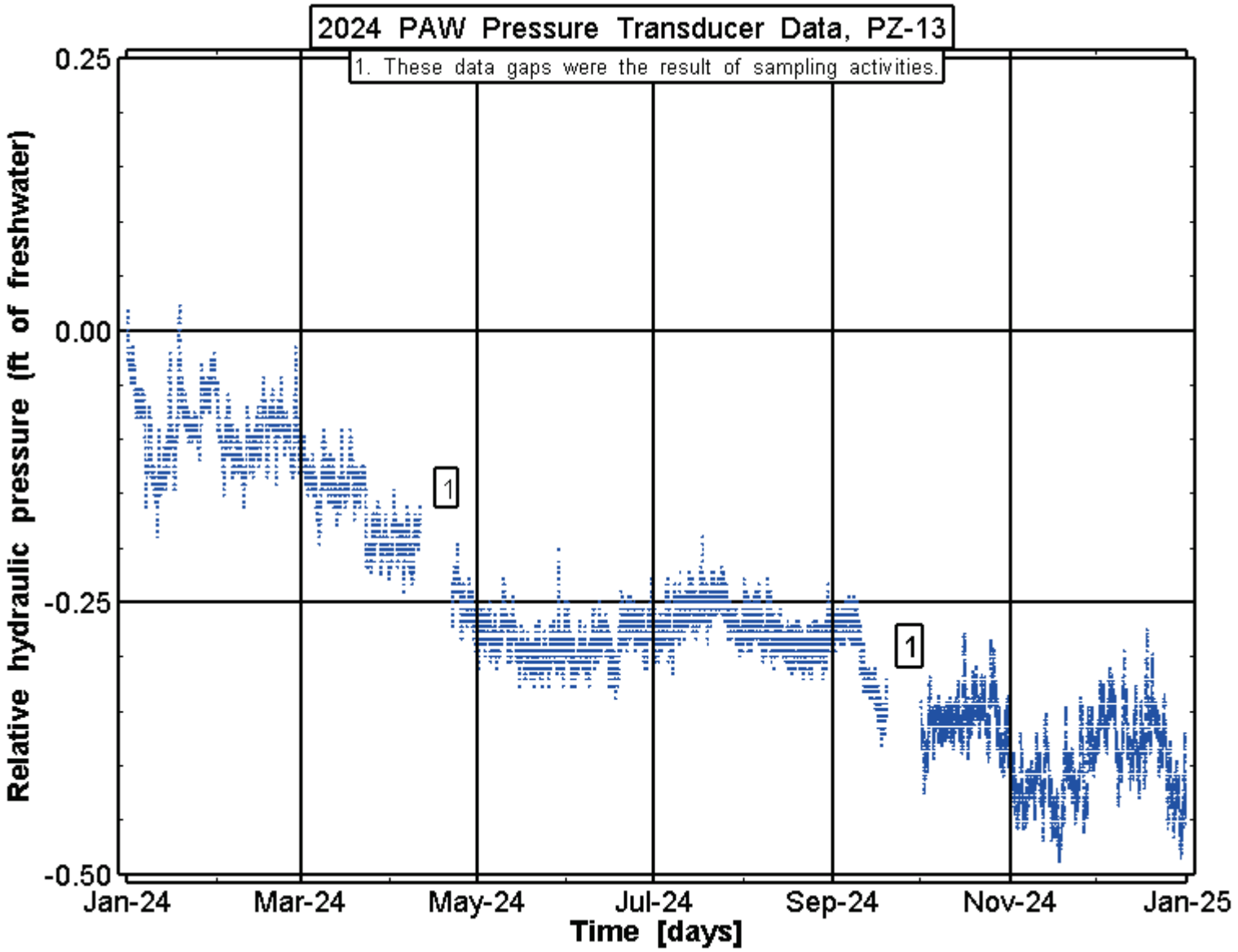


Appendix-Figure 70. Well PZ-11 experienced a net pressure head of -0.52 ft fresh water in 2024.

