Aladdin Plating Site Groundwater Monitoring Results, 2024: Data Summary Report

Environmental Assessment Program
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Abstract

The Aladdin Plating site (the site), located in Tacoma, Washington, operated historically as a commercial electroplating facility between 1958 and 1994. In 2005, chromium (trivalent and hexavalent), lead, and nickel contamination were discovered in site soils and groundwater following an investigation conducted by the Washington State Department of Ecology (Ecology). The historical electroplating activities at the site caused the contamination of soil and, subsequently, groundwater. Following building demolition and site investigation activities in summer of 2005, Ecology oversaw soil and concrete excavation to remove contaminant sources. Initial groundwater monitoring activities were conducted between November 2005 and May 2007. Results from this monitoring found concentrations of total chromium and nickel in groundwater near the source area as high as 920 micrograms per liter (µg/L) and 42,400 µg/L, respectively. A remedial investigation (RI) was performed in 2014 to address data gaps. An Ecology contractor removed additional contaminated soil in 2018 and post-excavation groundwater sampling was performed in 2019. Ongoing groundwater monitoring activities have been conducted by Ecology since 2022.

This report describes the water quality results for groundwater samples collected from four monitoring wells during semiannual monitoring events conducted during spring and fall 2024. The samples were analyzed for total and dissolved chromium and nickel.

Analytical results from groundwater samples collected during 2024 indicate that nickel concentrations in the the near-surface aquifer continue to exceed (not meet) cleanup levels, while chromium concentrations are below the cleanup levels. Though nickel concentrations have decreased since initial site cleanup activities began in 2005, they were as high as 11,400 µg/L for total nickel in groundwater samples collected in 2024, far above the 320 µg/L cleanup level for nickel as established by the Cleanup Action Plan.

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Background

The Aladdin Plating site (the site) located at 1657 Center St., Tacoma, WA, operated as a commercial electroplating facility between 1958 and 1994 (Figure 1). Pierce County assumed ownership of the property through foreclosure in the early 2000's. Soon after the Washington State Department of Ecology's (Ecology's) Toxic Cleanup Program (TCP) began management of the site's cleanup activities through designation as an orphan site. A private party purchased the site from Pierce County in 2021 (Carnes 2022).

In 2005, Ecology oversaw demolition of site buildings and conducted a subsurface investigation, which identified site soils and groundwater as having been contaminated by historical electroplating operations. Contaminants consisted of chromium, lead, and nickel in site soils, and chromium and nickel in the shallow groundwater, which is defined as the groundwater encountered less than 45 feet (ft) below ground surface (bgs) near the former electroplating facility. This investigation consisted of the advancement of six direct-push probes completed to depths of approximately 38 to 40 ft bgs. Soil samples and grab groundwater samples were collected from these six locations. Laboratory analytical results indicated soil concentrations of total nickel as high as 12,000 milligrams per kilogram (mg/kg) and total chromium concentrations up to 3,290 mg/kg, much greater than their respective Model Toxics Control Act (MTCA) Method A or Method B cleanup levels at five of the six direct-push probe locations (GeoEngineers 2014a). Grab groundwater samples collected in the direct push borings reported total chromium concentrations as high as 7,250 µg/L and a total nickel concentration of 918 µg/L, far exceeding the respective cleanup levels for each contaminant.

In July 2005, further site characterization activities included the digging of nine test pits to depths between 15 ft bgs and 17 ft bgs. Soil samples obtained from these test pits indicated concentrations of cadmium, total chromium, copper, lead, and nickel above their respective MTCA cleanup levels. Initial remedial activities at the site took place in July 2005 under Ecology oversight and consisted of excavating approximately 40 tons of contaminated soil, and 47 tons of contaminated concrete for off-site disposal. Post-excavation confirmation soil samples were collected at depths ranging from 2 ft bgs to 2.5 ft bgs. These samples indicated continued contamination of site soils (GeoEngineers 2014a).

Between November 2005 and May 2007, Landau Associates (Landau) conducted further site investigations and routine monitoring. These investigations included a Phase I Environmental Site Assessment in November 2005, in which five groundwater monitoring wells were installed onsite (MW-1s, MW-2s, MW-3s, MW-4s, and MW-4d). Analytical results from soil samples collected during this Phase I investigation indicated that soil contamination primarily occurred on the west-central and east-northeast extent of the site. Analytical results from groundwater samples indicated an exceedance of MTCA cleanup levels for nickel (320 µg/L) (GeoEngineers 2014a). Due to the closeness of the groundwater monitoring wells, groundwater flow direction could not be assessed as the measured groundwater gradient was essentially flat (Landau 2005).

Three additional groundwater monitoring wells (MW-5s, MW-6s, and MW-7s) were installed off-property in the City of Tacoma road right-of-way in June 2006 as part of a Phase II

Environmental Site Assessment. Groundwater samples were collected at the eight site monitoring wells in July 2006. Analytical results from this event indicated concentrations of nickel in MW-3s, and chromium, hexavalent chromium, and nickel in MW-4s were above their respective MTCA cleanup levels. Contaminant concentrations above MTCA cleanup levels at MW-6 were attributed to elevated turbidity during sampling procedures (GeoEngineers 2014a).

Groundwater monitoring activities continued with the collection of groundwater samples in October 2006 and March 2007, and monthly measurement of groundwater levels between September 2006 and May 2007. Monthly groundwater levels indicated an east-southeast groundwater flow direction, and analytical results from the groundwater sampling events indicated continued exceedances of MTCA cleanup levels for total chromium, hexavalent chromium, and nickel in site groundwater (GeoEngineers 2014a).

As the previous investigations had not fully delineated the extent of site contamination, a Remedial Investigation and Feasibility Study (RI/FS) was completed in 2014. The remedial investigation activities consisted of 14 soil borings on-property, collection of groundwater levels and samples from the eight existing monitoring wells, and collection of grab-groundwater samples from 10 off-property direct-push borings completed downgradient from the site (GeoEngineers 2014a).

Analytical results from soil samples collected during this investigation indicated total chromium, total lead, and total nickel concentrations above MTCA Method A and/or Method B cleanup levels in numerous shallow soil samples (0 ft bgs – 7.5 ft bgs), and limited exceedance of cleanup levels in deeper soil samples (7.5 ft bgs – 15.0 ft bgs). Analytical results from groundwater samples reported concentrations of total chromium, hexavalent chromium, and total nickel in excess of MTCA Method A and/or Method B cleanup levels in multiple onsite wells (Appendix A). The results of this investigation indicated that the extent of the contamination of both site soils and shallow groundwater primarily occurred in the inferred source area of MW-4s, and its proximal downgradient area (GeoEngineers 2014a). However, GeoEngineers concluded that the extent of downgradient nickel in groundwater had not been fully delineated by this investigation.

In 2014, GeoEngineers submitted a Cleanup Action Plan (CAP) following the RI/FS, which identified excavation and disposal of site soils that exceed cleanup levels as a potential remedial strategy (GeoEngineers 2014b). It was anticipated that the removal of contaminated soil would result in a gradual decrease in the metal concentrations impacting groundwater, and act as an alternative to active groundwater remediation measures.

Additional cleanup activities began in 2018 and consisted of decommissioning the five original onsite monitoring wells, and the excavation of contaminated soils. Following these actions, two monitoring wells were installed. Well MW-4sR replaced the decommissioned well MW-4s, and well MW-8s was installed to monitor groundwater downgradient of the former facility (GeoEngineers 2019). Post-excavation confirmation soil sampling indicated continued exceedance of nickel in the soil between 4 ft bgs to 8 ft bgs, which may act as a source of nickel contamination in the groundwater at the site (Ecology 2020a).

