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Annual 2023 Groundwater and Cap Compliance Monitoring Report

BNSF Hillyard Dross Cap
Spokane, Washington

16 August 2023

Prepared for

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KJ Project No. 2396114.00

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Section 1: Introduction

This report summarizes the groundwater and compliance monitoring activities conducted during 2023 at the BNSF Railway Company (BNSF) Hillyard Dross Cap site (Site), located at the southwestern intersection of E. Wellesley Avenue and N. Ferrall Street in Spokane, Washington. The Site is also referred to as the Aluminum Recycling Corporation Site in the Washington State Department of Ecology (Ecology) Consent Decree No. 01202037-9 (Ecology 2001). The Site location relative to the surrounding area is illustrated on Figure 1. Major Site features are displayed on Figure 2.

1.1 Background

The Final Remedial Action Work Plan (FRAWP) for the Site was completed in 2001 (EMR 2001). The Final Cleanup Action Plan (FCAP), including the Operations and Maintenance Plan, was completed in July 2003 (GeoEngineers 2003). Site activities include groundwater sampling of the four Site wells (MW-3R, MW-4, MW-5 and MW-6) and inspection of the remedial components outlined in the FCAP.

Ecology has completed three 5-year periodic reviews of the Site in 2008, 2013 and 2022, respectively. In the latest Periodic Review, Ecology concluded that "contaminant concentrations are showing improvements" and "the measures that were taken for the original cleanup action remain protective today" (Ecology 2022). The 2022 Periodic Review is included as Appendix A.

The contaminants of concern (COCs) for the Site include chloride and nitrate (as nitrogen). The cleanup levels (CULs), which are defined in the FCAP, are 250 milligrams per liter (mg/L) for chloride and 10 mg/L for nitrate. Fluoride and nitrite (as nitrogen) were previously COCs at the Site. Ecology removed fluoride from the COC list in the 2013 5-year periodic review and removed nitrite from the list during the 2022 5-year periodic review based on a statistical analysis of the data collected to date (see Appendix A).

In a 30 July 2014 email, Ecology requested that BNSF establish criteria for a data evaluation to determine whether compliance with the groundwater CULs was being achieved (Ecology 2014). Ecology recommended conducting a statistical analysis of a rolling dataset to evaluate attainment of CULs. Based on Ecology's publication 94-49, "*Guidance on Sampling and Data Analysis Methods"*, attainment of CULs is evaluated by comparing the 95 percent upper confidence limit (95% UCL) of the mean (calculated from sampling data) to the CUL. Ecology recommended using a rolling data set of the most recent 20 samples (5 years of quarterly data) for the analysis. The constituent in the designated well is considered to have met the CUL if, after evaluating the last 20 samples at a given monitoring well, the 95% UCL of the mean is lower than the CUL and no single sample exceeds twice the CUL and less than 10% of the samples exceed the CUL. The statistical analysis is conducted following each sampling event and reported to Ecology. The Ecology Model Toxics Control Act (MTCA) Stat program is used for the analysis. The results of the 2023 statistical analyses are presented in Section 2.4.

In a letter dated 5 July 2017 to Ecology, BNSF requested that the frequency of remedial cap inspection and groundwater monitoring at the Site be reduced to once per year, with both

activities to be conducted in the second quarter. Ecology approved the requested change in a letter dated 25 July 2017.

In a letter dated 5 November 2020 to Ecology, BNSF requested that the frequency of groundwater monitoring at the Site be reduced to once every three years. Ecology approved the requested change via email on 17 November 2020. The reduction in sampling frequency was confirmed by Ecology in the 2022 Periodic Review. The once every three years sampling frequency was implemented with the May 2023 groundwater monitoring event.

Monitoring well MW-3 was decommissioned and replaced with new monitoring well MW-3R in March of 2022. MW-3R was first sampled during the May 2023 groundwater monitoring event The groundwater analytical datasets collected from MW-3 and MW-3R have been combined for purposes of statistical analysis and comparison to CULs in this report.

The results of the May 2023 groundwater sampling event and inspection of the remedial components are discussed below.

Section 2: 2023 Groundwater Sampling

2.1 General

Groundwater monitoring and sampling activities were performed at the Site in May 2023 by Spokane Environmental Solutions (SES). Groundwater levels and samples were collected from well MW-5 on 16 May 2023 and from wells MW-3R, MW-4, and MW-6 on 17 May 2023. The sample collected from well MW-5 (and a quality control field duplicate sample, DUP-01) were received at the laboratory outside of the 48-hour hold time for nitrate analysis. SES re-sampled MW-5 and DUP-01 on 30 May 2023. Dedicated submersible bladder pumps outfitted with dedicated Teflon-lined tubing were used for groundwater purging and sampling using low-flow techniques in the four wells. Field methods are summarized in Appendix B. Monitoring well sample logs are included in Appendix C.

The groundwater samples were submitted to Pace Analytical National Center for Testing and Innovation in Mt. Juliet, Tennessee, for analysis of chloride and nitrate by U.S. Environmental Protection Agency (EPA) Method 9056A.

A summary of groundwater elevations is presented in Table 1. Water quality parameters measured during groundwater purging are summarized in Table 2, and chloride and nitrate analytical results are summarized in Table 3. A copy of the laboratory analytical report and the Kennedy Jenks data validation report is presented in Appendix D.

2.2 Groundwater Elevation and Hydraulic Gradient Direction

Groundwater elevations, calculated from depth-to-water measurements collected 16 and 17 May 2023, ranged from 1,867.19 feet (monitoring well MW-6) to 1,869.24 feet (monitoring well MW-4) (Table 1). The interpreted groundwater flow direction beneath the Site at the time of the monitoring event was north-northwest under a hydraulic gradient of approximately 0.002 feet per foot, which is consistent with historical data. Interpreted groundwater elevation contours and groundwater hydraulic gradient direction for the three wells gauged on 17 May 2023 (MW-3R, MW-4, and MW-6) are presented on Figure 3.

2.3 Groundwater Analytical Results

Chloride and nitrate were reported at concentrations above the laboratory reporting limit in samples from wells MW-3R, MW-4, MW-5, and MW-6, but below respective CULs. Figures 4 and 5 present graphical representations of chloride and nitrate concentrations in groundwater, respectively. The analytical results for this event and previous sampling events are summarized in Table 3.

For quality control purposes, a field duplicate sample was collected from monitoring well MW-5 during the 2023 sampling event. The nitrate analysis results for the parent and duplicate samples collected on 16 May 2023 from well MW-5 were qualified as estimated concentrations that may be biased low, “J-“, based on sample analysis outside the 48-hour holding time. The results of the parent and duplicate samples collected on 30 May 2023 were within acceptable

limits and no qualifiers were added. The laboratory reports were reviewed for quality control/quality assurance purposes and were found to be acceptable for their intended purpose.

2.4 2023 Groundwater Statistical Analysis

Statistical analysis was applied to results of the last 20 groundwater samples collected from monitoring well MW-5 (nitrate-N and chloride) and MW-3/MW-3R (nitrate-N). Monitoring well MW-3 was decommissioned and replaced by MW-3R in March of 2022. The first sampling event for MW-3R occurred in May 2023. For the purposes of groundwater statistical analysis, the available data set from MW-3 was applied to MW-3R. To perform the statistical analyses, the dataset from a date range of January 2011 to May 2023 was used for monitoring well MW-3/MW-3R and April 2013 to May 2023 for monitoring well MW-5. A longer date range was required for monitoring well MW-3 because this well was dry during 10 sampling events since January 2011 and no samples could be collected.

Analyte concentrations have been below applicable CULs in samples collected from monitoring well MW-4 and MW-6 since 2013. Therefore, statistical analyses were not performed on the datasets for wells MW-4 and MW-6. Chloride concentrations in samples collected from monitoring well MW-3/MW-3R have been below the CUL in the last 20 groundwater samples. Therefore, statistical analysis was not performed on the chloride dataset for MW-3/MW-3R.

Table 4 presents a summary of the statistical analysis. The MTCA Stat output files are included in Appendix E. Based on the results of the statistical analysis and data evaluation, the following conclusions are made:

- The 95% UCL of the mean nitrate-N concentration in the dataset of monitoring well MW-3/MW-3R was 8.58 mg/L in 2023, which is less than the CUL of 10 mg/L. However, two of the last 20 samples (10 percent) reported nitrate-N concentrations above the CUL. Therefore, monitoring of nitrate-N in this well will continue.

- The 95% UCL of the mean nitrate-N concentration in the dataset of monitoring well MW-5 was 9.82 mg/L in 2023, which is less than the CUL of 10 mg/L. However, two of the last 20 samples (10 percent) reported nitrate-N concentrations above the CUL. The maximum reported concentration of nitrate-N in well MW-5 was 41.80 mg/L, which is greater than twice the CUL. Therefore, monitoring of nitrate-N in this well will continue.

- The 95% UCL of the mean chloride concentration in the dataset of monitoring well MW-5 was 268 mg/L in 2023, which is greater than the CUL of 250 mg/L. The chloride CUL has been exceeded in one sample (5 percent) collected during the last 20 sampling events. The maximum reported concentration of chloride in well MW-5 was 923 mg/L, which is greater than twice the CUL. Therefore, monitoring of chloride in this well will continue.

Section 3: Operation and Maintenance Activities

3.1 General

The dross encapsulation cell (dross cap) and associated stormwater system were constructed between 2001 and 2003. The dross cap consists of a low permeability, 40-millimeter-thick, high-density polyethylene (HDPE) geomembrane placed over the graded and prepared dross and soil surface. The geomembrane is overlain by 18 to 30 inches of rounded gravel that acts as a drain to shed water off of the geomembrane. A woven, permeable HDPE geotextile fabric is placed above the gravel and covered with approximately 18 inches of topsoil. The topsoil was hydroseeded upon installation.

Stormwater from the dross cap is directed to a channel along the perimeter of the cap, which drains either directly to the stormwater retention pond or to a sump located in the western portion of the Site. Stormwater that drains to the sump is pumped to the retention pond. Secondary overflow from the retention pond is routed to an onsite drywell.

Operation and maintenance (O&M) activities in 2023 consisted of annual remedial component system checks performed consistent with the approved O&M Plan. The annual inspection was completed on 17 May 2023 by SES and included assessment of the following: (1) the dross cap; (2) the stormwater conveyance, evaporation, and disposal system; and (3) other physical facilities such as access roads, setbacks, fencing, electrical system, and groundwater monitoring wells.

3.2 Dross Encapsulation Cell

No erosion or settlement of the dross cap was observed during the May 2023 inspection. Grasses and forbs were abundant on and surrounding the dross encapsulation cell during the growing season and were dormant during dry months, as is normal.

3.3 Stormwater Conveyance, Evaporation, and Disposal System

Stormwater conveyance, evaporation, and disposal system components were monitored in May 2023. The evaporation pond that collects Site stormwater is located directly northeast of the dross encapsulation cell. Water level elevations measured in the pond are referenced to the North American Vertical Datum of 1988. Post-construction evaporation pond water level elevations are presented in Table 5. The evaporation pond was not observed to be discharging to the overflow sump and drywell during the May 2023 inspection.

3.4 Monitoring Wells

Monitoring wells MW-3R, MW-4, MW-5, and MW-6 were observed to be in good condition during the monitoring event conducted in 2023. No physical damage to the well monuments was observed.

3.5 Other Physical Features

During the annual inspection completed on 17 May 2023, the following conditions were noted:

- The site entrance gate is difficult to operate; repairs will be performed.
- A low area along the western bank of the stormwater retention pond was observed; more gravel will be added to the area.
- Established trees were observed to be growing along the perimeter of the stormwater retention pond; these trees will be removed.

Other physical features such as access roads, setbacks, and fencing were in good condition.

Section 4: Summary

4.1 Departures from Consent Decree

There were no deviations from from tasks outlined in the Consent Decree for groundwater monitoring and inspection activities.

4.2 Groundwater Elevations and Estimated Flow

Groundwater elevations measured in May 2023 are within the range of previous groundwater elevation measurements at the Site. The hydraulic gradient and estimated groundwater flow direction during the 2023 monitoring event was generally towards the north-northwest, which is consistent with the general groundwater flow direction in the unconfined aquifer underlying the Site and general area (Spokane Valley-Rathdrum Prairie Aquifer) (U.S. Geological Survey 1988).

4.3 Groundwater Analytical Results

In 2023, chloride and nitrate were reported at concentrations below their respective CULs in the samples collected from monitoring wells MW-3R, MW-4, MW-5, and MW-6. Prior to 2023, chloride and nitrate were last reported above their respective CULs in June 2018 in well MW-5. Chloride was also reported above its CUL in July 2012 in well MW-5. Nitrate was reported above the CUL in January 2017 in well MW-3 and in April 2017 in well MW-5.

4.4 Site Conditions

The network of groundwater monitoring wells at the Site were secure and in good condition. Stormwater conveyance, evaporation, and disposal system components were found to be in good condition during this reporting period.

4.5 Planned Future Activities & Recommendations

Attainment of CULs is evaluated by comparing the 95% UCL of the mean (calculated from sampling data) to the CUL using a dataset of the most recent 20 samples. The constituent in the designated well is considered to have met the CUL if, after evaluating the last 20 samples from the well, the 95% UCL of the mean is lower than the CUL and no single sample exceeds twice the CUL and less than 10% of the samples exceed the CUL. Ecology originally recommended using this rolling dataset when the site was being monitored on a quarterly basis, such that 20 samples represented the last 5 years of quarterly data. In the latest Periodic Review, conducted by Ecology in 2022, groundwater monitoring frequency was reduced to one groundwater monitoring event every three years (triennial).

Since the site is under a triennial monitoring program, it is recommended that the dataset used for evaluating attainment of CULs be reduced to include data collected from the last 10 rounds of sampling to meet minimum statistical dataset requirements.

Inspection of the cap, stormwater system, and security fencing will continue to be performed annually. Groundwater monitoring will be performed in the Spring of 2026.

References

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GeoEngineers, Inc. 2003. Final Cleanup Action Report - Aluminum Recycling Corporation Site, 3412 East Wellesley Avenue, Spokane, Washington.