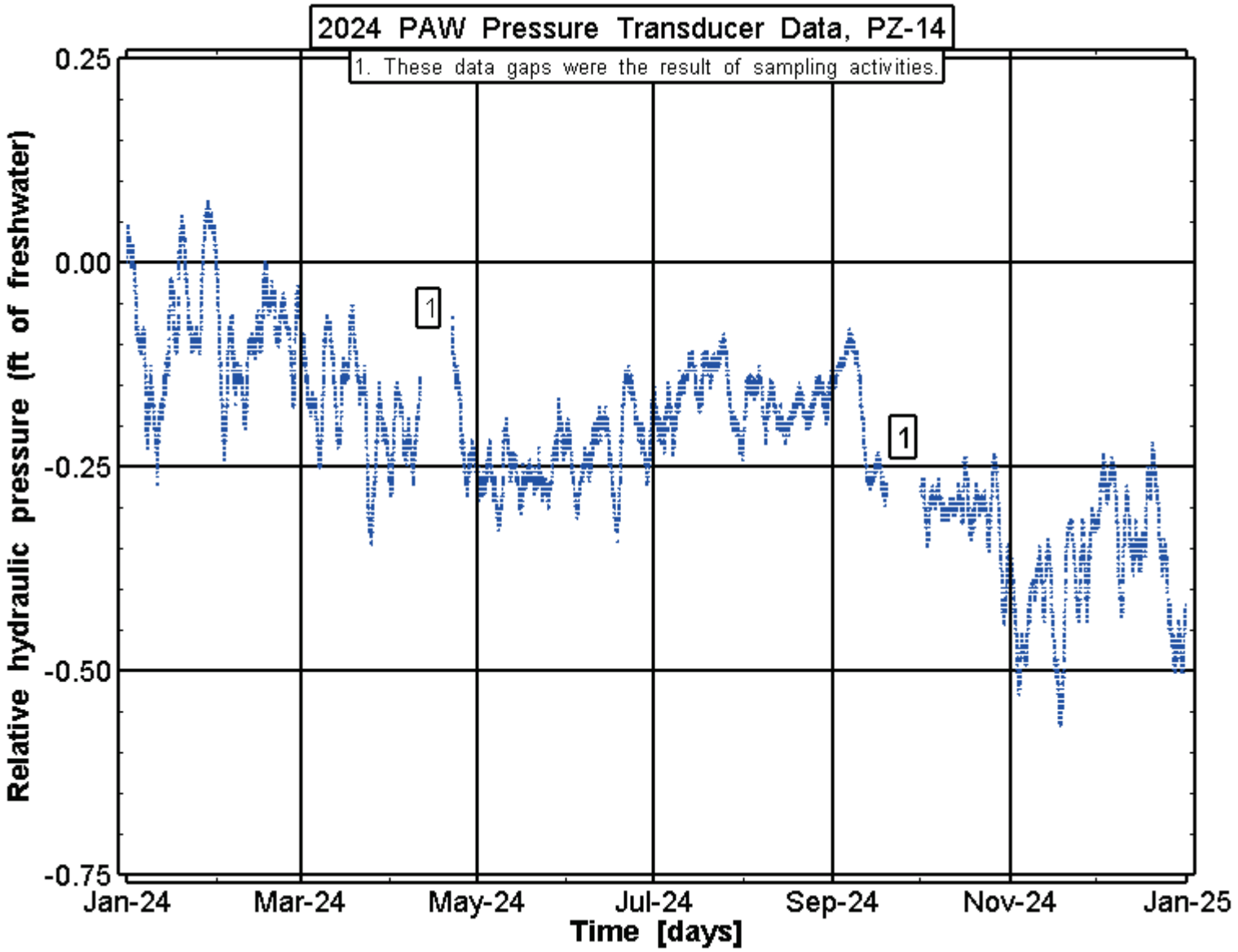


Appendix-Figure 71. Well PZ-12 experienced a net pressure head of -1.58 ft fresh water in 2024.