GeoEngineers continued groundwater monitoring activities in February 2019. Analytical results from this sampling event confirmed that nickel concentrations continued to exceed established cleanup levels in two monitoring wells, MW-4sR and MW-8s. Concentrations of chromium and nickel at well MW-4sR were nearly three times lower in samples collected during February 2019 than concentrations in MW-4s in March 2014, suggesting that the second soil excavation successfully reduced contaminant concentrations in the groundwater of the site (GeoEngineers 2019).

In 2022, Ecology published the Quality Assurance Project Plan (QAPP) detailing Ecology's semi-annual groundwater monitoring activities at four monitoring wells (MW-4sR, MW-6s, MW-7s, MW-8s) (Carnes 2022). The fifth existing monitoring well associated with the site (MW-5s) is difficult to reliably access due to traffic and parked vehicles; as such, it is not included in the monitoring plan. This sampling program intends to collect representative groundwater monitoring data for total and dissolved nickel and chromium analysis. This data report summarizes the groundwater results monitoring events conducted in 2024. The data and associated monitoring reports for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID, FS1277-PerfMonGW.

Physical Setting

The Aladdin Plating site occupies an approximately 100 ft by 30 ft parcel located approximately 240 ft above mean sea level (msl) in Tacoma, Washington. The site is in an industrial and commercial area of Tacoma and lies south of an approximately 80 ft tall bluff. The surroundings to the west, east, and south is relatively flat. The site is within the Puyallup-White Watershed (WRIA 10), which receives average annual precipitation ranging from 30 to 40 inches per year, falling mostly in the winter months (Ecology 2020b).

Site geology consists of deposits from the Vashon Stade of the Fraser Glaciation and include the Steilacoom Gravels, the Colvos Sand, and the Vashon Till (Schuster et al. 2015). The topographically low portion of the site is underlain by the Steilacoom Gravels, a coarse unit consisting mainly of pebbles and boulders. The slope to the north of the site consists of the Colvos Sand, a glacial advance deposit consisting of sand with lenses of silt or gravel; and is capped by the Vashon Till, a highly compact mixture of clay, silt, sand, and gravel (Schuster et al. 2015). Well logs from the site describe primarily sand with gravel and minor silt (GeoEngineers 2014a). The direction of groundwater flow in the site vicinity was determined to be towards the east-southeast during the RI/FS (GeoEngineers 2014a).

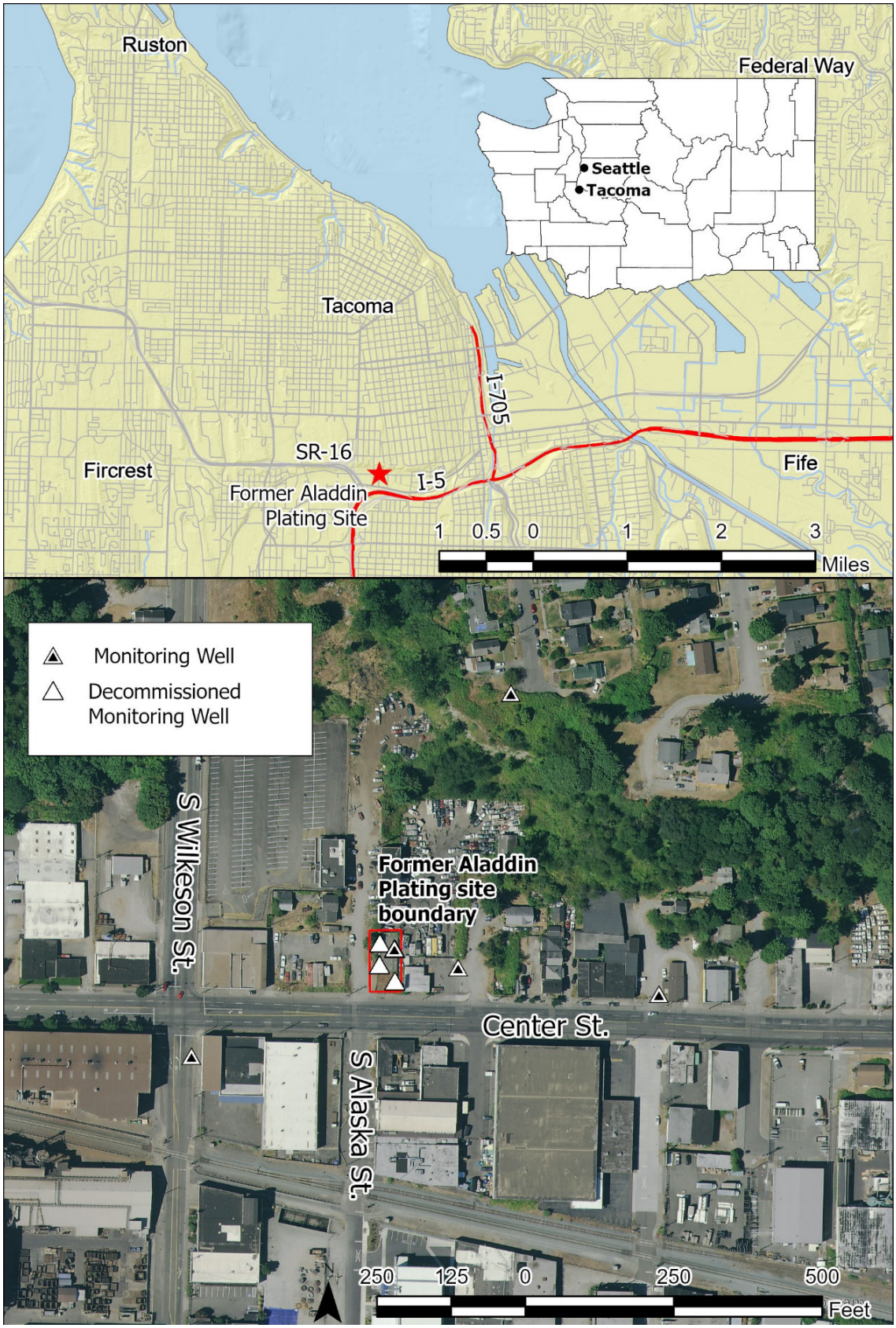

Figure 1. Aladdin Plating Site Location and Site Details

Methods and Results

In April and October 2024, Ecology collected groundwater samples from four monitoring wells (MW-4sR, MW-6s, MW-7s, and MW-8s) at the former Aladdin Plating site (Figure 2). These wells constitute four out of the five remaining monitoring wells associated with the site.

Ecology sampled these wells using industry-standard low-flow sampling techniques. Due to water depth exceeding maximum capabilities for a peristaltic pump at MW-6s, the wells were sampled with a stainless-steel bladder pump, using single-use polyethylene bladders and dedicated Teflon-lined polyethylene tubing at each well. The pump intake was placed midway into the screened interval at all wells but MW-6, which was pumped near the top of the screened interval.

Prior to and during purging, groundwater levels were measured to establish the static water level and assess possible drawdown as specified in standard operating procedure EAP052 (Ecology 2023). Static water levels are provided in Table 1.

Prior to sample collection, the wells were continuously purged through a flow-through cell at a rate of 0.3-liters/minute or less. The wells were purged until stabilization of field parameters (pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential, and turbidity) as specified in standard operating procedure EAP100 (Ecology 2019). Stabilized field parameters from April and October 2024 are provided in Tables 2 and 3, respectively.