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Tables

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[a] (feet)	Depth to Water[b] (feet)	Groundwater Elevation (feet)	Change in Elevation[c] (feet)
MW-3	6/30/1997	2,039.01	DRY	NA[d]	NA
MW-3	12/15/1998	2,039.01	176.16	1,862.85	NA
MW-3	2/22/1999	2,039.01	174.37	1,864.64	-1.79
MW-3	5/4/1999	2,039.01	171.21	1,867.80	-3.16
MW-3	7/28/1999	2,039.01	174.31	1,864.70	3.10
MW-3	12/8/1999	2,039.01	176.00	1,863.01	1.69
MW-3	6/20/2000	2,039.01	172.05	1,866.96	-3.95
MW-3	12/8/2000	2,039.01	176.65	1,862.36	4.60
MW-3	10/30/2002	2,039.01	DRY	NA	NA
MW-3	2/4/2003	2,039.01	DRY	NA	NA
MW-3	4/29/2003	2,039.01	172.37	1,866.64	4.28
MW-3	07/24/03	2,039.01	DRY	NA	NA
MW-3	10/30/03	2,039.01	DRY	NA	NA
MW-3	01/26/04	2,039.01	DRY	NA	NA
MW-3	4/16/2004	2,039.01	173.38	1,865.63	-0.91
MW-3	7/26/2004	2,039.01	176.45	1,862.56	-3.07
MW-3	10/15/2004	2,039.01	DRY	NA	NA
MW-3	1/28/2005	2,039.01	174.17	1,864.84	2.28
MW-3	4/29/2005	2,039.01	173.56	1,865.45	0.61
MW-3	7/20/2005	2,039.01	176.49	1,862.52	-2.93
MW-3	10/27/2005	2,039.01	DRY	NA	NA
MW-3	1/11/2006	2,039.01	175.31	1,863.70	1.18
MW-3	4/12/2006	2,039.01	173.11	1,865.90	2.20
MW-3	7/13/2006	2,039.01	174.24	1,864.77	-1.13
MW-3	10/24/2006	2,039.01	176.71	1,862.30	-2.47
MW-3	1/29/2007	2,039.01	174.57	1,864.44	2.14
MW-3	4/19/2007	2,039.01	170.08	1,868.93	4.49
MW-3	7/19/2007	2,039.01	176.11	1,862.90	-6.03
MW-3	9/13/2007	2,039.01	DRY	NA	NA
MW-3	10/29/2007	2,039.01	DRY	NA	NA
MW-3	1/30/2008 [e]	2,039.01	174.57	1,864.44	1.54
MW-3	4/22/2008	2,039.01	174.19	1,864.82	0.38
MW-3	7/23/2008	2,039.01	172.83	1,866.18	1.36
MW-3	10/22/2008	2,039.01	DRY	NA	NA
MW-3	1/29/2009	2,039.01	174.28	1,864.73	-1.45
MW-3	4/28/2009	2,039.01	171.43	1,867.58	2.85
MW-3	7/9/2009	2,039.01	174.09	1,864.92	-2.66
MW-3	10/29/2009	2,039.01	DRY	NA	NA
MW-3	1/19/2010	2,039.01	176.20	1,862.81	-2.11
MW-3	4/6/2010	2,039.01	175.52	1,863.49	0.68
MW-3	7/27/2010	2,039.01	175.26	1,863.75	0.26
MW-3	10/20/2010	2,039.01	DRY	NA	NA
MW-3	1/18/2011	2,039.01	174.19	1,864.82	1.07
MW-3	4/21/2011	2,039.01	170.21	1,868.80	3.98
MW-3	7/14/2011	2,039.01	169.85	1,869.16	0.36
MW-3	10/6/2011	2,039.01	176.50	1,862.51	-6.65

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-3	1/24/2012	2,039.01	176.01	1,863.00	0.49
MW-3	4/10/2012	2,039.01	171.43	1,867.58	4.58
MW-3	7/11/2012	2,039.01	171.23	1,867.78	0.20
MW-3	10/30/2012	2,039.01	DRY	NA	NA
MW-3	1/29/2013	2,039.01	174.86	1,864.15	-3.63
MW-3	4/11/2013	2,039.01	DRY	NA	NA
MW-3	10/24/2013	2,039.01	177.80	1,861.21	-2.94
MW-3	1/29/2014	2,039.01	175.67	1,863.34	2.13
MW-3	4/23/2014	2,039.01	170.72	1,868.29	4.95
MW-3	7/28/2014	2,039.01	175.14	1,863.87	-4.42
MW-3	10/29/2014	2,039.01	DRY	NA	NA
MW-3	1/28/2015	2,039.01	174.26	1,864.75	0.88
MW-3	4/14/2015	2,039.01	171.57	1,867.44	2.69
MW-3	7/14/2015	2,039.01	DRY	NA	NA
MW-3	10/27/2015	2,039.01	DRY	NA	NA
MW-3	1/26/2016	2,039.01	175.65	1,863.36	NA
MW-3	4/28/2016	2,039.01	170.76	1,868.25	4.89
MW-3	7/13/2016	2,039.01	175.72	1,863.29	-4.96
MW-3	10/12/2016	2,039.01	DRY	NA	NA
MW-3	1/31/2017	2,039.01	175.34	1,863.67	NA
MW-3	4/18/2017	2,039.01	167.18	1,871.83	8.16
MW-3	6/27/2018	2,039.01	172.34	1,866.67	-5.16
MW-3	4/30/2019	2,039.01	172.02	1,866.99	0.32
MW-3	4/29/2020	2,039.01	173.32	1,865.69	-1.30
Note: MW-3 abandoned in 2022 and replaced by MW-3R prior to the 2023 sampling event.					
MW-3R	5/17/2023 [(f)]	2,040.34	172.61	1,867.73	2.04
MW-4	12/15/1998	2,039.42	175.53	1,863.89	0.02
MW-4	2/22/1999	2,039.42	173.84	1,865.58	1.69
MW-4	5/4/1999	2,039.42	170.43	1,868.99	3.41
MW-4	7/28/1999	2,039.42	173.96	1,865.46	-3.53
MW-4	12/8/1999	2,039.42	175.50	1,863.92	-1.54
MW-4	6/15/2000	2,039.42	171.56	1,867.86	3.94
MW-4	12/7/2000	2,039.42	176.40	1,863.02	-4.84
MW-4	10/30/2002	2,039.42	NA	NA	NA
MW-4	2/4/2003	2,039.42	174.80	1,864.62	1.60
MW-4	4/29/2003	2,039.42	171.78	1,867.64	3.02
MW-4	7/24/2003	2,039.42	176.53	1,862.89	-4.75
MW-4	10/30/2003	2,039.42	177.05	1,862.37	-0.52
MW-4	1/26/2004	2,039.42	176.30	1,863.12	0.75
MW-4	4/16/2004	2,039.42	172.61	1,866.81	3.69
MW-4	7/26/2004	2,039.42	176.08	1,863.34	-3.47
MW-4	10/15/2004	2,039.42	176.70	1,862.72	-0.62
MW-4	1/28/2005	2,039.42	173.48	1,865.94	3.22
MW-4	4/29/2005	2,039.42	172.98	1,866.44	0.50
MW-4	7/20/2005	2,039.42	176.11	1,863.31	-3.13

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-4	10/27/2005	2,039.42	176.86	1,862.56	-0.75
MW-4	1/11/2006	2,039.42	174.57	1,864.85	2.29
MW-4	4/12/2006	2,039.42	172.33	1,867.09	2.24
MW-4	7/13/2006	2,039.42	173.94	1,865.48	-1.61
MW-4	10/24/2006	2,039.42	177.00	1,862.42	-3.06
MW-4	1/29/2007	2,039.42	174.03	1,865.39	2.97
MW-4	4/19/2007	2,039.42	170.23	1,869.19	3.80
MW-4	7/19/2007	2,039.42	175.79	1,863.63	-5.56
MW-4	9/13/2007	2,039.42	177.81	1,861.61	-2.02
MW-4	10/29/2007	2,039.42	176.87	1,862.55	0.94
MW-4	1/30/2008	2,039.42	175.73	1,863.69	1.14
MW-4	4/22/2008	2,039.42	173.54	1,865.88	2.19
MW-4	7/23/2008	2,039.42	172.55	1,866.87	0.99
MW-4	10/22/2008	2,039.42	176.17	1,863.25	-3.62
MW-4	1/29/2009	2,039.42	173.64	1,865.78	2.53
MW-4	4/28/2009	2,039.42	170.61	1,868.81	3.03
MW-4	7/9/2009	2,039.42	173.76	1,865.66	-3.15
MW-4	10/29/2009	2,039.42	176.65	1,862.77	-2.89
MW-4	1/19/2010	2,039.42	175.72	1,863.70	0.93
MW-4	4/6/2010	2,039.42	174.96	1,864.46	0.76
MW-4	7/27/2010	2,039.42	174.92	1,864.50	0.04
MW-4	10/20/2010	2,039.42	176.63	1,862.79	-1.71
MW-4	1/18/2011	2,039.42	173.58	1,865.84	3.05
MW-4	4/21/2011	2,039.42	169.50	1,869.92	4.08
MW-4	7/14/2011	2,039.42	169.48	1,869.94	0.02
MW-4	10/6/2011	2,039.42	176.10	1,863.32	-6.62
MW-4	1/24/2012	2,039.42	175.53	1,863.89	0.57
MW-4	4/10/2012	2,039.42	170.55	1,868.87	4.98
MW-4	7/11/2012	2,039.42	170.91	1,868.51	-0.36
MW-4	10/30/2012	2,039.42	176.01	1,863.41	-5.10
MW-4	1/29/2013	2,039.42	174.40	1,865.02	1.61
MW-4	4/11/2013	2,039.42	DRY	NA	NA
MW-4	10/24/2013	2,039.42	176.16	1,863.26	-1.76
MW-4	1/29/2014	2,039.42	175.40	1,864.02	0.76
MW-4	4/23/2014	2,039.42	170.09	1,869.33	5.31
MW-4	7/28/2014	2,039.42	174.81	1,864.61	-4.72
MW-4	10/29/2014	2,039.42	176.28	1,863.14	-1.47
MW-4	1/28/2015	2,039.42	173.69	1,865.73	2.59
MW-4	4/14/2015	2,039.42	171.03	1,868.39	2.66
MW-4	7/14/2015	2,039.42	176.83	1,862.59	-5.80
MW-4	10/27/2015	2,039.42	177.47	1,861.95	-0.64
MW-4	1/26/2016	2,039.42	175.11	1,864.31	2.36
MW-4	4/28/2016	2,039.42	170.13	1,869.29	4.98
MW-4	7/13/2016	2,039.42	175.37	1,864.05	-5.24
MW-4	10/12/2016	2,039.42	177.27	1,862.15	-1.90

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-4	1/31/2017	2,039.42	174.91	1,864.51	2.36
MW-4	4/18/2017	2,039.42	166.48	1,872.94	8.43
MW-4	6/27/2018	2,039.42	172.03	1,867.39	-5.55
MW-4	4/23/2019	2,039.42	171.19	1,868.23	0.84
MW-4	4/29/2020	2,039.42	172.60	1,866.82	-1.41
MW-4	5/17/2023 [(f)]	2,038.34	169.10	1,869.24	2.42
MW-5	12/15/1998	2,041.80	177.61	1,864.19	NA
MW-5	2/22/1999	2,041.80	177.10	1,864.70	0.51
MW-5	5/4/1999	2,041.80	173.90	1,867.90	3.20
MW-5	7/28/1999	2,041.80	177.07	1,864.73	-3.17
MW-5	12/10/1999	2,041.80	178.82	1,862.98	-1.75
MW-5	6/20/2000	2,041.80	174.78	1,867.02	4.04
MW-5	12/8/2000	2,041.80	178.61	1,863.19	-3.83
MW-5	10/30/2002	2,041.80	DRY	NA	NA
MW-5	2/4/2003	2,041.80	178.00	1,863.80	0.61
MW-5	4/29/2003	2,041.80	175.01	1,866.79	2.99
MW-5	7/24/2003	2,041.80	179.69	1,862.11	-4.68
MW-5	10/30/2003	2,041.80	180.37	1,861.43	-0.68
MW-5	1/26/2004	2,041.80	179.49	1,862.31	0.88
MW-5	4/16/2004	2,041.80	176.02	1,865.78	3.47
MW-5	7/26/2004	2,041.80	179.19	1,862.61	-3.17
MW-5	10/15/2004	2,041.80	179.97	1,861.83	-0.78
MW-5	1/28/2005	2,041.80	176.88	1,864.92	3.09
MW-5	4/29/2005	2,041.80	176.32	1,865.48	0.56
MW-5	7/20/2005	2,041.80	179.27	1,862.53	-2.95
MW-5	10/27/2005	2,041.80	180.14	1,861.66	-0.87
MW-5	1/11/2006	2,041.80	177.99	1,863.81	2.15
MW-5	4/12/2006	2,041.80	175.71	1,866.09	2.28
MW-5	7/13/2006	2,041.80	177.04	1,864.76	-1.33
MW-5	10/24/2006	2,041.80	180.24	1,861.56	-3.20
MW-5	1/29/2007	2,041.80	177.28	1,864.52	2.96
MW-5	4/19/2007	2,041.80	173.61	1,868.19	3.67
MW-5	7/19/2007	2,041.80	178.90	1,862.90	-5.29
MW-5	9/13/2007	2,041.80	180.97	1,860.83	-2.07
MW-5	10/29/2007	2,041.80	180.12	1,861.68	0.85
MW-5	1/30/2008	2,041.80	178.94	1,862.86	1.18
MW-5	4/22/2008	2,041.80	176.89	1,864.91	2.05
MW-5	7/23/2008	2,041.80	175.60	1,866.20	1.29
MW-5	10/22/2008	2,041.80	179.38	1,862.42	-3.78
MW-5	1/29/2009	2,041.80	176.98	1,864.82	2.40
MW-5	4/28/2009	2,041.80	174.12	1,867.68	2.86
MW-5	7/9/2009	2,041.80	176.85	1,864.95	-2.73
MW-5	10/29/2009	2,041.80	179.86	1,861.94	-3.01
MW-5	1/19/2010	2,041.80	178.91	1,862.89	0.95
MW-5	3/10/2010 [(g)]	2,041.80	178.51	1,863.29	0.40

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-5	4/6/2010	2,041.80	178.21	1,863.59	0.30
MW-5	7/27/2010	2,041.80	178.05	1,863.75	0.16
MW-5	10/20/2010	2,041.80	179.84	1,861.96	-1.79
MW-5	1/18/2011	2,041.80	176.90	1,864.90	2.94
MW-5	4/21/2011	2,041.80	172.91	1,868.89	3.99
MW-5	7/14/2011	2,041.80	172.65	1,869.15	0.26
MW-5	10/6/2011	2,041.80	179.26	1,862.54	-6.61
MW-5	1/24/2012	2,041.80	178.77	1,863.03	0.49
MW-5	4/10/2012	2,041.80	174.14	1,867.66	4.63
MW-5	7/11/2012	2,041.80	174.03	1,867.77	0.11
MW-5	10/30/2012	2,041.80	179.20	1,862.60	-5.17
MW-5	1/29/2013	2,041.80	177.60	1,864.20	1.60
MW-5	4/11/2013	2,041.80	DRY	NA	NA
MW-5	10/24/2013	2,041.80	179.28	1,862.52	-1.68
MW-5	1/29/2014	2,041.80	178.40	1,863.40	0.88
MW-5	4/23/2014	2,041.80	173.48	1,868.32	4.92
MW-5	7/28/2014	2,041.80	177.92	1,863.88	-4.44
MW-5	10/29/2014	2,041.80	179.49	1,862.31	-1.57
MW-5	1/28/2015	2,041.80	176.99	1,864.81	2.50
MW-5	4/14/2015	2,041.80	174.31	1,867.49	2.68
MW-5	7/14/2015	2,041.80	179.97	1,861.83	-5.66
MW-5	10/27/2015	2,041.80	180.69	1,861.11	-0.72
MW-5	1/26/2016	2,041.80	178.38	1,863.42	2.31
MW-5	4/28/2016	2,041.80	173.49	1,868.31	4.89
MW-5	7/13/2016	2,041.80	178.51	1,863.29	-5.02
MW-5	10/12/2016	2,041.80	180.52	1,861.28	-2.01
MW-5	1/31/2017	2,041.80	178.11	1,863.69	2.41
MW-5	4/18/2017	2,041.80	169.91	1,871.89	8.20
MW-5	6/27/2018	2,041.80	175.12	1,866.68	-5.21
MW-5	4/23/2019	2,041.80	174.72	1,867.08	0.40
MW-5	4/29/2020	2,041.80	175.99	1,865.81	-1.27
MW-5	5/16/2023	2,041.80	174.15	1,867.65	1.84
MW-5	5/30/2023 [(h)]	2,041.80	174.34	1,867.46	1.65
MW-6	12/15/1998	2,042.73	177.20	1,865.53	NA
MW-6	2/22/1999	2,042.73	178.44	1,864.29	-1.24
MW-6	5/4/1999	2,042.73	175.37	1,867.36	3.07
MW-6	7/28/1999	2,042.73	178.33	1,864.40	-2.96
MW-6	12/10/1999	2,042.73	182.40	1,860.33	-4.07
MW-6	6/20/2000	2,042.73	176.16	1,866.57	6.24
MW-6	12/7/2000	2,042.73	180.97	1,861.76	-4.81
MW-6	10/30/2002	2,042.73	DRY	NA	NA
MW-6	2/4/2003	2,042.73	179.70	1,863.03	1.27
MW-6	4/29/2003	2,042.73	176.39	1,866.34	3.31
MW-6	7/24/2003	2,042.73	180.98	1,861.75	-4.59
MW-6	10/30/2003	2,042.73	181.77	1,860.96	-0.79