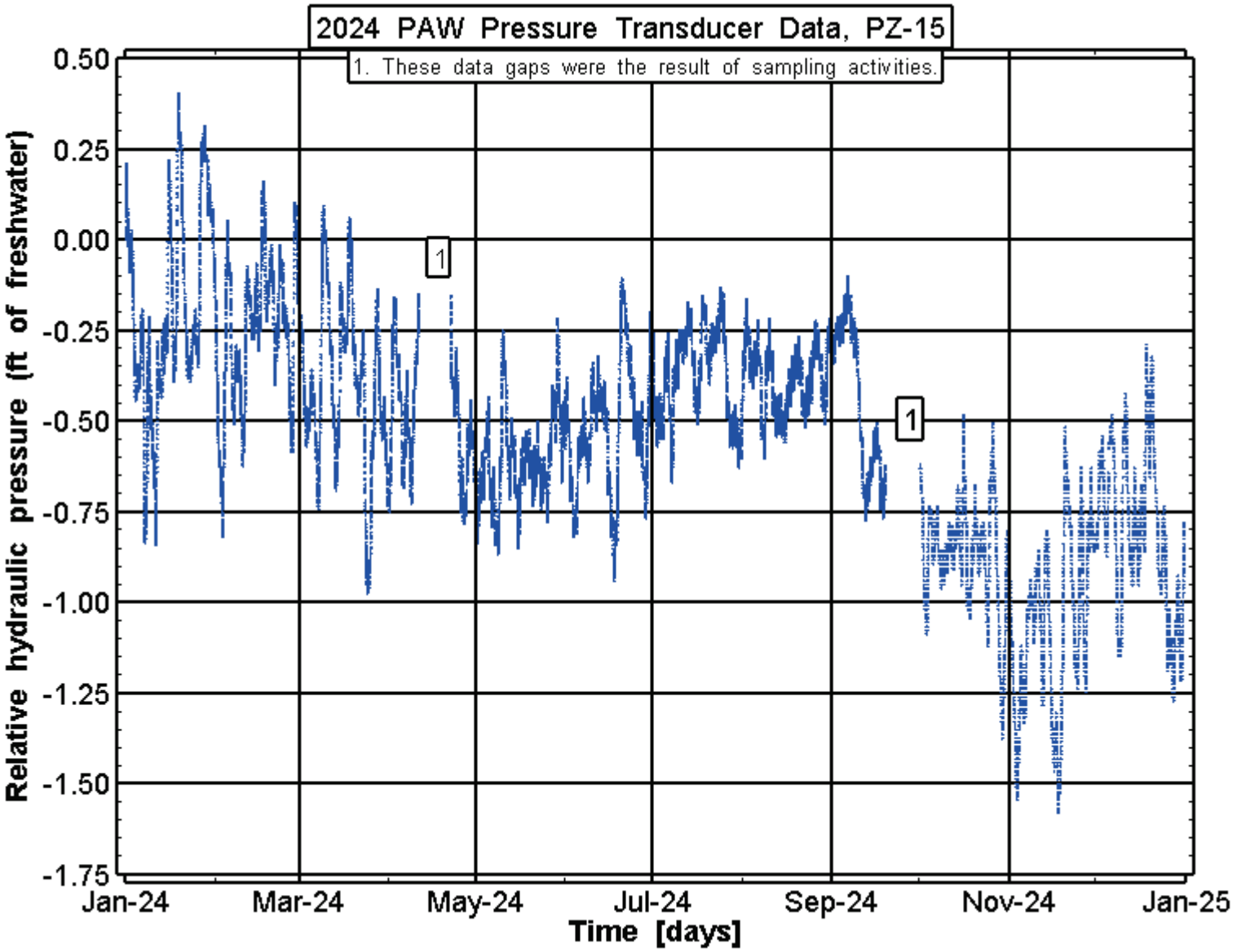
Exceptional Service in the National Interest
Information Only



Appendix-Figure 72. Well PZ-13 experienced a net pressure head of -0.44 ft fresh water in 2024.



Appendix-Figure 73. Well PZ-14 experienced a net pressure head of -0.43 ft fresh water in 2024.



Appendix-Figure 74. Well PZ-15 experienced a net pressure head of -0.87 ft fresh water in 2024.

Internal Distribution

MS-1395	D.O. Bowman	Org. 8882
MS-1395	L. Kirkes	Org. 8882
MS-1395	J. Kirkes	Org. 8882
MS-1395	P. Johnson	Org. 8882
MS-1395	O. Reyna	Org. 8882
MS-1395	O. Lofton	Org. 8882
MS-1395	R. Keith	Org. 8880
MS-1395	C. Miller	Org. 8882

Exceptional Service in the National Interest
Information Only