Samples were collected directly from the discharge tubing into laboratory-supplied containers. Dissolved metals samples were field-filtered using in-line 0.45-micron membrane filters. Samples were stored on ice and transported using standard chain-of-custody protocol and delivered to the Manchester Environmental Laboratory (MEL) in Port Orchard, Washington. Samples were analyzed by MEL for total and dissolved chromium and nickel using EPA Method 200.8.

Well purge water was collected and stored on site in a 55-gallon drums. Purge water transport and disposal procedures followed Washington State regulations (WAC 173-303-400).

Figure 2. Site Layout

Table 1. Well construction details and water levels from April 2024, and October 2024.

Well ID	Top of Casing Elevation [a] (feet)	Well Depth (feet bgs)	Screen Interval (feet bgs)	April 2024 Groundwater Elevation [a] (feet)	October 2024 Groundwater Elevation [a] (feet)
MW-4sR	245.13	40	24-39	218.43	218.02
MW-5s	248.01	45	35–45	—	—
MW-6s	358.19	153.5	143–153	218.95	218.6
MW-7s	242.57	42	32–42	217.36	215.95
MW-8s	242.96	42.5	24–39	218.21	217.77

bgs: Below ground surface.
[a] Vertical datum for elevation data is NVGD29.
—: Water level not measured during this sampling event.

Table 2. Field Measurements from April 2024.

Well ID	pH (SU)	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Temperature (°C)	Turbidity (NTUs)
MW-4sR	5.82	101.5	8.71	201.2	12.96	7.60
MW-6s	6.40	339.2	6.75	155.8	14.57	8.67
MW-7s	6.54	288.7	8.14	147.3	13.40	2.02
MW-8s	5.77	163.3	8.48	219.0	13.13	9.80

SU: Standard unit
µS/cm: Microsiemens per centimeter
mg/L: Milligrams per liter
mV: Millivolts
C: Celsius
NTUs: Nephelometric turbidity units

Table 3. Field Measurements from October 2024.

Well ID	pH (SU)	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Temperature (°C)	Turbidity (NTUs)
MW-4sR	5.59	150.4	8.54	209.4	12.80	6.30
MW-6s	6.26	364.2	5.34	163.4	12.90	6.29
MW-7s	6.44	315.3	6.72	128.2	14.00	0.56
MW-8s	5.65	147.4	8.26	217.1	14.10	6.70

SU: Standard unit
µS/cm: Microsiemens per centimeter
mg/L: Milligrams per liter
mV: Millivolts
C: Celsius
NTUs: Nephelometric turbidity units

In April and October 2024, water levels could not be measured from MW-5s due to the well's proximity to parked cars and active traffic on the roadway near the well.

Groundwater samples collected during April and October 2024 were submitted for total and dissolved chromium and nickel analysis to assess the contamination of groundwater near and downgradient from the former electroplating facility. Analytical results for the two sample events are presented in Tables 4 and 5. The results are also shown spatially in Figures 3 and 4, and as plots in Figures 5 through 8. MTCA Method A and Method B groundwater cleanup levels are provided in comparison to sample analytical results (WAC 173-340-720).

Blind field duplicate samples were collected for quality control from wells MW-8s in April 2024 and MW-4sR in October 2024. Relative percent differences (RPDs) calculated from these parent and duplicate samples ranged from 1.47% to 5.10% (Table 6). These values meet the data quality objective of 20% as specified in the Quality Assurance Project Plan (Carnes 2022). On Figures 3, 4, and 8, the results are reported as the highest concentration between parent and duplicate sample result. Overall, the laboratory data quality control and quality assurance results indicate that the analytical performance was good. All results are usable as reported.

Table 4. Analytical results from April 2024 and associated cleanup limits. All concentrations are in µg/L.

Well	Total Chromium	Dissolved Chromium	Total Nickel	Dissolved Nickel
MW-4sR	**27.3**	**28.1**	**174**	**177**
MW-6s	**0.84**	**0.52**	**5.7**	**4.98**
MW-7s	**0.57**	**0.5**	**2.32**	**2.17**
MW-8s	**28.3**	**27.4**	**11400**	**10700**
MW-8s (duplicate)	**28.8**	**27**	**11100**	**10900**
MTCA cleanup levels	50	50	320[a]	320[a]

Bold: Analyte was detected.
Underline: Values are greater than the MTCA Method A and/or Method B cleanup levels.
MTCA: MTCA Method A Groundwater Cleanup Level (WAC 173-340-720).
[a] No Method A Value exists for this metal, MTCA Method B Value was used in its place.

Table 5. Analytical results from October 2024 and associated cleanup limits. All concentrations are in µg/L.

Well	Total Chromium	Dissolved Chromium	Total Nickel	Dissolved Nickel
MW-4sR	**8.19**	**7.32**	**587**	**603**
MW-6s	**0.59**	**0.53**	**5.87**	**5.74**
MW-7s	**0.58**	**0.58**	**2.59**	**2.57**
MW-8s	**28.1**	**26.3**	**6320**	**6500**
MW-4sR (duplicate)	**8.46**	**7.04**	**597**	**573**
MTCA cleanup levels	*50*	*50*	*320[a]*	*320[a]*

Bold: Analyte was detected.
Underline: Values are greater than the MTCA Method A and/or Method B cleanup levels.
MTCA: MTCA Method A Groundwater Cleanup Level (WAC 173-340-720).
[a] No Method A Value exists for this metal, MTCA Method B Value was used in its place.

Table 6. Relative percent differences of duplicate sample results

Well	Sampling Date	Total Chromium	Dissolved Chromium	Total Nickel	Dissolved Nickel
MW-8s	April 2024	1.75%	1.47%	2.67%	1.85%
MW-4sR	October 2024	3.24%	3.90%	1.69%	5.10%