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-6	1/26/2004	2,042.73	180.85	1,861.88	0.92
MW-6	4/16/2004	2,042.73	177.56	1,865.17	3.29
MW-6	7/26/2004	2,042.73	180.55	1,862.18	-2.99
MW-6	10/15/2004	2,042.73	181.39	1,861.34	-0.84
MW-6	1/28/2005	2,042.73	178.33	1,864.40	3.06
MW-6	4/29/2005	2,042.73	177.73	1,865.00	0.60
MW-6	7/20/2005	2,042.73	180.60	1,862.13	-2.87
MW-6	10/27/2005	2,042.73	181.54	1,861.19	-0.94
MW-6	1/11/2006	2,042.73	179.49	1,863.24	2.05
MW-6	4/12/2006	2,042.73	177.23	1,865.50	2.26
MW-6	7/13/2006	2,042.73	178.47	1,864.26	-1.24
MW-6	10/24/2006	2,042.73	181.64	1,861.09	-3.17
MW-6	1/29/2007	2,042.73	178.70	1,864.03	2.94
MW-6	4/19/2007	2,042.73	175.08	1,867.65	3.62
MW-6	7/19/2007	2,042.73	180.18	1,862.55	-5.10
MW-6	9/13/2007	2,042.73	182.37	1,860.36	-2.19
MW-6	10/29/2007	2,042.73	181.52	1,861.21	0.85
MW-6	1/30/2008	2,042.73	180.32	1,862.41	1.20
MW-6	4/22/2008	2,042.73	178.39	1,864.34	1.93
MW-6	7/23/2008	2,042.73	176.88	1,865.85	1.51
MW-6	10/22/2008	2,042.73	180.75	1,861.98	-3.87
MW-6	1/29/2009	2,042.73	178.41	1,864.32	2.34
MW-6	4/28/2009	2,042.73	175.65	1,867.08	2.76
MW-6	7/9/2009	2,042.73	178.15	1,864.58	-2.50
MW-6	10/29/2009	2,042.73	181.27	1,861.46	-3.12
MW-6	1/19/2010	2,042.73	180.34	1,862.39	0.93
MW-6	4/6/2010	2,042.73	179.68	1,863.05	0.66
MW-6	7/27/2010	2,042.73	179.36	1,863.37	0.32
MW-6	10/20/2010	2,042.73	181.23	1,861.50	-1.87
MW-6	1/18/2011	2,042.73	178.39	1,864.34	2.84
MW-6	4/21/2011	2,042.73	174.43	1,868.30	3.96
MW-6	7/14/2011	2,042.73	174.00	1,868.73	0.43
MW-6	10/6/2011	2,042.73	180.63	1,862.10	-6.63
MW-6	1/24/2012	2,042.73	180.13	1,862.60	0.50
MW-6	4/10/2012	2,042.73	175.73	1,867.00	4.40
MW-6	7/11/2012	2,042.73	175.32	1867.41	0.41
MW-6	10/30/2012	2,042.73	180.59	1862.14	-5.27
MW-6	1/29/2013	2,042.73	178.94	1863.79	1.65
MW-6	4/11/2013	2,042.73	DRY	NA	NA
MW-6	10/24/2013	2,042.73	180.81	1861.92	-1.87
MW-6	1/29/2014	2,042.73	179.81	1862.92	1.00
MW-6	4/23/2014	2,042.73	174.96	1867.77	4.85
MW-6	7/28/2014	2,042.73	179.21	1863.52	-4.25
MW-6	10/29/2014	2,042.73	180.87	1861.86	-1.66
MW-6	1/28/2015	2,042.73	178.43	1864.30	2.44

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-6	4/14/2015	2,042.73	175.72	1867.01	2.71
MW-6	7/14/2015	2,042.73	181.31	1861.42	-5.59
MW-6	10/27/2015	2,042.73	182.08	1,860.65	-0.77
MW-6	1/26/2016	2,042.73	179.80	1,862.93	2.28
MW-6	4/28/2016	2,042.73	174.94	1,867.79	4.86
MW-6	7/13/2016	2,042.73	179.80	1,862.93	-4.86
MW-6	10/12/2016	2,042.73	181.92	1,860.81	-2.12
MW-6	1/31/2017	2,042.73	179.44	1,863.29	2.48
MW-6	4/18/2017	2,042.73	171.41	1,871.32	8.03
MW-6	6/27/2018	2,042.73	176.40	1,866.33	-4.99
MW-6	4/23/2019	2,042.73	176.25	1,866.48	0.15
MW-6	4/29/2020	2,042.73	177.52	1,865.21	-1.27
MW-6	5/17/2023	2,042.73	175.54	1,867.19	1.98

Notes:
(a) Top of well casing elevations were provided by EMR Inc.
(b) Depth to water measurements recorded relative to top of well casing.
(c) Change in groundwater elevation since previous event.
(d) NA = Elevation not available because well was dry.
(e) Anomalous groundwater elevation is a suspected measurement error.
(f) Top of well casing elevations for wells MW-3R and MW-4 were provided by Arcadis.
(g) Monitoring well MW-5 was re-sampled on 10 March 2010 because of a laboratory error with respect to the sample collected 19 January 2010.
(h) Monitoring well MW-5 was re-sampled on 30 May 2023 because the sample collected on 16 May 2023 was received by the analytical lab outside the 48-hour hold time.

Table 2: Summary of Water Quality Parameters

Well Number	Date Sampled	Temperature (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (DO) (mg/L)	pH (s.u.)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	Notes
MW-3	09/24/13	Dry.						--
MW-3	01/29/14	8.29	712	--	8.19	112.2	34.2	Less than 2 ft of water column present; sampled using polyethylene bailer.
MW-3	04/23/14	13.8	62.5	10.5	7.87	120.4	11.3	Sampled using polyethylene bailer.
MW-3	07/28/14	13.35	431	--	7.87	73.2	--	Less than 2 ft of water column present; sampled using polyethylene bailer.
MW-3	10/29/14	Insufficient water to sample.						--
MW-3	01/28/15	9.25	818	9.06	8.26	98.9	86.32	Sampled using polyethylene bailer.
MW-3	04/14/15	11.05	643	9.15	8.16	70.8	108.50	Sampled using polyethylene bailer.
MW-3	07/14/15	Insufficient water to sample.						--
MW-3	10/27/15	Dry.						--
MW-3	01/26/16	9.82	329	--	7.99	--	58	Less than 2 ft of water column present; sampled using polyethylene bailer.
MW-3	04/28/16	11.35	624	10.83	8.15	110.3	185.50	Sampled using polyethylene bailer.
MW-3	07/13/16	12.72	838	11.45	8.17	92.5	63.27	Less than 2 ft of water column present; sampled using polyethylene bailer.
MW-3	10/12/16	Dry						--
MW-3	01/31/17	9.96	818	9.30	7.27	85.8	123.0	Less than 2 ft of water column present; sampled using polyethylene bailer.
MW-3	04/18/17	10.83	500	8.38	8.42	65.6	5.63	Sampled using polyethylene bailer.
MW-3	06/27/18	Insufficient water to sample.						--
MW-3	05/14/19	15.21	454	6.73	8.12	133	42	Well redeveloped on 30 April 2019. Due to turbidity, parameters were measured on 14 May 2020 and sample was collected on 15 May 2020.
MW-3	04/29/20	Insufficient water to sample.						--
MW-3R	05/17/23	Parameters were not recorded during sampling. See Appendix C: Monitoring Well Sampling Field Logs for details.						--
MW-4	10/24/13	11.18	226	9.14	7.65	120.8	1	--
MW-4	01/29/14	10.01	325	--	7.22	111.9	1.24	--
MW-4	04/23/14	10.14	215	8.32	8.22	161.1	0.4	--
MW-4	07/28/14	12.54	486	10.01	7.06	117.8	0.83	--
MW-4	10/29/14	11.50	291	8.13	7.94	98.5	0.00	--
MW-4	01/28/15	10.47	361	9.84	7.88	23.4	1.30	--
MW-4	04/14/15	10.83	417	10.29	7.66	94.7	0.25	--
MW-4	07/14/15	13.81	390	14.64	7.56	45.9	0.00	--
MW-4	10/27/15	12.92	238	8.89	8.10	143.1	1.08	--
MW-4	01/26/16	10.67	148	9.90	8.05	190.9	0.71	--
MW-4	04/28/16	12.29	277	8.77	7.94	101.6	1.94	--
MW-4	07/13/16	14.07	530	10.18	7.59	98.8	0.92	--
MW-4	01/31/17	10.27	567	9.67	6.56	99.8	2.32	--
MW-4	04/18/17	11.51	435	9.91	8.02	71.9	1.00	--
MW-4	06/27/18	18.93	574	5.05	7.87	115	0.0	--
MW-4	04/23/19	12.17	295	2.23	8.30	211	0.0	--
MW-4	04/29/20	12.54	254	2.54	8.30	63	0.0	--
MW-4	05/17/23	12.90	238	7.99	7.73	64.2	NM	--
MW-5	10/24/13	11.55	870	9.19	7.59	100.5	1	--
MW-5	01/29/14	--	808	--	7.59	105.8	0.86	--
MW-5	04/23/14	11.00	794	3.94	7.80	149.2	0.4	--
MW-5	07/28/14	14.02	369	10.27	7.63	96.8	1.22	--
MW-5	10/29/14	12.15	484	8.44	7.96	105.2	0.00	--
MW-5	01/28/15	9.49	807	9.56	7.62	123.1	1.96	--
MW-5	04/14/15	11.80	503	10.03	7.73	84.4	0.43	--
MW-5	07/14/15	16.67	623	12.74	7.37	51.2	0.01	--

Table 2: Summary of Water Quality Parameters

Well Number	Date Sampled	Temperature (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (DO) (mg/L)	pH (s.u.)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	Notes
MW-5	10/27/15	12.73	659	9.09	7.78	179.0	0.83	--
MW-5	01/26/16	10.76	326	8.02	7.70	196.1	0.21	--
MW-5	04/28/16	13.15	376	7.83	7.91	97.7	1.90	--
MW-5	07/13/16	12.79	793	6.03	7.79	91.7	0.45	--
MW-5	10/12/16	12.73	766	8.45	7.77	62.1	1.26	--
MW-5	01/31/17	8.90	393	7.90	6.50	49.7	11.76	--
MW-5	04/18/17	11.04	724	6.47	8.12	74.7	1.82	--
MW-5	06/27/18	20.42	577	1.81	7.43	176	0.5	--
MW-5	04/23/19	11.80	452	2.16	8.11	203	0.0	--
MW-5	04/29/20	16.90	355	8.29	8.01	79	0.0	--
MW-5	05/16/23	16.90	363	8.03	7.24	58.2	NM	--
MW-5	05/30/23	16.60	361	8.16	7.32	58.9	NM	--
MW-6	10/24/13	11.85	323	8.84	7.71	97.2	1	--
MW-6	01/29/14	--	--	--	--	--	58.05	--
MW-6	04/23/14	11.84	205	7.90	8.24	141.0	1.3	--
MW-6	07/28/14	14.02	216	7.73	7.78	95.1	2.29	--
MW-6	10/29/14	12.21	380	7.47	7.84	112.0	0.93	--
MW-6	01/28/15	9.92	357	9.11	8.16	111.3	3.20	--
MW-6	04/14/15	11.49	238	11.15	7.85	75.6	1.40	--
MW-6	07/14/15	14.93	350	14.51	7.46	46.9	0.75	--
MW-6	10/27/15	12.89	295	8.30	8.00	183.5	1.79	--
MW-6	01/26/16	10.18	166	8.98	8.06	220.0	0.61	--
MW-6	04/28/16	12.97	207	8.24	8.15	91.0	1.38	--
MW-6	07/13/16	14.93	294	9.74	8.05	87.3	1.44	--
MW-6	10/12/16	10.17	340	8.23	7.72	86.5	0.19	--
MW-6	01/31/17	9.00	270	7.70	7.13	72.9	4.03	--
MW-6	04/18/17	10.90	216	7.07	8.41	60.6	1.11	--
MW-6	06/27/18	16.00	250	3.85	8.33	103.0	0.0	--
MW-6	04/23/19	13.43	229	3.25	8.32	199	1.9	--
MW-6	04/29/20	12.87	279	3.81	8.40	35	0.0	--
MW-6	05/17/23	16.30	225	7.15	7.93	56.4	NM	--

Notes:
°C = degrees Celsius
µS/cm = microSiemens per centimeter
mg/L = milligrams per liter
s.u. = standard units
mV = millivolts
NTU = Nephelometric turbidity units
NM = Not Measured
ft = feet

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-3	06/30/97	**397**[d]	**83.80**
MW-3	12/15/98	181	**42.40**
MW-3	07/28/99	134	**14.30**
MW-3	06/20/00	61.1	9.58
MW-3	04/29/03 [f]	68.4	6.37
MW-3	04/16/04	107	**13.20**
MW-3	01/28/05	67.3	**14.40**
MW-3	04/29/05	75.4	**12.70**
MW-3	01/11/06	93.3	**16.10**
MW-3	04/12/06	62.6	6.16
MW-3	07/13/06	5.03	**13.80**
MW-3	10/24/06	50.2	**12.9 J** [j]
MW-3	01/29/07	128	**23**
MW-3	04/19/07	36.6	3.18
MW-3	07/19/07 [k]	85.6	**19.40**
MW-3	01/30/08 [k]	74.5	**14.10**
MW-3	04/22/08	53.8	7.90
MW-3	07/23/08	80.6	**11.30**
MW-3	01/29/09	68.2	7.95
MW-3	04/28/09	74.2	8.44
MW-3	07/09/09	77.1	6.24
MW-3	01/19/10	NS[l]	NS
MW-3	04/07/10	40	7.50
MW-3	07/27/10	77	**13.00**
MW-3	10/20/10	NS	NS
MW-3	01/18/11	51	6.00
MW-3	04/21/11	35	4.20
MW-3	07/14/11	39	6.90
MW-3	10/06/11	NS	NS
MW-3	01/24/12	71	9.70
MW-3	04/10/12	60	5.10
MW-3	07/11/12	57	9.50
MW-3	10/30/12	NS	NS
MW-3	01/29/13	110	**15.00**
MW-3	04/11/13	37	4.70
MW-3	10/24/13 [k]	NS	NS
MW-3	01/29/14	67	8.10
MW-3	04/23/14	43	5.60
MW-3	07/28/14	60	**11.00**
MW-3	10/29/14	NS	NS
MW-3	01/28/15	25	2.50
MW-3	04/14/15	44.00	6.27
MW-3	07/14/15	NS	NS