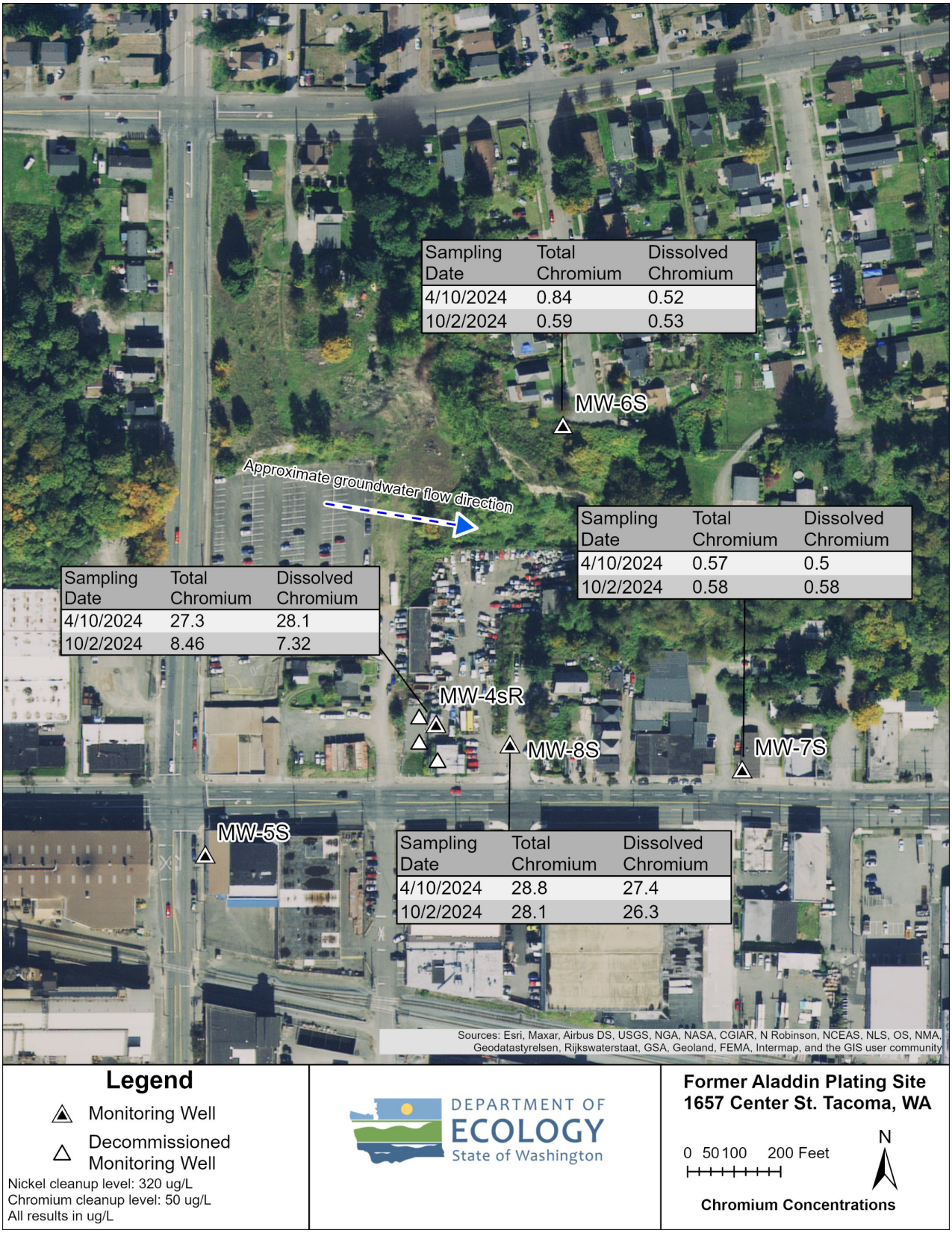

Figure 3. Total and Dissolved Chromium Concentrations (µg/L) in 2024

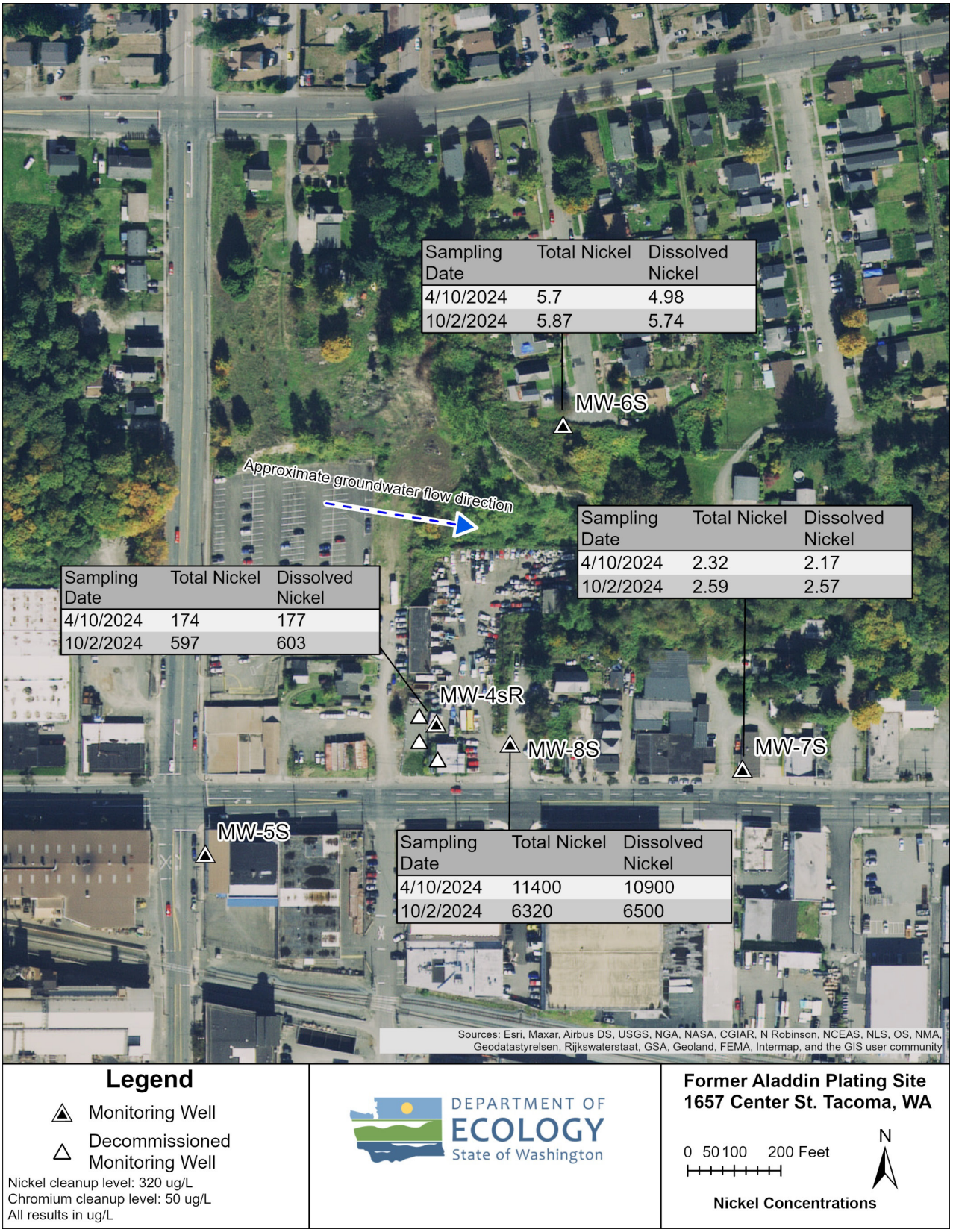

Figure 4. Total and Dissolved Nickel Concentrations (µg/L) in 2024

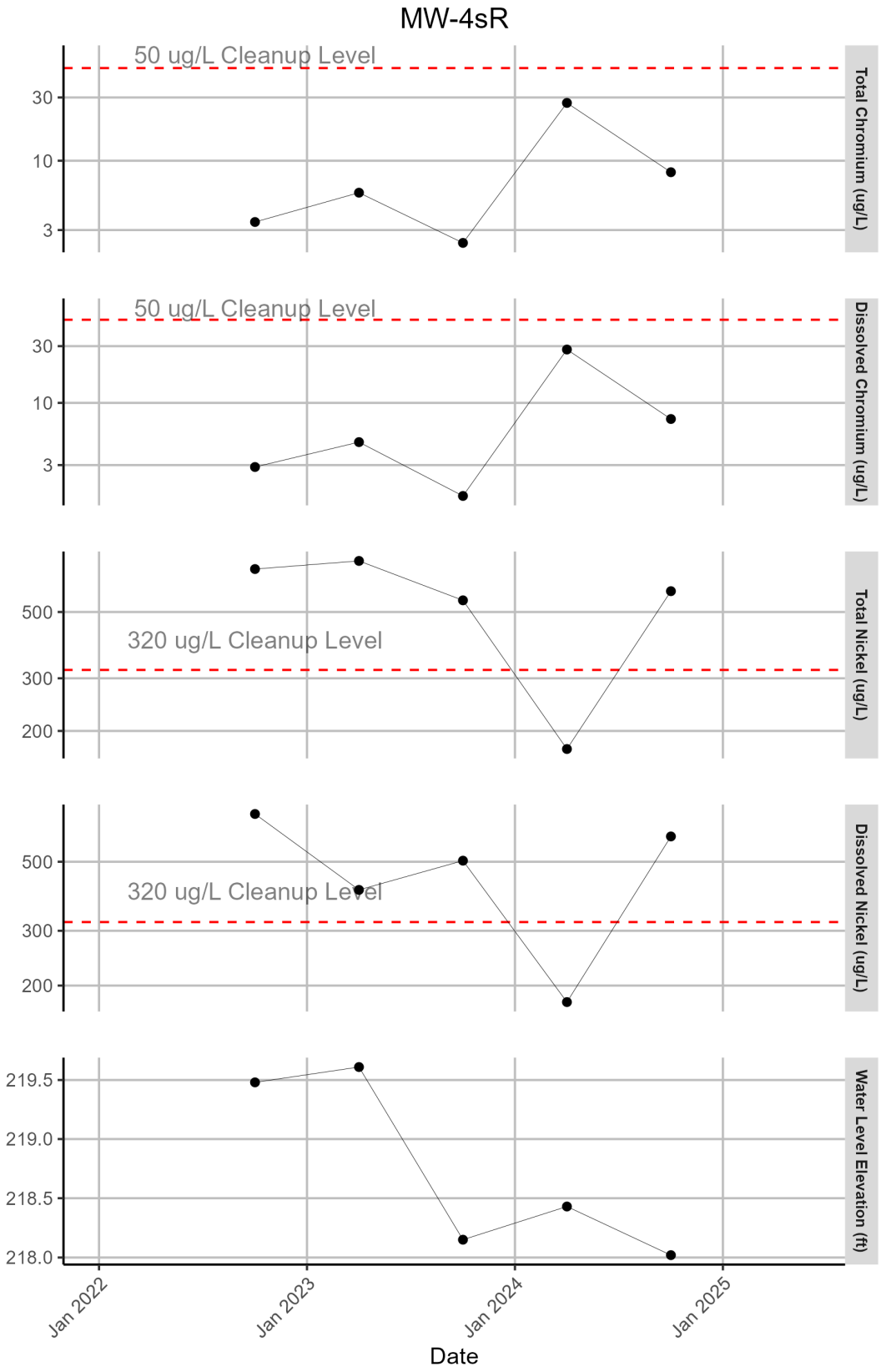

Figure 5. MW-4sR contaminant concentrations (log scale) and groundwater elevations (ft NVGD29) for 2022 – 2024

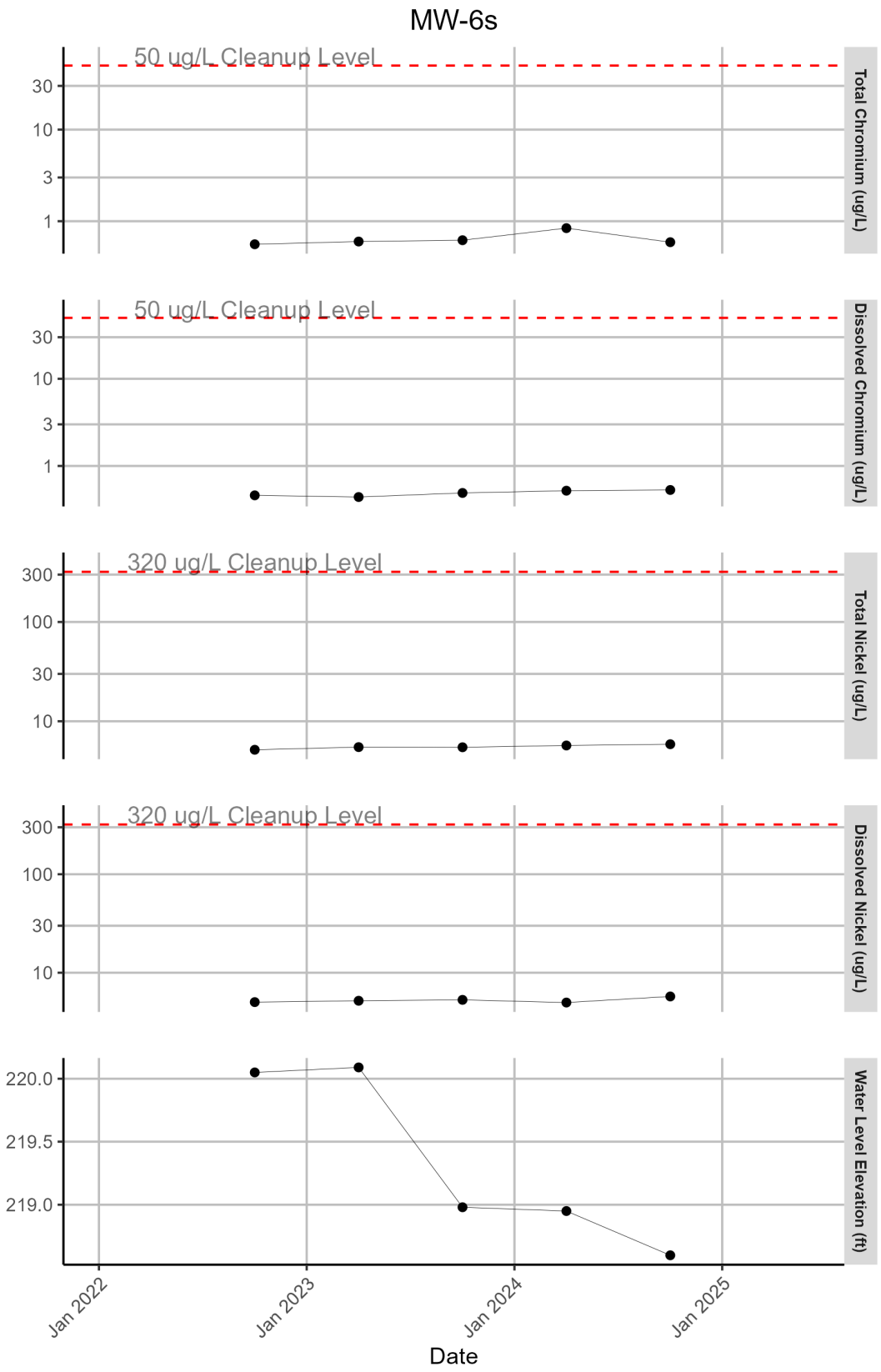

Figure 6. MW-6s contaminant concentrations (log scale) and groundwater elevations (ft NVGD29) for 2022 – 2024