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-3	10/27/15	NS	NS
MW-3	01/26/16	44.8	6.51
MW-3	04/28/16	34.7	4.67
MW-3	07/13/16	51.90	9.83
MW-3	10/12/16	NS	NS
MW-3	01/31/17	86.10	**11.20**
MW-3	04/18/17	21.20	4.57
MW-3	06/27/18 [c]	NS	NS
MW-3	05/15/19	22.20	3.81
MW-3	04/29/20	NS	NS
MW-3	04/29/20	NS	NS
MW-3R	05/17/23	15.9	3.37
MW-4	12/15/98	2.46	1.22
MW-4	07/28/99	133.00	4.20
MW-4	12/08/99	2.13	1.50
MW-4	06/15/00	70.50	2.49
MW-4	12/07/00	3.89	1.36
MW-4	10/30/02	2.80	2.72
MW-4	02/04/03 [e]	2.76	1.61
MW-4	04/29/03	21.20	2.13
MW-4	07/24/03	16.50	2.69
MW-4	10/30/03	1.97	2.59
MW-4	01/26/04	2.65	1.96
MW-4	04/16/04	2.25	1.03
MW-4	07/26/04	14.70	4.43
MW-4	10/15/04	4.60	2.79
MW-4	01/28/05	5.18	3.23
MW-4	04/29/05	106.00	6.20
MW-4	07/20/05	48.30	**10.20**
MW-4	10/27/05	2.47	2.40
MW-4	01/11/06	1.97	0.68
MW-4	04/12/06	1.80	0.57
MW-4	07/13/06	41.00	5.25
MW-4	10/24/06	5.44	1.11
MW-4	01/29/07	28.50	4.59
MW-4	04/19/07	28.20	4.37
MW-4	07/19/07 [k]	16.60	6.11
MW-4	09/13/07	2.08	0.94
MW-4	10/29/07	2.60	1.77
MW-4	01/30/08 [k]	4.70	6.25
MW-4	04/22/08	3.98	3.49
MW-4	07/23/08	7.32	3.86
MW-4	10/22/08	2.75	1.28

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-4	01/29/09	2.59	0.78
MW-4	04/28/09	2.50	0.68
MW-4	07/09/09	19.30	4.42
MW-4	10/29/09	2.70	1.90
MW-4	01/19/10	5.60	3.90
MW-4	04/07/10	3.20	1.40
MW-4	07/27/10	7.80	4.00
MW-4	10/20/10	2.70	2.00
MW-4	01/18/11	2.60	ND
MW-4	04/21/11	2.40	ND
MW-4	07/14/11	3.80	1.60
MW-4	10/06/11	4.30	2.40
MW-4	01/24/12	3.60	2.30
MW-4	04/10/12	3.00	1.00
MW-4	07/11/12	4.70	2.70
MW-4	10/30/12	2.80	2.40
MW-4	01/29/13	3.60	2.30
MW-4	04/11/13	2.70	<0.90
MW-4	10/24/13 [k]	2.60	1.40
MW-4	01/29/14	5.50	2.50
MW-4	04/23/14	3.20	0.93
MW-4	07/28/14	5.90	2.90
MW-4	10/29/14	3.80	2.70
MW-4	01/28/15	3.20	0.92
MW-4	04/14/15	3.55	1.55
MW-4	07/14/15	4.47	2.36
MW-4	10/27/15	3.70	1.58
MW-4	01/26/16	5.16	1.89
MW-4	04/28/16	3.32	0.98
MW-4	07/13/16	3.39	1.75
MW-4	10/12/16	3.25	1.49
MW-4	01/31/17	3.29	4.93
MW-4	04/18/17	2.88	0.94
MW-4	06/27/18 [c]	4.41	2.70
MW-4	04/23/19	5.19	1.84
MW-4	04/29/20	4.42	1.37
MW-4	05/17/23	4.79	1.15
MW-5	12/15/98	**690**	**19.40**
MW-5	07/28/99	113	2.50
MW-5	12/10/99	**432**	5.65
MW-5	06/20/00	**257**	0.80
MW-5	12/08/00	**518**	6.37
MW-5	10/30/02	**1660**	**16.20**

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-5	02/04/03 [e]	227	8.39
MW-5	04/29/03	**345**	ND
MW-5	07/24/03	**928**	**11.10**
MW-5	10/30/03	**1490**	ND
MW-5	01/26/04	**1330**	**11.40**
MW-5	04/16/04	**1260**	ND
MW-5	07/26/04	**896**	**18.10**
MW-5	10/15/04	**4810**	**43.60**
MW-5	01/28/05	**970**	**32.80**
MW-5	04/29/05	**1030**	**31.00**
MW-5	07/20/05	**492**	**19.20**
MW-5	10/27/05	**1020**	**31.50**
MW-5	01/11/06	**650**	9.95
MW-5	04/12/06	**902**	9.35
MW-5	07/13/06	**740**	8.42
MW-5	10/24/06	**644**	**10.9[h]**
MW-5	01/29/07	**587**	**18.50**
MW-5	04/19/07	**693**	**11.10**
MW-5	07/19/07	122	5.89
MW-5	09/13/07	**438**	**12.3**
MW-5	10/29/07	**700**	**16.20**
MW-5	01/30/08	**513**	**13.30**
MW-5	04/22/08	**546**	3.05
MW-5	07/23/08	**914**	6.36
MW-5	10/22/08	**292**	**10.00**
MW-5	01/29/09	**298**	9.43
MW-5	04/28/09	**417**	**10.50**
MW-5	07/09/09	112	3.20
MW-5	10/29/09	**290**	**11[k]**
MW-5	01/19/10	**360**	**13[k]**
MW-5	03/10/10	**330**	**14.00**
MW-5	04/07/10	**330**	**15.00**
MW-5	07/27/10	48	5.50
MW-5	10/20/10	**330**	**15.00**
MW-5	01/18/11	**260**	**14.00**
MW-5	04/21/11	**370**	**11.00**
MW-5	07/14/11	**1500**	**24.00**
MW-5	10/06/11	**320**	8.20
MW-5	01/24/12	240	**13.00**
MW-5	04/10/12	150	6.70
MW-5	07/11/12	**680**	**14.00**
MW-5	10/30/12	69	1.30
MW-5	01/29/13	89	7.50

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-5	04/11/13	160	8.70
MW-5	10/24/13	140	9.10
MW-5	10/24/13 (Dup)	140	9.20
MW-5	01/29/14	130	9.40
MW-5	01/29/14 (Dup)	130	9.40
MW-5	04/23/14	120	7.20
MW-5	04/23/14 (Dup)	120	7.20
MW-5	07/28/14	25	4.00
MW-5	07/28/14 (Dup)	25	4.00
MW-5	10/29/14	44	4.20
MW-5	10/29/14 (Dup)	43	4.20
MW-5	01/28/15	160	7.60
MW-5	01/28/15 (Dup)	160	7.70
MW-5	04/14/15	47	4.15
MW-5	04/14/15 (Dup)	47	3.87
MW-5	07/14/15	65	5.43
MW-5	07/14/15 (Dup)	66	5.46
MW-5	10/27/15	99	5.83
MW-5	10/27/15 (Dup)	102	6.32
MW-5	01/26/16	89	6.04
MW-5	01/26/16 (Dup)	88	5.99
MW-5	04/28/16	26	2.49
MW-5	04/28/16 (Dup)	26	2.50
MW-5	07/13/16	152	5.35
MW-5	07/13/16 (Dup)	153	5.35
MW-5	10/12/16	149	3.61
MW-5	10/12/16 (Dup)	148	3.62
MW-5	01/31/17	15	3.80
MW-5	01/31/17 (Dup)	15	3.89
MW-5	04/18/17	83	**11.50**
MW-5	04/18/17 (Dup)	83	**11.40**
MW-5	06/27/18 [c]	**923 J**	**41.80**
MW-5	06/27/18 (Dup)	**1290 J**	**43.40**
MW-5	04/23/19	17	3.84
MW-5	04/23/19 (Dup)	17	3.83
MW-5	04/29/20	6.07	3.39
MW-5	04/29/20 (Dup)	6.15	3.38
MW-5	05/16/23 [o]	20.2	3.69 J-
MW-5	05/16/23 (Dup)	20.0	3.34 J-
MW-5	05/30/23	101	7.42
MW-5	05/30/23 (Dup)	101	7.43
MW-6	12/15/98	14.20	7.85
MW-6	07/28/99	9.52	1.90

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-6	12/10/99	17.90	1.09
MW-6	06/20/00	2.27	0.80
MW-6	12/07/00	38.60	2.49
MW-6	10/30/02	68.00	4.79
MW-6	02/04/03 [e]	12.60	1.39
MW-6	04/29/03	5.05	2.31
MW-6	07/24/03	16.00	2.43
MW-6	10/30/03	31.00	4.13
MW-6	01/26/04	16.20	2.21
MW-6	04/16/04	11.40	1.37
MW-6	07/26/04	13.90	3.03
MW-6	10/15/04	28.00	3.31
MW-6	01/28/05	17.70	4.50
MW-6	04/29/05	5.80	8.20
MW-6	07/20/05	17.50	7.60
MW-6	10/27/05	21.10	1.73
MW-6	01/11/06	14.20	1.61
MW-6	04/12/06	10.30	1.21
MW-6	07/13/06	2.07	0.89
MW-6	10/24/06	5.73	0.68
MW-6	01/29/07	13.10	1.52
MW-6	04/19/07	8.08	1.18
MW-6	07/19/07 [k]	3.78	1.32
MW-6	09/13/07	45.60	4.61
MW-6	10/29/07	30.00	2.47
MW-6	01/30/08 [k]	19.20	1.98
MW-6	04/22/08	14.40	1.04
MW-6	07/23/08	2.47	1.02
MW-6	10/22/08	61.80	4.45
MW-6	01/29/09	5.32	0.88
MW-6	04/28/09	3.49	1.36
MW-6	07/09/09	2.89	1.08
MW-6	10/29/09	51.00	4.00
MW-6	01/19/10	9.70	1.40
MW-6	04/07/10	4.80	1.80
MW-6	07/27/10	2.70	1.00
MW-6	10/20/10	4.50	1.00
MW-6	01/18/11	5.70	1.30
MW-6	04/21/11	2.70	1.00
MW-6	07/14/11	4.10	1.40
MW-6	10/06/11	25.00	6.80
MW-6	01/24/12	5.80	1.10
MW-6	04/10/12	6.90	1.70

Table 3: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrogen[a] (mg/L)
Cleanup Level[n]		250	10
MW-6	07/11/12	2.70	ND
MW-6	10/30/12	31.00	4.80
MW-6	01/29/13	16.00	2.70
MW-6	04/11/13	5.10	1.90
MW-6	10/24/13	28.00	2.30
MW-6	01/29/14	5.40	0.99
MW-6	04/23/14	2.90	0.78
MW-6	07/28/14	3.30	0.78
MW-6	10/29/14	36.00	1.90
MW-6	01/28/15	3.20	0.68
MW-6	04/14/15	3.29	1.79
MW-6	07/14/15	5.01	1.45
MW-6	10/27/15	9.85	1.44
MW-6	01/26/16	5.46	2.09
MW-6	04/28/16	2.54	0.66
MW-6	07/13/16	4.65	1.12
MW-6	10/12/16	28.00	2.11
MW-6	01/31/17	4.43	1.48
MW-6	04/18/17	3.27	0.97
MW-6	06/27/18 [c]	2.62	1.01
MW-6	04/23/19	4.37	1.34
MW-6	04/29/20	4.56	1.82
MW-6	05/17/23	5.56	1.22

Table 3: Summary of Groundwater Analytical Results

Notes

(a) Analysis by U.S. Environmental Protection Agency (EPA) Method 300.0 except where noted.
(b) mg/L = milligrams per liter
(c) Nitrate-Nitrite analysis by EPA Method 353.2 and Chloride analysis by EPA Method 9056A for samples collected on 06/27/18. Based on correspondence with the analytical laboratory and analytical results for nitrite since 2013, it is assumed that the nitrate-nitrite analytical results are representative of nitrate concentrations in the water samples. In 2020 and 2023, Nitrate-Nitrite and Chloride analysis by EPA Method 9056A.
(d) Bold indicates analyte reported at a concentration that exceeds the cleanup level.
(e) NA = Not analyzed
(f) Groundwater monitoring conducted by EMR through 2002, GeoEngineers between 2003 and 2012, and Kennedy Jenks since 2013.
(g) ND = Not detected
(h) < = Analyte not detected above the indicated laboratory reporting limit.
(i) BOLD and Italicized indicates the laboratory reporting limit was greater than the cleanup level.
(j) Estimated value.
(k) Not Used
(l) NS = Not sampled
(m) Analysis performed outside of method-specified hold time because concentration of analyte in sample required a dilution.
(n) Cleanup level defined in the site Final Cleanup Action Plan (FCAP, GeoEnginers 2003).
"(Dup)" = blind field duplicate sample
"J" indicates an estimated concentration based on either the result being less than the laboratory reporting limit or data validation findings
"J-" indicates an estimated concentration that may be biased low based on data validation findings.
(o) Monitoring well MW-5 was re-sampled on 30 May 2023 because the sample collected on 16 May 2023 was received by the analytical lab outisde the 48-hour hold time.

Table 4: Statistical Analysis Summary

Constituent	Well ID	No. of Samples	No. of Detections	Minimum Detected (mg/L)[b]	Maximum Detected (mg/L)	95% UCL[a]		
						Data Distribution	95% UCL Method	95% UCL (mg/L)
Nitrate-N	MW-3/MW-3R	20	20	2.50	15.00	Lognormal	Land	8.58
	MW-5	20	20	2.49	41.80	Lognormal	Land	9.82
Washington State Department of Ecology Model Toxics Control Act Cleanup Level								10
Chloride	MW-5	20	20	6.07	923	Lognormal	Land	268
Washington State Department of Ecology Model Toxics Control Act Cleanup Level								250

Notes:

(a) 95% UCL = 95 percent upper confidence limit on the mean. Statistical calculations were performed using Model Toxics Control Act Stat (accessed August 2023).