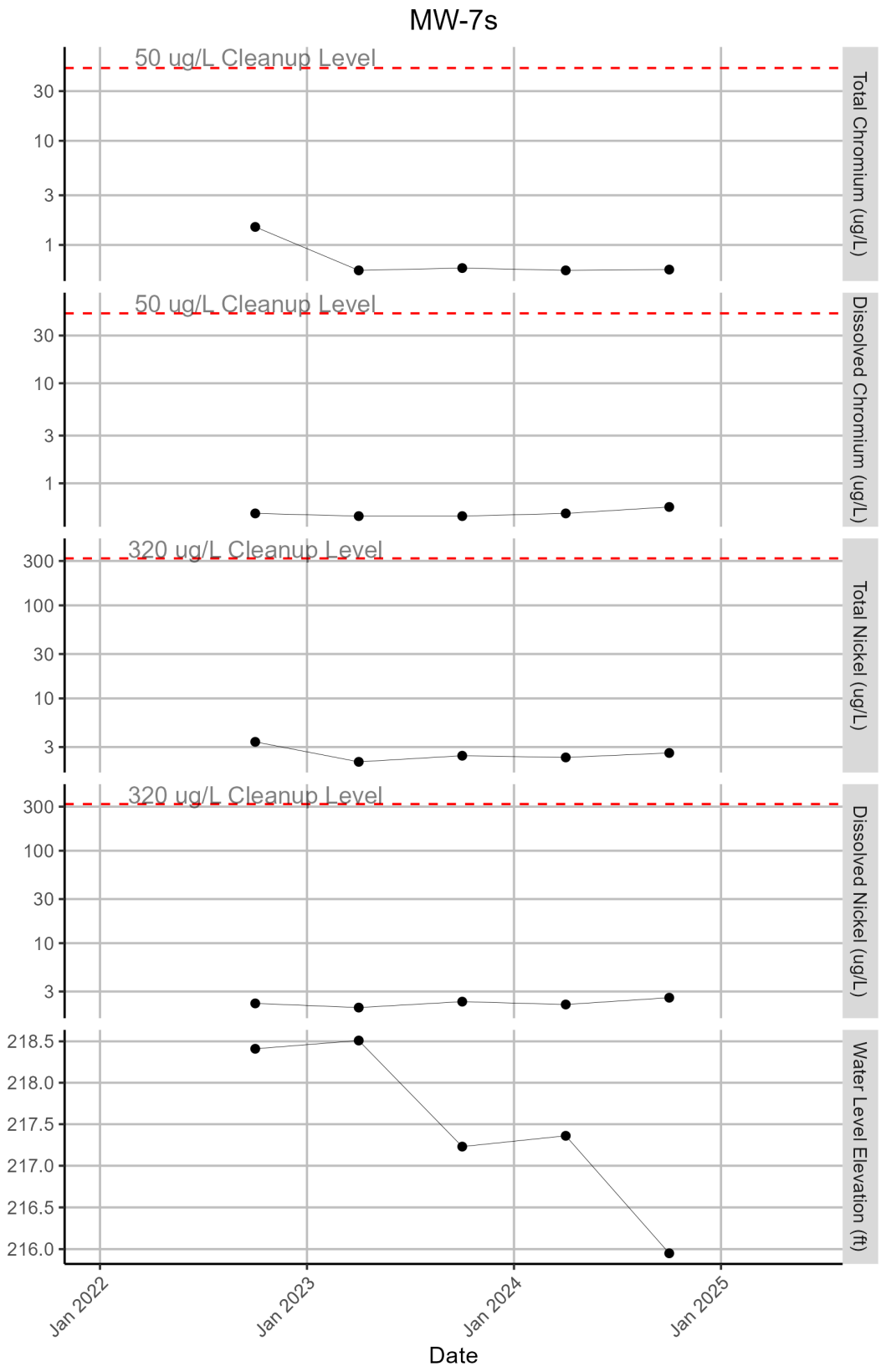

Figure 7. MW-7s contaminant concentrations (log scale) and groundwater elevations (ft NVGD29) for 2022 – 2024

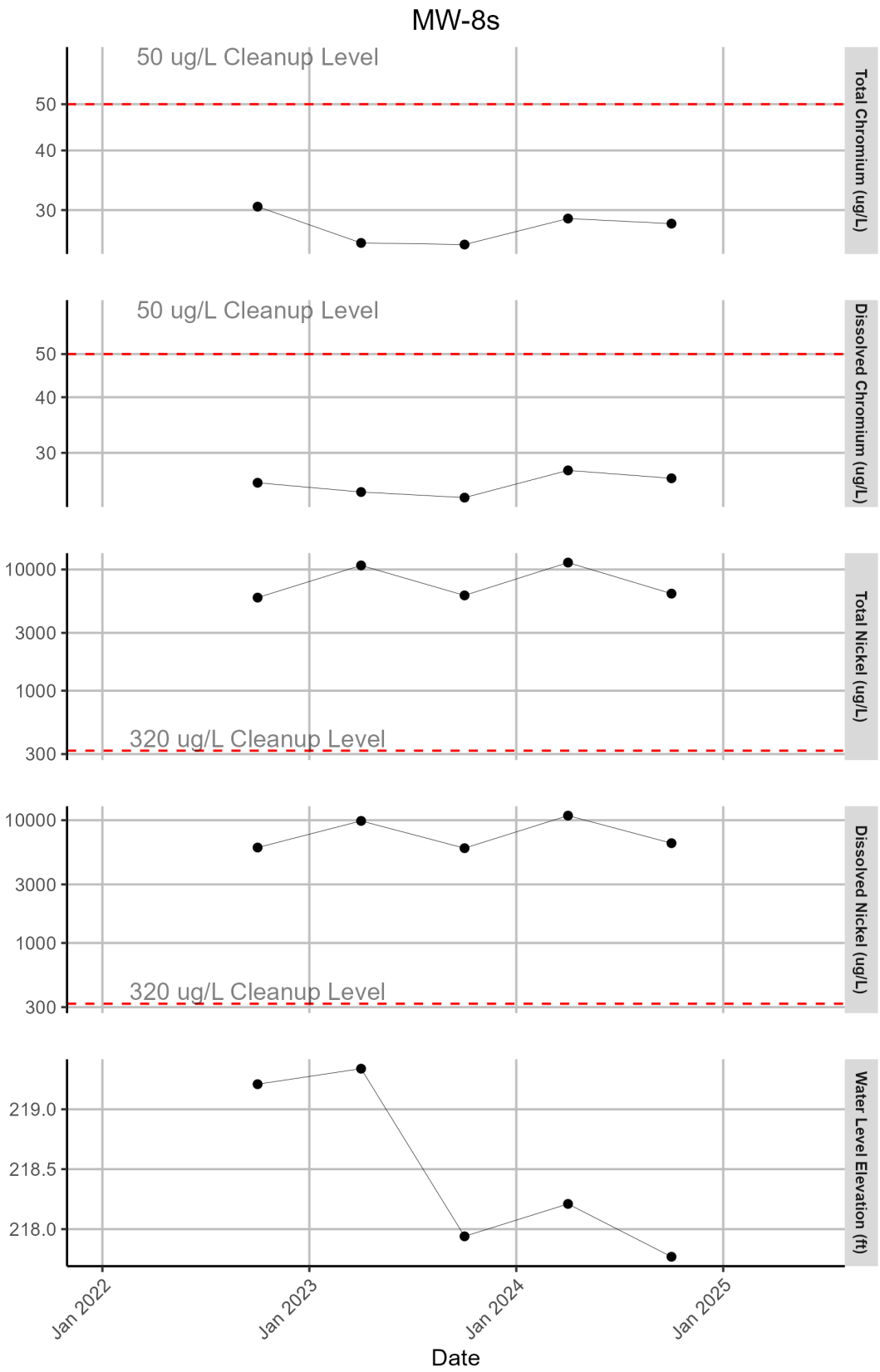

Figure 8. MW-8s contaminant concentrations (log scale) and groundwater elevations (ft NVGD29) for 2022 – 2024

Discussion

Historical Operations Area and Crossgradient Well — Wells MW-4sR, MW-6s

Well MW-4sR is in the footprint of the 2018 excavation and placed near the former location of wells MW-4s and MW-4d. Concentrations of total and dissolved nickel in this well during April 2024 were below the applicable cleanup levels of 320 µg/L as specified in the CAP (GeoEngineers 2014b, WAC 173-340-740). Total and dissolved nickel exceeded the cleanup level during October 2024, with reported concentrations of 597 µg/L and 603 µg/L, respectively. Nickel results in MW-4sR indicate a decrease in concentrations following the 2018 soil excavation, where initial post-excavation nickel concentrations were reported as high as 2,700 µg/L. Recent nickel concentrations are within the range of reported concentrations during Ecology's monitoring at the site (Figure 5). Chromium concentrations in well MW-4sR were below the cleanup levels of 50 µg/L during both sampling events in 2024. There is an apparent seasonal trend in chromium concentrations in MW-4sR, with concentrations higher in the spring than in fall (Figure 5).