(b) mg/L = milligrams per liter

Table 5: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
8/26/2003	2,035.85
9/25/2003	2,035.64
10/30/2003	2,035.50
11/26/2003	2,035.60
12/22/2003	2,036.64
1/28/2004	2,038.77
02/20/04[b]	2,039.18
3/16/2004	2,039.08
4/19/2004	2,038.64
5/20/2004	2,038.10
6/16/2004	2,038.81
7/26/2004	2,037.98
8/23/2004	2,037.73
9/13/2004	2,037.48
10/15/2004	2,037.52
11/8/2004	2,037.48
12/15/2004	2,038.52
01/28/05[b]	2,039.12
2/16/2005	2,039.06
3/10/2005	2,039.00
4/20/2005	2,039.02
5/14/2005	2,038.93
6/9/2005	2,039.02
7/14/2005	2,038.77
8/15/2005	2,037.77
9/27/2005	2,036.85
10/21/2005	2,037.85
11/3/2006	2,038.02
12/16/2006	2,037.85
01/17/06[b]	2,039.10
02/03/06[b]	2,039.10
03/17/06[b]	2,039.10
04/14/06[b]	2,039.10
05/03/06[b]	2,039.10
6/7/2006	2,038.18
7/6/2006	2,038.85
8/31/2006	2,038.85
9/13/2006	2,038.77
10/30/2006	NM
11/13/2006	2,038.89
12/4/2006	2,038.93
01/04/07[b]	2,039.14
02/02/07[c]	NM

Table 5: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
03/06/07[b]	2,039.10
4/7/2007	2,036.87
5/3/2007	2,036.90
6/1/2007	2,038.94
07/03/07[c]	NM
8/1/2007	2,037.70
9/7/2007	2,037.07
10/9/2007	2,037.17
11/19/2007	2,037.24
12/20/2007	2,038.64
1/29/2008	2,039.39
2/6/2008	2,039.31
3/17/2008	2,039.39
04/04/08[b]	2,039.41
5/1/2008	2,039.27
6/16/2008	2,039.03
7/4/2008	2,038.69
8/5/2008	2,037.99
9/10/2008	2,037.59
10/7/2008	2,037.38
11/11/2008	2,037.56
12/5/2008	2,037.59
01/09/09[b]	2,039.57
02/22/09[b]	2,039.49
03/10/09[b]	2,039.55
04/09/09	2,039.39
5/4/2009	2,039.21
6/5/2009	2,038.79
7/10/2009	2,038.28
8/13/2009	2,037.69
9/8/2009	2,037.34
10/5/2009	2,036.65
11/12/2009	2,037.54
12/7/2009	2,037.75
01/19/10[b]	2,039.48
02/17/10[b]	2,039.49
03/08/10[b]	2,039.41
4/22/2010	2,039.32
5/12/2010	2,039.21
6/4/2010	2,039.30
7/30/2010	2,038.88
8/20/2010	2,038.47
9/9/2010	2,038.18

Table 5: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
10/11/2010	2,038.07
11/10/2010	2,038.42
12/10/10[b]	2,039.59
01/20/11[b]	2,039.49
02/17/11[b]	2,039.48
03/21/11[b]	2,039.49
04/09/11[b]	2,039.45
5/11/2011	2,039.39
06/10/11[b]	2,039.49
7/8/2011	2,039.09
8/8/2011	2,038.39
9/21/2011	2,037.39
10/12/2011	2,037.90
11/17/2011	2,037.89
12/9/2012	2,037.99
1/11/2012	2,038.29
02/16/12[b]	2,039.49
03/14/12[b]	2,039.49
04/07/12[b]	2,039.49
05/15/12[b]	2,039.37
6/12/2012	2,039.18
7/12/2012	2,038.79
8/22/2012	2,039.09
9/14/2012	2,037.51
10/22/2012	2,037.09
November 2012[b][d]	NA
12/12/12[b]	2,039.37
01/15/13[b]	2,039.27
10/24/2013	2,038.09
11/19/2013	2,038.09
12/18/2013	2,038.15
1/29/2014	2038.69
2/26/2014[b]	2,039.29
3/28/2014 [b]	2,039.23
4/23/2014	2,039.13
5/28/2014	2,038.84
6/17/2014	2,038.61
7/28/2014	2,038.12
8/21/2014	2,037.39
9/17/2014	2,038.39
10/24/2014	2,038.31
11/25/2014	2,037.52
12/11/2014	2,038.39

Table 5: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[(a)] (feet)
1/29/2015	2,039.39
2/20/2015	2,039.36
3/31/2015	2,039.39
4/24/2015	2,039.20
5/22/2015	2,038.89
6/25/2015	2,038.30
7/14/2015	2,037.94
8/10/2015	2,037.44
9/30/2015	2,036.84
10/28/2015	2,036.69
11/23/2015	2,036.78
12/18/2015	2,037.99
1/26/2016	2,039.41
2/25/2016	2,039.37
3/21/2016	2,039.44
4/22/2016	2,039.22
5/27/2016	2,039.01
6/28/2016	2,038.49
7/19/2016	2,038.09
8/18/2016	2,037.59
9/23/2016	2,037.04
10/21/2016	2,037.95
11/14/2016	2,039.39
12/22/2016	2,039.45
1/31/2017	2,039.47
2/27/2017	2,039.53
3/16/2017	2,039.49
4/19/2017	2,039.53
5/17/2017	2,039.43
6/15/2017	2,038.95
6/27/2018	2,038.59
4/23/2019	2,039.48
4/29/2020	2,039.19
5/17/2023	2,039.31

Notes:
(a) Pond water surface elevation relative to NAVD 88. Water level elevation corresponds to the event gauge reading at the pond plus a base elevation of 2,036.59 feet mean sea level (MSL).
(b) Water within the pond was discharging to overflow sump.
(c) Not measured because the pond's staff gauge shifted position, requiring maintenance during subsequent operation and maintenance (O&M) visit.
(d) Water level was within normal range for the time of year. However, a precise water level is not available
NM = not measured.
NA = not available.

Figures

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Legend

Approximate Site Location

N

0 625 1,250

Scale: Feet

Kennedy Jenks

BNSF Railway Company
Hillyard Dross
Spokane, Washington

Vicinity Map

2396114*00
August 2023

Figure 1

Note:
1. All locations are approximate.
2. MW-3 abandoned and replaced by MW-3R in March 2022.

\\kjc.local\kjc-root\GIS\GIS_CloudProjects\BNSF\Washington\Hillyard\Events\2023 Events\2023 06\Fig2_SiteMap.mxd

Legend

Well Status

- Abandoned Monitoring Well
- Monitoring Well
- Site Features

N

0 75 150

Scale: Feet

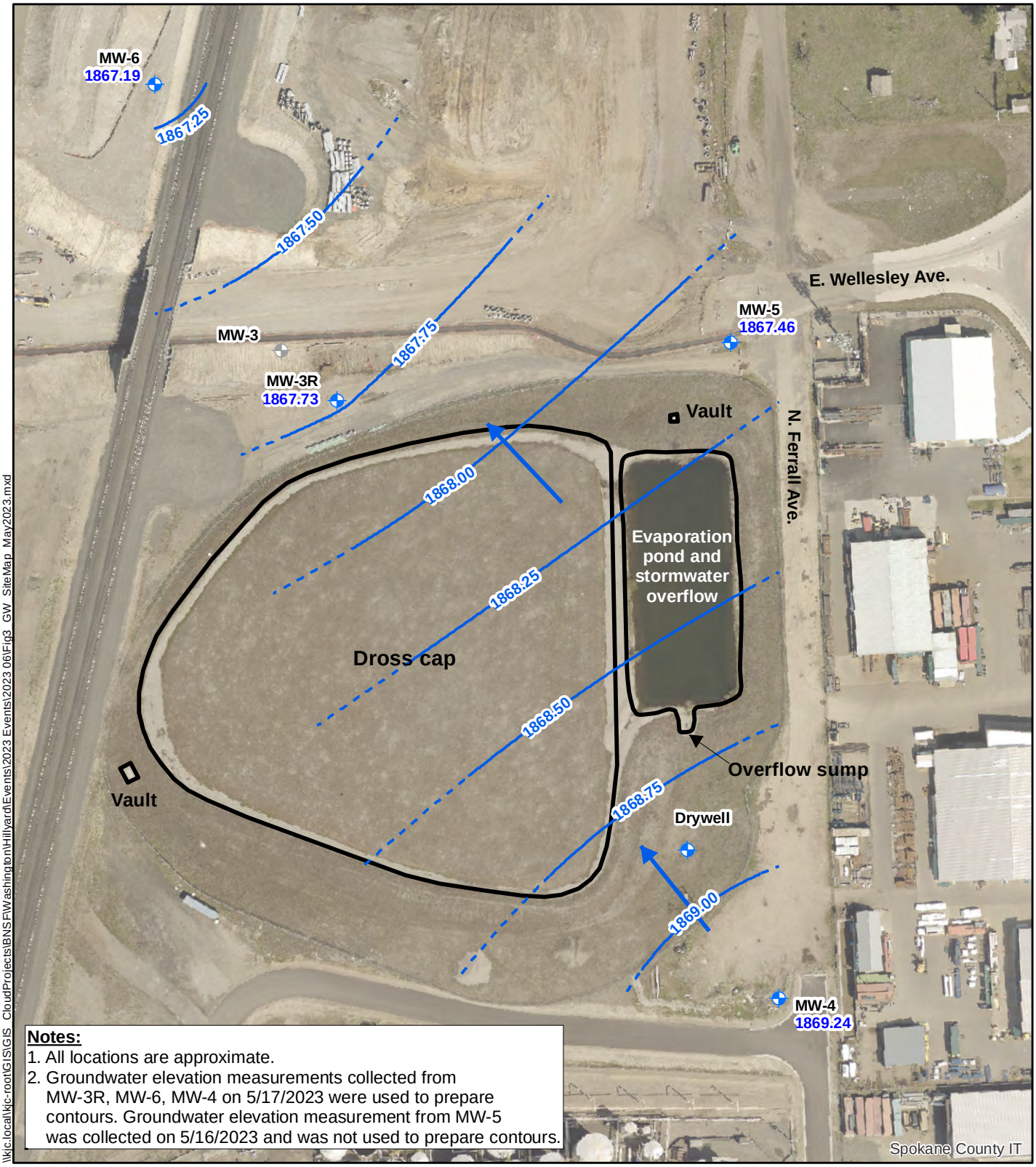
Kennedy Jenks

BNSF Railway Company
Hillyard Dross
Spokane, Washington

Site Map

2396114*00
August 2023

Figure 2



Notes:
1. All locations are approximate.
2. Groundwater elevation measurements collected from MW-3R, MW-6, MW-4 on 5/17/2023 were used to prepare contours. Groundwater elevation measurement from MW-5 was collected on 5/16/2023 and was not used to prepare contours.

\\kjc.local\kjc-root\GIS\GIS_CloudProjects\BNSF\Washington\Hillyard\Events\2023 Events\2023 06\Fig3_GW_SiteMap_May2023.mxd

Legend

- Abandoned Monitoring Well
- Monitoring Well
- Groundwater flow direction
- Groundwater contour, dashed where inferred
- Site Features

N

0 75 150

Scale: Feet

Kennedy Jenks

BNSF Railway Company
Hillyard Dross
Spokane, Washington

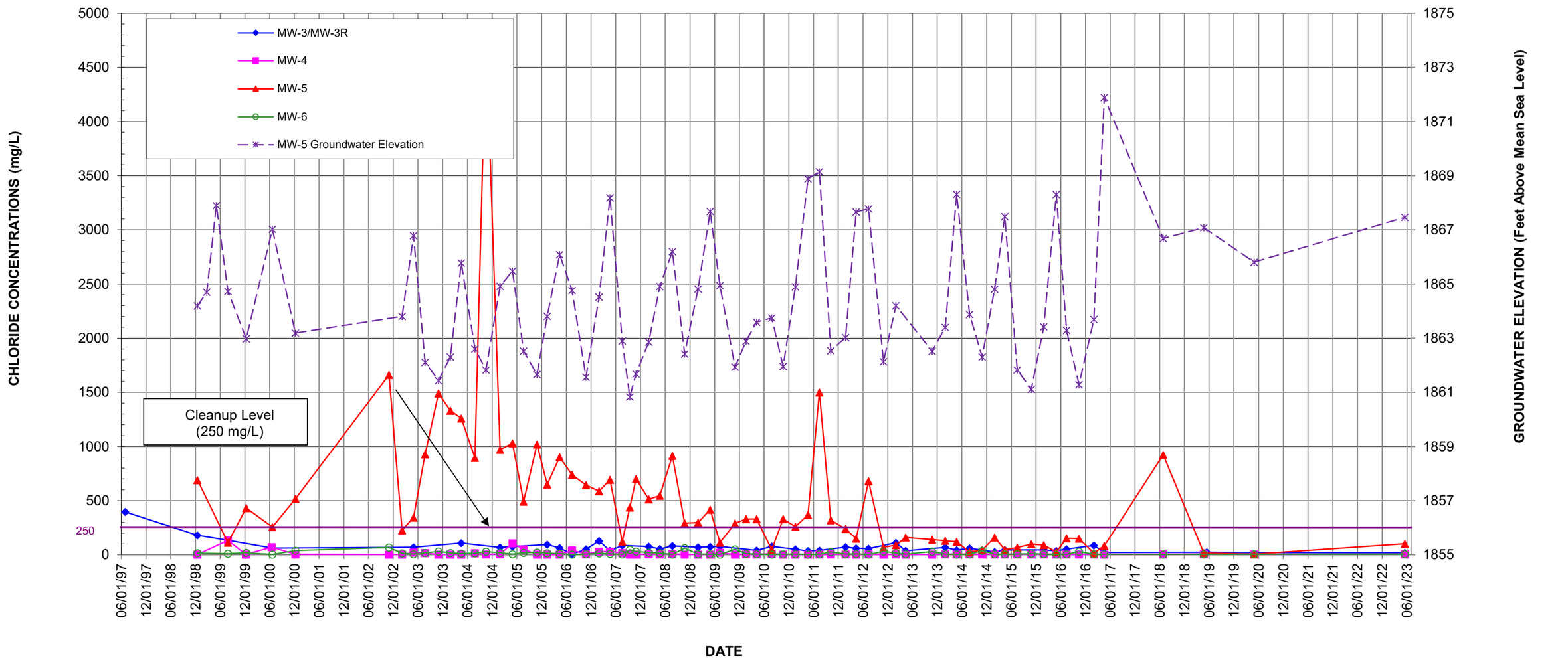
Groundwater Potentiometric Surface Contours: May 2023

2396114*00
August 2023

Figure 3

FIGURE 4

BNSF HILLYARD DROSS CAP
CHLORIDE CONCENTRATIONS AND MW-5 GROUNDWATER ELEVATION

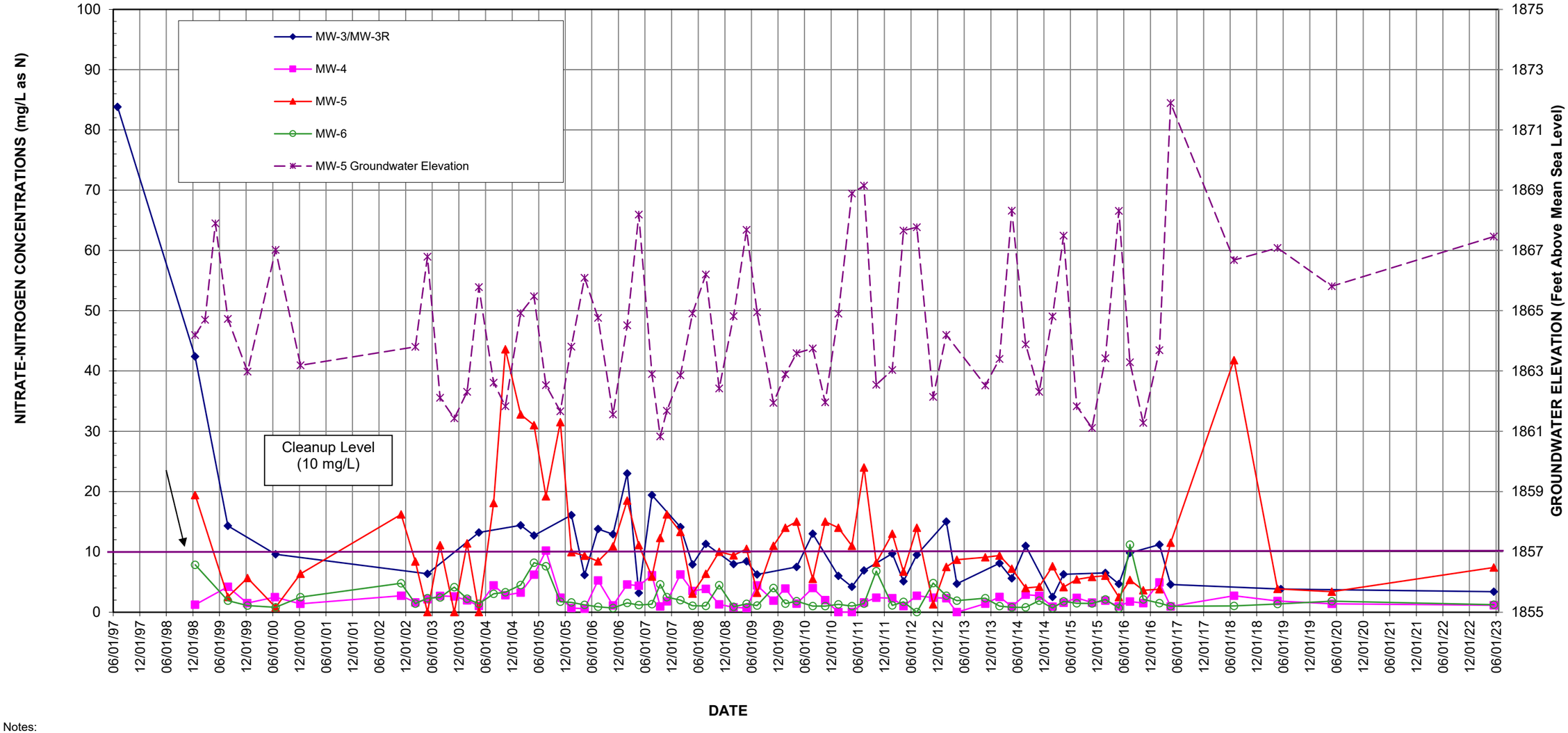


Notes:

1. Non-detectable concentrations are presented as zero.

FIGURE 5

BNSF HILLYARD DROSS CAP
NITRATE-NITROGEN CONCENTRATIONS AND MW-5 GROUNDWATER ELEVATION



Notes:

1. Non-detectable concentrations are presented as zero.
2. June 2018 results include nitrite.

Appendix A

Washington State Department of Ecology 2022 Periodic Review

Third Periodic Review
Aluminum Recycling Corporation Site

3412 E. Wellesley Avenue, Spokane, Spokane County

Facility Site ID 627, Cleanup Site ID 1133

Toxics Cleanup Program, Eastern Region

Washington State Department of Ecology
Spokane, Washington

May 2022

Document Information

This document is available on the Department of Ecology's Aluminum Recycling Corporation website[1].

Related Information

- Cleanup site ID: 1133
- Facility site ID: 627

Contact Information

Toxics Cleanup Program

Eastern Regional Office
Sandra Treccani, Site Manager
4601 N. Monroe St.
Spokane, WA 99205
Phone: 509-724-3119
Website[2]: Washington State Department of Ecology

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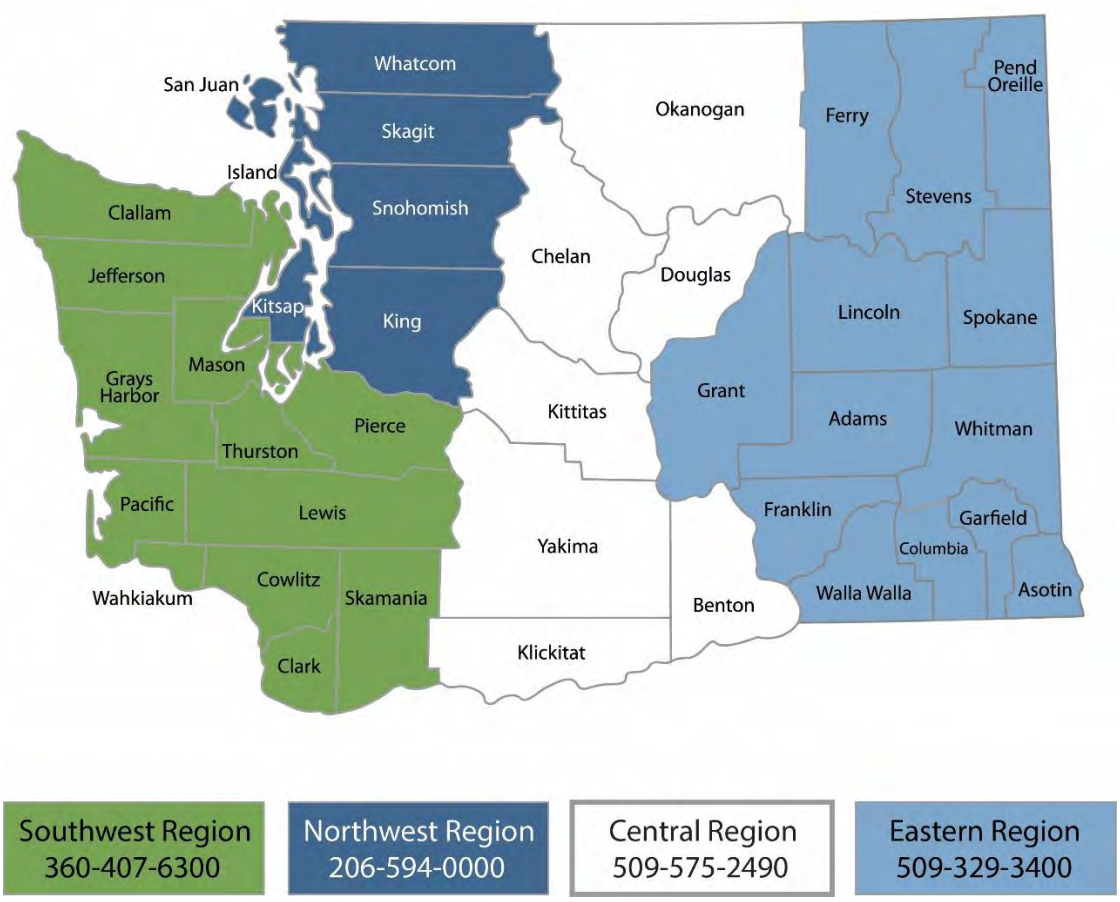
[1] https://apps.ecology.wa.gov/cleanupsearch/site/1133
[2] www.ecology.wa.gov/contact
[3] https://ecology.wa.gov/About-us/Accountability-transparency/Our-website/Accessibility

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

Table of Contents

Introduction

This report presents the Washington State Department of Ecology's (Ecology) third periodic review for the Aluminum Recycling Corporation cleanup site (Site). This periodic review is required as part of the site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70A.305 Revised Code of Washington, implemented by Ecology. Periodic reviews evaluate post-cleanup site conditions and monitoring data to assure human health and the environment are being protected. They are required for sites where an institutional control is part of the cleanup action.

BNSF Railway Company (BNSF) conducted cleanup actions at the Site in 2003. These actions addressed contaminated soils, but residual groundwater contamination remained. Groundwater monitoring has been ongoing since completing the cleanup action. Ecology completed the first periodic review in 2008 and the second periodic review in 2013.

Summary of Site Conditions

Site history

The eight-acre Site was initially used as a gravel pit for an asphalt plant (Figure 1). Beginning in 1954, Site use changed to an aluminum reprocessing facility using scrap aluminum and aluminum dross. Several lessees continued these operations until 1987, when all lessees abandoned the property with an estimated 65,000 cubic yards of dross material remaining on-site. BNSF retained ownership of the property throughout that timeframe.

The facility processed white dross, which was composed of aluminum skim and other materials derived from primary smelting operations. White dross, which contains various oxides, aluminum metal, carbides, and nitrides, was treated through the addition of salts, cryolite, and heat to separate out molten aluminum metal. The resulting residue after the secondary treatment was high-salt black dross. This material, along with a small volume of semi-processed white dross, was deposited on-site in various waste piles and in the former gravel pit.

Approximately 65,000 cubic yards of dross remained on-site when the property was abandoned in 1987. When the black dross is wet, it generates ammonia odors and heat. This caused complaints from the public and one fire. Temporary surface stabilization measures had been taken to limit these reactions.

Site physical characteristics

Regional hydrogeology

Geology in the Site vicinity consists of Columbia basalts overlain by Quaternary flood deposits. The flood deposits are composed of poorly sorted boulders, cobbles, gravel, and sand. The coarse nature of the deposits results in very high permeabilities. Depth to bedrock below the Site ranges from 250–300 feet below ground surface. (EMR, 1999)

The Site overlies the Spokane-Valley Rathdrum-Prairie Aquifer, which is the sole source of water for more than 400,000 people in the greater Spokane area. The aquifer flows from Northern Idaho to the west and southwest down the Spokane Valley at an estimated rate of 60 to 90 feet per day (ft/day). In the area of the Site, the flow divides around a protrusion of basalt at Five Mile Prairie and flows to the northwest through the Hillyard Trough. The flow rate in this region is about 46 ft/day. Depth to groundwater at the Site is approximately 178 feet below ground surface.

Previous site investigations

In 1985, Ecology completed a Preliminary Assessment (PA) of the property, and recommended dust and fumes be controlled; the dross materials be appropriately disposed of; and local water supply wells be sampled to ensure they hadn't been contaminated. Ecology then conducted a PA/Site Inspection (SI) Phase I in 1987. We concluded the Site was potentially contaminated with hazardous substances. No dangerous waste designation was completed at that time.

In 1988, BNSF performed a Site characterization study. Groundwater, soil, and deeper dross samples were collected, and surface stabilization and Site access restrictions occurred.

In 1989, a dross characterization study was done for BNSF. About 95 percent of the dross on-site could be considered a dangerous waste under Washington State regulations due to high concentrations of chloride, fluoride, and nitrate. Also, groundwater under the dross piles contained chloride, fluoride, and nitrate at levels exceeding state drinking water standards.

In 1991, Ecology completed a Site ranking using the Washington Ranking Method (WARM); the Site received a rank of 2 on a scale of 1 to 5, with 1 representing the greatest threat to human health and the environment. In 1996, BNSF's consultant reviewed the previous work and provided information on the physical and chemical properties of the dross, indicating it was not a dangerous waste according to bioassay testing. It also indicated the remaining salts were encapsulated and unable to be leached. Site access restrictions were also established.

BNSF and Ecology signed an Agreed Order in November 1998 to complete a Remedial Investigation/Feasibility Study (RI/FS), which was finalized one year later. Results indicated groundwater was contaminated with chloride, fluoride, nitrate, and nitrite. Soil was also contaminated where it was mixed with dross.

Ecology prepared a Cleanup Action Plan (CAP) in 2000, which summarized investigations and contamination at the Site, and selected the remedy. The remedy, implemented in 2001, involved excavating and consolidating dross and soil mixed with dross into an on-site pit, capping the consolidation area with a low-permeability, multimedia cover system, and routing surface water drainage into an on-site, lined evaporation pond. Fencing, signs, and deed restrictions are maintained for the property. Four existing monitoring wells, installed prior to the RI/FS, are also sampled on a quarterly basis for chloride, fluoride, nitrate, and nitrite.

Nature and extent of contamination

Soils

Soil was also sampled as part of the RI/FS investigation. Samples were taken along with the dross from the same borings and test pits. The maximum depth of soil samples was 5 feet below the soil/dross interface at each sample location. With the exception of chloride, concentrations were generally lower in the soils than in the dross. The presence of these contaminants in soil was due to contaminants leaching downward through the dross piles.

Groundwater

Groundwater beneath the Site is contaminated through the leaching of contaminants as a result of precipitation and runoff through the dross piles and soil. The groundwater contains chloride, fluoride, and nitrate at concentrations above Site cleanup levels. Maximum concentrations measured in investigations prior to and during the RI were 1,400 parts per million (ppm) chloride, 14 ppm fluoride, and 83 ppm nitrate. Figure 3 shows the distribution of chloride in groundwater. Because chloride is a conservative tracer, it is expected to move readily in groundwater and represents the maximum extent groundwater contamination might occur. Therefore, other parameters are not plotted but are assumed to have the same general distribution pattern.

Cleanup Action Plan

After BNSF completed the RI/FS in November 1999, Ecology finalized the Cleanup Action Plan in May 2000.

Cleanup standards

The two primary components of cleanup standards are cleanup levels and points of compliance.

Cleanup levels

Cleanup levels determine the concentration at which a particular hazardous substance does not threaten human health or the environment. Site cleanup levels were developed as follows:

- Groundwater – Method B cleanup levels protective of drinking water were used. Indicator hazardous substances were chloride, fluoride, nitrate, and nitrite.
- Soils – Method B residential cleanup levels protective of groundwater and direct contact were used for Site soils. The indicator hazardous substances were lead and dross material.

Table 1 shows the final cleanup levels for the identified Site indicators after considering background concentrations, practical quantitation limits, and total Site risk.

Points of compliance

The point of compliance is defined in MTCA as the point or points where cleanup levels shall be attained (Washington Administrative Code [WAC] 173-340-200). Once those cleanup levels have been attained at that point, the site is no longer considered a threat to human health and the environment.

WAC 173-340-740(6) gives the point of compliance requirements for soil. For soil cleanup levels based on protection of groundwater, the point of compliance is in the soils throughout the Site.

The point of compliance for groundwater is defined in WAC 173-340-720(8). Groundwater points of compliance are established for the entire Site from the top of the saturated zone to the lowest potentially affected portion of the aquifer.

Site cleanup

Ecology completed negotiations on the Cleanup Action Plan and Consent Decree in May 2000. The selected remedial action for soil was consolidating dross and contaminated soil, and capping with an impermeable cover.

Site cleanup occurred between October 2001 and January 2003. Ecology approved the final Cleanup Action Report in July 2003. Ecology also filed an environmental covenant for the property in June 2001 that prohibited groundwater use and required cap maintenance. Groundwater has been regularly monitored since cleanup completion.