Well MW-6s is located atop a bluff approximately 470 feet from and crossgradient to well MW-4sR. Chromium and nickel concentrations in well MW-6s were far below their respective cleanup levels during all sampling events. Contaminant concentrations in MW-6s have been relatively stable throughout Ecology's monitoring at the site (Figure 6).

Groundwater Downgradient from Site — Wells MW-7s and MW-8s

Well MW-8s is located approximately 110 feet downgradient of well MW-4sR. Both wells share similar construction depths and screened intervals (Table 1). Concentrations of total and dissolved nickel in well MW-8s continue to far exceed (not meet) the applicable cleanup levels. Well MW-8s had the highest nickel concentrations of all wells sampled in 2024, with total nickel ranging from 6,320 µg/L to 11,400 µg/L and dissolved nickel ranging from 6,500 µg/L to 10,900 µg/L (Figure 4). Nickel concentrations in MW-8s were the highest in the April 2024 sampling event, however, these results indicate concentrations have decreased since post-excavation sampling in 2019 when concentrations were reported as 13,000 µg/L (Appendix A). There is an apparent seasonal trend to total and dissolved nickel concentration in MW-8s, with concentrations higher in the spring than in fall (Figure 8). Chromium concentrations in MW-8s were below the cleanup levels during all sampling events and are within the range of concentrations reported throughout Ecology's monitoring at the site (Figure 8).

Well MW-7s is located approximately 450 feet downgradient of well MW-4sR. Well construction details are similar to MW-4sR and MW-8s, however, MW-7s is screened three feet deeper (Table 1). Chromium and nickel concentrations in samples collected from well MW-7s during all sampling events were far below their respective cleanup levels. Contaminant levels in MW-7s have remained relatively stable throughout Ecology's monitoring at the site (Figure 7).

Conclusions

Analytical data from samples collected during April and October 2024 indicate that the near-surface aquifer at the former Aladdin Plating site continues to be impacted by nickel contamination far above the 320 µg/L MTCA cleanup level (WAC 173-340-720). Total and dissolved nickel concentrations in wells MW-4sR and MW-8s are higher than (not meeting) applicable cleanup levels, representing near-source and downgradient contamination, respectively.

Historical results demonstrate significant decreases in nickel and chromium concentrations following excavation activities in 2005 and 2019 (Appendix A and Appendix B), however, concentrations of site contaminants remain significantly elevated above cleanup levels in MW-8s. While MW-4sR historically reported high concentrations of total and dissolved chromium, and dissolved nickel since Ecology began monitoring the site, recent concentrations reflect a significant decrease from historical concentrations in the footprint of the former electroplating facility. Samples collected at the remaining site wells were below cleanup levels and were consistent with those throughout Ecology's monitoring of the site (Tables 5, and 6, Appendix A, Appendix B, Figures 3 through 8).

The 2024 analytical data indicates that historic source removal activities are effectively reducing concentrations of chromium and nickel in the near-surface aquifer at the Aladdin Plating site.

Recommendations

Based on analytical results from the April and October 2024 monitoring events, the following is recommended:

- Semi-annual groundwater monitoring events should continue as scheduled due to nickel concentrations which continue to exceed (not meet) established cleanup levels. Analytical results from these sampling events indicate that source removal of impacted soil onsite has reduced concentrations of chromium and nickel in the near-surface aquifer, however, further semi-annual monitoring is necessary to confirm that these concentrations continue to naturally attenuate towards cleanup goals.

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WAC 173-340-740. Model Toxics Control Act-Cleanup. Washington State Department of Ecology, Olympia, WA. https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-740

Appendix A. Historical Groundwater Data

Table A1. Historical analytical data (µg/L) for Aladdin Plating monitoring wells, 2005 – 2019

Well	Analyte	CUL	June 2005[1]	Nov. 2005[1]	July 2006[1]	Oct. 2006[1]	Mar. 2007[1]	Mar. 2014[2]	Feb. 2019[3]
MW-1s[4]	Chromium (Total)	50	——	—	**5.61**	**4.8**	**3.3**	<5	—
	Nickel (Total)	320	—	—	**6.59**	**6.34**	**3.91**	<0.01	—
	Hexavalent Chromium (Total)	48	**2,580**	—	<11	<11	<11	<10	—
	Chromium (Dissolved)	50	—	—	—	**4.87**	**2.1**	—	—
	Nickel (Dissolved)	320	—	—	—	**3.69**	**2.41**	<10	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	<11	—	—
MW-2s[4]	Chromium (Total)	50	—	**29.3**	**25.4**	**9.8**	**62.8**	<5	—
	Nickel (Total)	320	—	**5.74**	**11.1**	**9.43**	**12.3**	<0.01	—
	Hexavalent Chromium (Total)	48	—	**28**	**12**	**26**	**13**	<10	—
	Chromium (Dissolved)	50	—	—	—	**4.95**	**44.2**	—	—
	Nickel (Dissolved)	320	—	—	—	**3.07**	**4.15**	<10	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	**58**	—	—
MW-3s[4]	Chromium (Total)	50	—	**13.6**	**49.6**	**27.1**	**100**	<5	—
	Nickel (Total)	320	—	**348**	**1,710**	**343**	**2,270**	**270**	—
	Hexavalent Chromium (Total)	48	—	<11	**15**	**20**	**85**	<10	—
	Chromium (Dissolved)	50	—	—	—	**22.9**	**78**	—	—
	Nickel (Dissolved)	320	—	—	—	**314**	**2100**	**250**	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	**26**	**106**	—	—
MW-4s[4]	Chromium (Total)	50	—	**4.5**	**286**	**174**	**920**	**98**	—
	Nickel (Total)	320	—	**11**	**17,200**	**17,300**	**42,400**	**7,770**	—
	Hexavalent Chromium (Total)	48	—	<11	**361**	**199**	**933**	**44**	—
	Chromium (Dissolved)	50	—	—	—	**194**	**817**	—	—
	Nickel (Dissolved)	320	—	—	—	**16,300**	**41,900**	**7960**	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	**193**	**951**	—	—