Periodic Review

Regulation

WAC 173-340-420(2) requires Ecology to conduct a periodic review of a site every five years under the following conditions:

(a) Whenever Ecology conducts a cleanup action;
(b) Whenever Ecology approves a cleanup action under an order, agreed order, or consent decree;
(c) Or, as resources permit, whenever Ecology issues a no further action opinion;
(d) And, one of the following conditions exists:
    (1) Institutional controls or financial assurance are required as part of the cleanup.
    (2) Where the cleanup level is based on a practical quantitation limit.
    (3) Where, in the department's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup, or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors Ecology shall consider include [WAC 173-340-420(4)]:

(a) The effectiveness of ongoing or completed cleanup actions.

(b) New scientific information for individual hazardous substances or mixtures present at the Site.
(c) New applicable state and federal laws for hazardous substances present at the Site.
(d) Current and projected Site use.
(e) Availability and practicability of higher preference technologies.
(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology shall publish a notice of all periodic reviews in the *Site Register* and provide an opportunity for public comment.

Basis

Because the Site underwent a cleanup action Ecology approved under a consent decree and institutional controls were required as part of the cleanup action, periodic reviews are required at a frequency of at least every five years.

Periodic reviews were competed in 2008 and 2013; this is the third periodic review for the Site.

Effectiveness of ongoing or completed cleanup actions

Evaluating the cleanup action effectiveness involves assessing contaminant levels and trends to determine if the cleanup actions are performing as expected.

An engineered cover system was placed over the dross materials remaining on the Site. This low-permeability cover was designed to minimize surface water infiltration and route it away from the emplaced waste. Although grasses were planted on the cover surface, they did not grow successfully. Despite that, surface erosion appears to be minimal. The lined evaporation pond, installed to capture surface runoff, functions well, and can handle high-flow events without overflow. The cover system and evaporation pond are visually inspected on an annual basis to ensure there is no significant deterioration.

Institutional controls at the Site include access restrictions and a restrictive covenant. Fencing and signs are checked and maintained on an annual basis along with the cover and pond. The restrictive covenant, which limits the use of the Site, was recorded and is in place. These limitations include maintenance of fences and signs, industrial use only, limitations on groundwater withdrawal and use, and restrictions on activities that would interfere with the performance of the remedy. These institutional controls have proven effective in limiting exposure and protecting the integrity of the remedy.

Groundwater contaminant concentrations have been monitored since June 1997 at four Site monitoring wells (Figure 2). Monitoring frequency was quarterly through 2016, semi-annually in 2016 and 2017, and annually since then. Beginning in 2021, monitoring will only occur once every three years. Fluoride was removed from the monitoring program in the 2013 Periodic Review because cleanup levels were achieved in all wells.

Nitrite hasn't been detected in any well at the Site since October 2013. Therefore, nitrate is no longer a contaminant of concern, and it can be removed from the monitoring program.

Groundwater data for chloride and nitrate in all wells are shown in Tables 2 and 3. A Mann-Kendall trend evaluation was performed for chloride and nitrate data. Both contaminants show slightly decreasing trends at all wells, except for nitrate in monitoring well 6, which shows a slight increasing trend. Overall, contaminant concentrations are showing improvements.

New scientific information for individual hazardous substances or mixtures present at the Site

There is no new scientific information that affects the Site.

New applicable state and federal laws for hazardous substances present at the Site

No new federal or state laws exist that would apply to contaminants at the Site.

Current and projected Site and resource use

The Site is vacant. Trespassing is discouraged by a chain-link fence around the Site perimeter. Regular Site inspections indicate the fencing does keep trespassers off the Site.

No change in land use is currently projected for the Site. When the CAP was written, it was anticipated a freeway would be built very near the Site. Accommodations were made during the design for rerouting train tracks and other issues specific to the freeway corridor. Work on this freeway has started, and construction is occurring immediately adjacent to the Site. Monitoring well 3 was impacted by construction work, and was replaced in March 2022.

Availability and practicability of more permanent remedies

A "permanent" cleanup action is defined in MTCA as a cleanup action in which cleanup standards can be met without further action being required. Several remedial alternatives were evaluated in the CAP. Of these, the only remedy evaluated that would be more permanent would be removal and off-site disposal. No new technologies have been developed since the CAP that would be more permanent.

Availability of improved analytical techniques to evaluate compliance with cleanup levels

No improved analytical techniques are available.

Conclusions

Ecology has determined the remedy at the Site is generally protective of human health and the environment. The measures that were taken for the original cleanup action remain protective

today. Continued inspections ensure the cap remains functioning, and compliance monitoring allows for groundwater impacts and trends to be measured. The existence of institutional controls in the form of deed restrictions confirms Site uses will remain consistent with the presence of contamination. Further periodic reviews will be required as long as institutional controls are in place at the Site, in accordance with WAC 173-340-420(7).

References

GeoEngineers, 2003, *Final Cleanup Action Report, Aluminum Recycling Corporation Site*.

Environmental Management Resources, 1999, *Final Remedial Investigation/Feasibility Study for the Hillyard Dross Site*.

Washington State Department of Ecology, 2001, Model Toxics Cleanup Act Regulation Chapter 173-340 WAC.

Washington State Department of Ecology, 2000, *Final Cleanup Action Plan, Aluminum Recycling Corporation Site*.

Figures

Figure 1: Site location

Figure 2: Site map and well locations

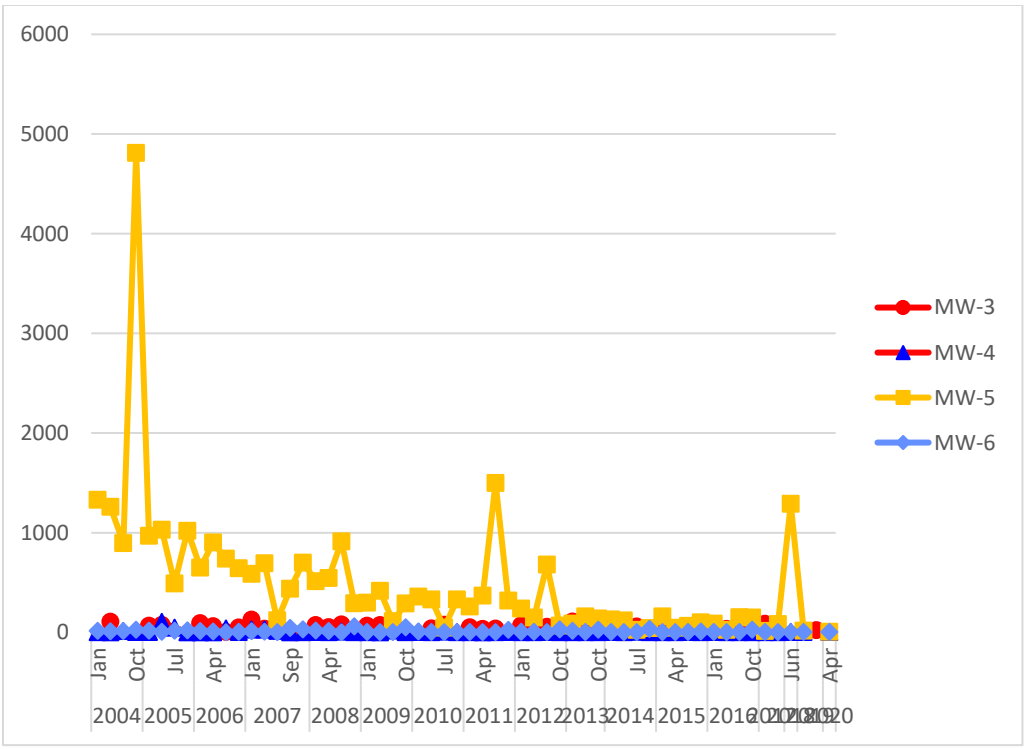


Figure 3: Chloride concentrations, since cleanup completed

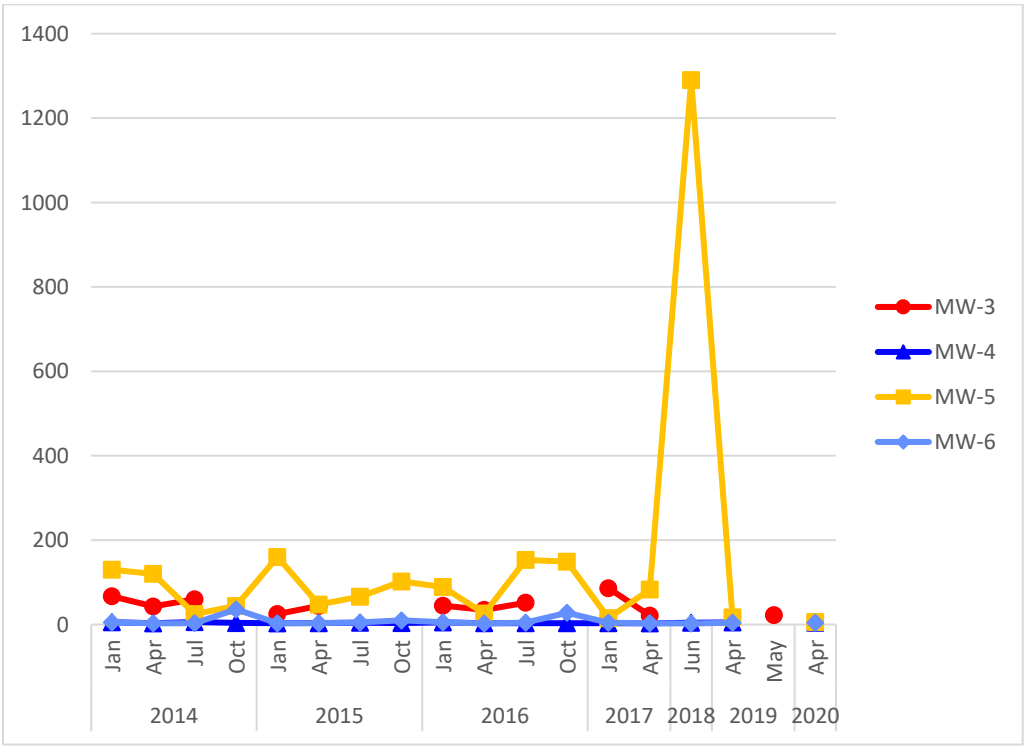


Figure 4: Chloride concentrations, since 2013

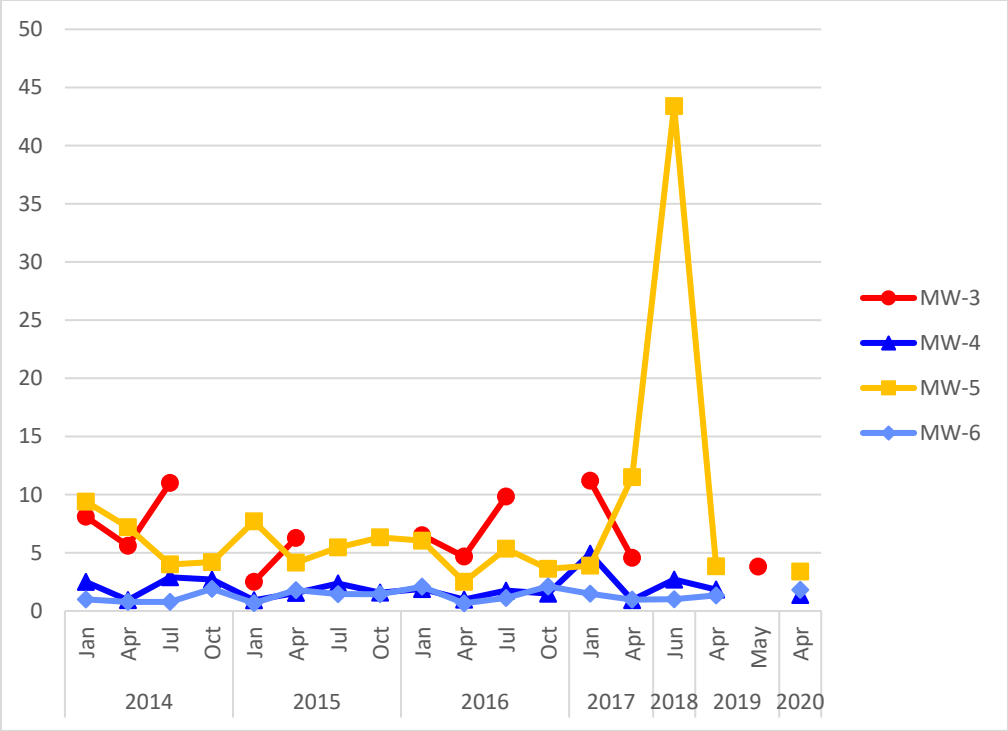


Figure 5: Nitrate concentrations, since 2013

Tables

Table 1: Cleanup levels

Indicator	Groundwater cleanup level (parts per million)	Groundwater basis
Chloride	250	Method B
Nitrate-nitrogen	10	Maximum contaminant level
Nitrite-nitrogen	1	Maximum contaminant level

Table 2: Chloride groundwater data

Red or * means exceeds cleanup level.
All concentrations are in parts per million.

Sampling date	Well MW-3	Well MW-4	Well MW-5	Well MW-6
Jan 2014	67	5.5	130	5.4
Apr 2014	43	3.2	120	2.9
Jul 2014	60	5.9	25	3.3
Oct 2014	dry	3.8	44	36
Jan 2015	25	3.2	160	3.2
Apr 2015	44	3.55	47.4	3.29
Jul 2015	dry	4.47	66.1	5.01
Oct 2015	dry	3.7	102	9.85
Jan 2016	44.8	5.16	89	5.46
Apr 2016	34.7	3.32	26	2.54
Jul 2016	51.9	3.39	153	4.65
Oct 2016	dry	3.25	149	28
Jan 2017	86.1	3.29	15	4.43
Apr 2017	21.2	2.88	83	3.27
Jun 2018	dry	4.41	1,290	2.62
Apr 2019	22.2	5.19	17	4.37
Apr 2020	dry	4.42	6.15	4.56

Table 3: Nitrate Groundwater Data

Red or * means exceeds cleanup level.
All concentrations are in parts per million.

Sampling date	Well MW-3	Well MW-4	Well MW-5	Well MW-6
Jan 2014	8.1	2.5	9.4	0.99
Apr 2014	5.6	0.93	7.2	0.78
Jul 2014	11	2.9	4	0.78
Oct 2014	dry	2.7	4.2	1.9
Jan 2015	2.5	0.92	7.7	0.68
Apr 2015	6.27	1.55	4.15	1.79
Jul 2015	dry	2.36	5.46	1.45
Oct 2015	dry	1.58	6.32	1.44
Jan 2016	6.51	1.89	6.04	2.09
Apr 2016	4.67	0.98	2.5	0.66
Jul 2016	9.83	1.75	5.35	1.12
Oct 2016	dry	1.49	3.62	2.11
Jan 2017	11.2	4.93	3.89	1.48
Apr 2017	4.57	0.94	11.5	0.97
Jun 2018	dry	2.7	43.4	1.01
Apr 2019	3.81	1.84	3.84	1.34
Apr 2020	dry	1.37	3.38	1.82

Appendix B

Field Methods

Appendix B

Field Methods

General

Groundwater monitoring activities completed at the Hillyard Dross Cap facility followed standard U.S. Environmental Protection Agency (EPA) low-flow methods and procedures. Procedures were consistent with those previously conducted during recent sampling events. Known deviations from the Washington State Department of Ecology (Ecology) approved sampling methods [documented in EMR's *Final Remedial Action Work Plan* (FRAWP) finalized on 22 April 2003] were related to purge water disposal, sampling equipment and methods, decontamination methods, and instrument calibration and included the following:

- Purge water was containerized within a labeled 55-gallon drum located within the hazardous materials storage area of the BNSF Parkwater Railyard.
- Sampling was performed at monitoring wells MW-3R, MW-4, MW-5 and MW-6 using low-flow sampling methods and dedicated bladder pumps.
- Instrument calibration was performed consistent with manufacturer's recommendations, rather than with the procedures detailed in the FRAWP.