Well	Analyte	CUL	June 2005[1]	Nov. 2005[1]	July 2006[1]	Oct. 2006[1]	Mar. 2007[1]	Mar. 2014[2]	Feb. 2019[3]
MW-4sR	Chromium (Total)	50	—	—	—	—	—	—	**15**
	Nickel (Total)	320	—	—	—	—	—	—	**2,600**
	Hexavalent Chromium (Total)	48	—	—	—	—	—	—	**12**
	Chromium (Dissolved)	50	—	—	—	—	—	—	**11**
	Nickel (Dissolved)	320	—	—	—	—	—	—	**2,700**
	Hexavalent Chromium (Dissolved)	48	—	—	—	—	—	—	—
MW-4d[4]	Chromium (Total)	50	—	<0.50	**49.1**	**18.4**	**4.9**	<5	—
	Nickel (Total)	320	—	**1.86**	**36.6**	**14.6**	**8.58**	**10**	—
	Hexavalent Chromium (Total)	48	—	<11	**15**	<11	<11	<10	—
	Chromium (Dissolved)	50	—	—	—	**3.21**	**1.9**	—	—
	Nickel (Dissolved)	320	—	—	—	**3.5**	**6.67**	**260**	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	<11	—	—
MW-5s	Chromium (Total)	50	—	—	**9.27**	**11.4**	**6.27**	<5	—
	Nickel (Total)	320	—	—	**14.3**	**18.7**	**8.96**	<10	—
	Hexavalent Chromium (Total)	48	—	—	**12**	<11	<11	<10	—
	Chromium (Dissolved)	50	—	—	—	**2.1**	**2.3**	—	—
	Nickel (Dissolved)	320	—	—	—	**7.02**	**5.45**	<10	—
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	<11	—	—
MW-6s	Chromium (Total)	50	—	—	**135**	**1,630**	**36**	**10**	**8.1**
	Nickel (Total)	320	—	—	**118**	**1,780**	**45.3**	**10**	**12**
	Hexavalent Chromium (Total)	48	—	—	**19**	**47**	<11	<10	10 U
	Chromium (Dissolved)	50	—	—	—	**2.1**	**1.2**	—	1.0 U
	Nickel (Dissolved)	320	—	—	—	**19.2**	**11**	<10	8.0 U
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	<11	—	—

Well	Analyte	CUL	June 2005[1]	Nov. 2005[1]	July 2006[1]	Oct. 2006[1]	Mar. 2007[1]	Mar. 2014[2]	Feb. 2019[3]
MW-7s	Chromium (Total)	50	—	—	**18.4**	**2.5**	**3.4**	<5	**2.1**
	Nickel (Total)	320	—	—	**18.2**	**4.86**	**4.76**	<10	8.0 U
	Hexavalent Chromium (Total)	48	—	—	**25**	<11	<11	<10	10 U
	Chromium (Dissolved)	50	—	—	—	**1.1**	**1.4**	—	1.0 U
	Nickel (Dissolved)	320	—	—	—	**1.93**	**3.08**	—	8.0 U
	Hexavalent Chromium (Dissolved)	48	—	—	—	<11	**11**	—	—
MW-8s	Chromium (Total)	50	—	—	—	—	—	—	**32**
	Nickel (Total)	320	—	—	—	—	—	—	**13,000**
	Hexavalent Chromium (Total)	48	—	—	—	—	—	—	**31**
	Chromium (Dissolved)	50	—	—	—	—	—	—	**28**
	Nickel (Dissolved)	320	—	—	—	—	—	—	**13,000**
	Hexavalent Chromium (Dissolved)	48	—	—	—	—	—	—	—

[1] Landau Associates, 2007
[2] GeoEngineers, 2014a
[3] GeoEngineers, 2019
[4] Monitoring well decommissioned in 2018
U: Analyte not detected at or above the reported value
—: Not analyzed for
Highlighted cells indicate exceedance of cleanup level
Bold text indicates analyte was detected above the laboratory reporting limit

Table A2. Historical analytical data (µg/L) for Aladdin Plating direct push boring grab water samples, June 2005

Well	Analyte	CUL	June 2005
ALDW1[1]	Chromium (Total)	50	3,480
ALDW1[1]	Nickel (Total)	320	—
ALDW1[1]	Hexavalent Chromium (Total)	48	470
ALDW2[1]	Chromium (Total)	50	—
ALDW2[1]	Nickel (Total)	320	918
ALDW2[1]	Hexavalent Chromium (Total)	48	843
ALDW3[1]	Chromium (Total)	50	7,250
ALDW3[1]	Nickel (Total)	320	—
ALDW3[1]	Hexavalent Chromium (Total)	48	1,280
ALDW4[1]	Chromium (Total)	50	—
ALDW4[1]	Nickel (Total)	320	—
ALDW4[1]	Hexavalent Chromium (Total)	48	1,280
ALDW5[1]	Chromium (Total)	50	—
ALDW5[2]	Nickel (Total)	320	—
ALDW5[2]	Hexavalent Chromium (Total)	48	632

[1] Landau Associates, 2007

—: Not analyzed for

CUL: MTCA Method A and/or Method B Cleanup level

Shading indicates exceedance of cleanup level

Appendix A References

GeoEngineers, Inc. 2014. Report of Findings — Soil Explorations and Groundwater Monitoring, Aladdin Plating Site, 1657 Center Street, Tacoma, Washington. June 16, 2014.

GeoEngineers, 2019. Aladdin Plating Groundwater Monitoring Event — February 2019. Former Aladdin Plating site, 1657 Center St. Tacoma Washington. https://apps.ecology.wa.gov/gsp/DocViewer.ashx?did=82251

Landau Associates, 2007. Groundwater Monitoring Report, Fall 2006 through Spring 2007, Former Aladdin Plating Facility, Tacoma, Washington. July 31, 2007.

Appendix B. Performance Monitoring Groundwater Data

Table B1. Analytical data (µg/L) for Aladdin Plating monitoring wells, 2006[1] – 2024

Well	Date	Total Chromium	Dissolved Chromium	Total Nickel	Dissolved Nickel
MW-4sR	2/2019	15	11	2600	2700
	10/2022	3.45	2.89	696	712
	4/2023	5.74	4.68	741[2] J	406
	10/2023	2.4	1.65	547	504
	4/2024	27.3	28.1	174	177
	10/2024	8.46	7.32	597	603
MW-6s	7/2006	135	—	118	—
	10/2006	1630	2.1	1780	19.2
	3/2007	36	1.2	45.3	11
	3/2014	10	—	10	10 U
	2/2019	8.1	1.0 U	12	8.0 U
	10/2022	0.56	0.46	5.16	5.03
	4/2023	0.6	0.44	5.49	5.19
	10/2023	0.62	0.49	5.47	5.3
	4/2024	0.84	0.52	5.7	4.98
	10/2024	0.59	0.53	5.87	5.74
MW-7s	7/2006	18.4	—	18.2	—
	10/2006	2.5	1.1	4.86	1.93
	3/2007	3.4	1.4	4.76	3.08
	3/2014	5 U	—	10 U	—
	2/2019	2.1	1.0 U	8.0 U	8.0 U
	10/2022	1.49	0.5	3.41	2.23
	4/2023	0.57	0.47	2.08	2.01
	10/2023	0.6	0.47	2.42	2.33
	4/2024	0.57	0.5	2.32	2.17
	10/2024	0.58	0.58	2.59	2.57
MW-8s	2/2019	32	28	13000	13000
	10/2022	30.5	25.7	5860	5990
	4/2023	25.6	24.5	10800	9870
	10/2023	25.4	23.8	6110	5920
	4/2024	28.8	27.4	11400	10900
	10/2024	28.1	26.3	6320	6500
MTCA cleanup levels	—	*50*	*50*	*320[a]*	*320[a]*

Bold: Analyte was detected.

Underline: Values are greater than the MTCA Method A and/or Method B cleanup levels.

MTCA: MTCA Method A Groundwater Cleanup Level (WAC 173-340-720).

J: Reported numerical value is an estimate.

[1] Analytical data between 2006 and 2019 presented for comparison to Ecology monitoring data.

[2] Sample value reported as an estimate due to RPD value exceeding DQOs of 20%.

[a] No Method A Value exists for this metal, MTCA Method B Value was used in its place.

'—' Not applicable or data not available due to well not being sampled.