Groundwater Elevations

Depths to groundwater were measured relative to the monitoring well casing rims using an electronic water level indicator. Prior to groundwater sample collection, water level measurements were collected from each well. After removing the well cap, sufficient time was allowed for the water level to equilibrate with the ambient air pressure. Prior to water level measuring, the existing reference point on the well casing was determined. A water level indicator probe was slowly lowered into the well until the sound from the indicator was audible. The probe was then slowly pulled out a few inches, and dropped back down at smaller increments until the water level could be determined to within 0.01 foot. The water level was measured based on an existing reference point on the well casing. Following sampling activities, the total depth of the well was then measured and recorded to the nearest 0.01 foot by allowing the measuring tape to contact the base of the well. The probe of the water level indicator was decontaminated between wells with a detergent wash, a tap water rinse, and a distilled water rinse. Groundwater table elevations were calculated by subtracting the depth to the groundwater table from the casing rim elevations. Groundwater table elevations measured during this reporting period are presented in the report.

Groundwater Sampling

Groundwater purging and sampling was performed consistent with EPA's low-flow groundwater sampling procedure, as described in EPA (1996) and Puls and Barcelona (1996). Dedicated submersible bladder pumps, outfitted with dedicated Teflon-lined tubing, were used for groundwater purging and sampling. During purging activities, water quality parameters, including pH, conductivity, temperature, turbidity, and oxidation-reduction potential and dissolved oxygen, were measured using a YSI 556 MPS multi-parameter meter equipped with a flow-through cell and recorded. The meter was calibrated on a daily basis in a manner consistent with manufacturer procedures. Groundwater samples were collected after 1) water quality parameters had stabilized or 2) a minimum of 3 wells volumes of groundwater was removed. During purging and sampling, drawdown was not allowed to exceed 0.3 foot and purge rate was not allowed to exceed 400 milliliters per minute.

Water quality parameter stabilization criteria include the following:

- Turbidity: ±10 percent for values greater than 5 nephelometric turbidity units (NTU)
- Dissolved oxygen: ±10 percent
- Conductivity: ±3 percent
- pH: ±0.1 unit
- Temperature: ±3 percent.

After groundwater quality stabilization criteria were satisfied, the pump's discharge tubing was disconnected from the flow-through cell and groundwater samples were collected for analysis of the following compounds in the following order: chloride and nitrate-nitrogen. Each sample was decanted into sample containers supplied by the analytical laboratory. Groundwater samples collected for chemical analysis were kept cool during onsite storage and transport to the analytical laboratory. Chain-of-custody procedures were observed during transport of the groundwater samples.

Monitoring well MW-5 was re-sampled as samples collected from the well (MW-5 & DUP-01) were received at the laboratory outside of the required 48-hour hold time.

Purge water was containerized within a labeled 55-gallon drum located within the hazardous materials storage area of the BNSF Parkwater Railyard.

References

Puls, R.W. and Barcelona, M.J. 1996. Low-flow (minimal drawdown) ground-water sampling procedures: EPA Ground Water Issue, April, pp. 1-9.

U.S. Environmental Protection Agency. Region 1. 1996. Low stress (low-flow) purging and sampling procedure for the collection of ground water samples from monitoring wells. EPA SOP No. GW 0001, Revision No. 2. July 30, 1996.

Appendix C

Monitoring Well Sampling Field Logs

Spokane Environmental Solutions

Well Monitoring Data Sheet

Project No.	NA	**Project:**	BNSF Hillyard Dross
Sampler:	Brandon Kautzman	**Start Date:**	05-17-2023
Well I.D.	MW-3R	**Well Diameter (in):**	NA
Depth To Water (ft):	172.6	**Total Well Depth (ft):**	193.00 measured
Depth to Free Product (ft):	NA	**Free Product Thickness (ft):**	NA
Field Instrument(s):		**Sample Method:**	Pump Discharge

Purge Details

Purge Method:	Dedicated pump	**Tubing:**	Dedicated tubing
Refill/Discharge Cycle (s/s):	NA	**Discharge Pressure (psi):**	NA
Flow Rate (/min):	NA	**Pump Depth (ft):**	NA
Water Column (ft):	20.39	**Casing Volume (gal):**	NA

Parameters

Parameters not collected.

Did well dewater?	No	**Amount evacuated ():**	NA

Sample Details

Sampling Date and Time:	05-17-2023 10:51		
Sample ID:	MW-3R(20230517)	**Laboratory**	Pace Analytical Services, Mt.Juliet, TN
Laboratory Analysis:			
Equipment Blank ID:	NA	**Duplicate ID:**	NA

Well, Sample, Other Notes: Bladder pump was not functioning correctly. Parameter sensor wasn't filling since air/water mixture was blowing through. Purged over 3 casing volumes and sampled.

'NA' denotes not measured, not available, or not applicable.

Spokane Environmental Solutions

Well Monitoring Data Sheet

Project No.	NA	**Project:**	BNSF Hillyard Dross
Sampler:	Brandon Kautzman	**Start Date:**	05-17-2023
Well I.D.	MW-4	**Well Diameter (in):**	2
Depth To Water (ft):	169.1	**Total Well Depth (ft):**	NA
Depth to Free Product (ft):	NA	**Free Product Thickness (ft):**	NA
Field Instrument(s):	Hanna	**Sample Method:**	Pump Discharge

Purge Details

Purge Method:	Dedicated Pump	**Tubing:**	Dedicated Tubing
Refill/Discharge Cycle (s/s):	10/5	**Discharge Pressure (psi):**	90.0
Flow Rate (ml/min):	10.872	**Pump Depth (ft):**	183.1
Water Column (ft):	NA	**Casing Volume (gal):**	NA

Parameters

Time	Temperature (deg C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	ORP (mV)	Water Removed (ml)	Depth to Water / Observations
13:55	13.4	7.85	234.0	53.00	8.10	43.4	0.10	169.1
14:00	13.3	7.80	233.0	53.00	8.10	58.5	100.0	169.1
14:05	13.2	7.78	237.0	53.00	8.08	60.1	100.0	169.1
14:10	13.1	7.74	237.0	53.00	7.97	62.1	100.0	169.1
14:15	13.0	7.75	237.0	53.00	7.93	63.1	100.0	169.1
14:22	12.9	7.73	238.0	53.00	7.99	64.2	100.0	169.1

Did well dewater?	No	**Amount evacuated (ml):**	500.1

Sample Details

Sampling Date and Time:	05-17-2023 13:36		
Sample ID:	MW-4(20230517)	**Laboratory**	Pace Analytical Services, Mt.Juliet, TN
Laboratory Analysis:			
Equipment Blank ID:	NA	**Duplicate ID:**	QCFB-01-20230517

Well, Sample, Other Notes: Turbidity based off equation TDS x 0.4535 since equipment I was sent didn't measure turbidity.

'NA' denotes not measured, not available, or not applicable.

Spokane Environmental Solutions

Well Monitoring Data Sheet

Project No.	NA	**Project:**	BNSF Hillyard Dross
Sampler:	Brandon Kautzman	**Start Date:**	05-16-2023
Well I.D.	MW-5	**Well Diameter (in):**	2
Depth To Water (ft):	174.2	**Total Well Depth (ft):**	NA
Depth to Free Product (ft):	NA	**Free Product Thickness (ft):**	NA
Field Instrument(s):	Hanna HI98194	**Sample Method:**	Pump Discharge

Purge Details

Purge Method:	Dedicated Pump	**Tubing:**	Dedicated Tubing
Refill/Discharge Cycle (s/s):	10/5	**Discharge Pressure (psi):**	5.00
Flow Rate (ml/min):	8.221	**Pump Depth (ft):**	0.00
Water Column (ft):	NA	**Casing Volume (gal):**	NA

Parameters

Time	Temperature (deg C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	ORP (mV)	Water Removed (ml)	Depth to Water / Observations
12:59	21.2	7.36	360.0	78.00	8.37	43.6	0.10	174.2
13:10	19.2	7.17	351.0	79.00	8.00	57.0	120.0	174.2
13:15	19.1	7.09	350.0	79.00	8.38	58.6	80.0	174.2
13:20	17.9	7.07	350.0	80.00	8.30	63.5	80.0	174.2
13:25	17.2	7.11	351.0	80.00	8.08	62.3	80.0	174.2
13:30	16.9	7.12	353.0	80.00	8.15	61.8	80.0	174.2
13:35	16.8	7.13	359.0	79.00	8.25	59.5	80.0	174.2
13:40	16.9	7.24	363.0	80.00	8.03	58.2	80.0	174.5

Did well dewater?	No	**Amount evacuated (ml):**	600.1

Sample Details

Sampling Date and Time:	05-16-2023 13:45		
Sample ID:	MW-5(20230516)	**Laboratory**	Pace Analytical Services, Mt.Juliet, TN
Laboratory Analysis:			
Equipment Blank ID:	NA	**Duplicate ID:**	DUP-01-20230500

Well, Sample, Other Notes: Turbidity based off equation TDS x 0.4535 since equipment I was sent didn't measure turbidity.

'NA' denotes not measured, not available, or not applicable.

Spokane Environmental Solutions

Well Monitoring Data Sheet

Project No.	NA	**Project:**	BNSF Hillyard Dross
Sampler:	Brandon Kautzman	**Start Date:**	05-30-2023
Well I.D.	MW-5	**Well Diameter (in):**	2
Depth To Water (ft):	174.3	**Total Well Depth (ft):**	NA
Depth to Free Product (ft):	NA	**Free Product Thickness (ft):**	NA
Field Instrument(s):	Horiba	**Sample Method:**	Pump Discharge

Purge Details

Purge Method:	Dedicated Pump	**Tubing:**	Dedicated Tubing
Refill/Discharge Cycle (s/s):	10/5	**Discharge Pressure (psi):**	100.0
Flow Rate (ml/min):	0.671	**Pump Depth (ft):**	0.00
Water Column (ft):	NA	**Casing Volume (gal):**	NA

Parameters

Time	Temperature (deg C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	ORP (mV)	Water Removed (ml)	Depth to Water / Observations
12:05	17.9	7.19	361.0	73.60	8.19	56.2	100.0	174.4
12:10	17.2	7.26	360.0	53.21	8.24	55.6	100.0	174.3
12:15	16.8	7.35	358.0	23.81	8.15	56.1	100.0	174.3
12:20	16.8	7.33	360.0	22.56	8.09	57.3	100.0	174.3
12:25	16.6	7.32	361.0	21.69	8.16	58.9	100.0	174.3

Did well dewater?	No	**Amount evacuated (ml):**	500

Sample Details

Sampling Date and Time:	05-30-2023 12:30		
Sample ID:	MW-5(20230530)	**Laboratory**	Pace Analytical Services, Mt.Juliet, TN
Laboratory Analysis:			
Equipment Blank ID:	NA	**Duplicate ID:**	DUP-01-20230530 QCFB-01-20230530

Well, Sample, Other Notes:

'NA' denotes not measured, not available, or not applicable.

Spokane Environmental Solutions

Well Monitoring Data Sheet

Project No.	NA	**Project:**	BNSF Hillyard Dross
Sampler:	Brandon Kautzman	**Start Date:**	05-17-2023
Well I.D.	MW-6	**Well Diameter (in):**	2
Depth To Water (ft):	175.5	**Total Well Depth (ft):**	206.00 measured
Depth to Free Product (ft):	NA	**Free Product Thickness (ft):**	NA
Field Instrument(s):	Hanna	**Sample Method:**	Pump Discharge

Purge Details

Purge Method:	Dedicated Pump	**Tubing:**	New Tubing
Refill/Discharge Cycle (s/s):	10/5	**Discharge Pressure (psi):**	110.0
Flow Rate (ml/min):	13.337	**Pump Depth (ft):**	198.0
Water Column (ft):	30.46	**Casing Volume (gal):**	4.97

Parameters

Time	Temperature (deg C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	ORP (mV)	Water Removed (ml)	Depth to Water / Observations
16:00	17.2	7.92	223.0	51.00	8.11	49.1	0.10	175.5
16:05	16.7	7.94	226.0	52.00	7.24	56.8	100.0	175.5
16:10	16.5	7.93	225.0	52.00	7.28	56.2	100.0	175.5
16:15	16.2	7.92	222.0	51.00	7.11	56.6	100.0	175.5
16:17	16.3	7.93	225.0	51.00	7.15	56.4	100.0	175.5

Did well dewater?	No	**Amount evacuated (ml):**	400.1

Sample Details

Sampling Date and Time:	05-17-2023 16:20		
Sample ID:	MW-6(20230517)	**Laboratory**	Pace Analytical Services, Mt.Juliet, TN
Laboratory Analysis:			
Equipment Blank ID:	NA	**Duplicate ID:**	NA

Well, Sample, Other Notes: Turbidity based off equation TDS x 0.4535 since equipment I was sent didn't measure turbidity.

'NA' denotes not measured, not available, or not applicable.

Appendix D

Laboratory Analytical Report

Data Validation Report

Site/Facility Name: Hillyard Dross
Laboratory Sample Delivery Group: L1617988
Laboratory Report Date: 2023-06-07
Date Validated: 2023-06-12
Laboratory Name: Pace Analytical Services, Mt.Juliet, TN
Laboratory Location: Mt. Juliet, TN

Table 1. Data Validation Summary

Quality Control Element	Item Checked?	Issue Noted?	Data Qualified?
Chain of Custody	X		
Sample Preservation	X		
Holding Time	X	X	X
Method Blanks	X		
Trip Blanks	NA		
Laboratory Control Samples	X		
Matrix Spikes	X		
Surrogate Recovery	NA		
Laboratory Duplicates	X	X	
Field Blank Samples	X		
Field Duplicate Samples	X		
Chromatograms Provided	NA		
Dissolved Metals Field Filtered	NA		
Other Issues or Information	X		

Data Validation Details

Holding Time

The Nitrate analysis for sample MW-5-20230516 exceeded the method recommended holding time of 48 hours. The sample was detected, qualified as estimated, J-.

The Nitrite analysis for sample MW-5-20230516 exceeded the method recommended holding time of 48 hours. The sample was not detected, qualified as rejected, R.

The Nitrite analysis for sample DUP-01-20230500 exceeded the method recommended holding time of 48 hours. The sample was not detected, qualified as rejected, R.

Re-sampling results and data validation for Nitrate and Nitrite due to holding time issues are located under SDG L1621149.

Trip Blanks

Trip blanks were not collected or associated with this sample delivery group.

Surrogate Recovery

Surrogates were not required by the methods in this sample delivery group.

Laboratory Duplicates

The laboratory duplicate RPD for sample MW-5-20230516 consisted of a detect and non-detect pair where the detection was <5x the reporting limit and the difference between sample results was <1x the lowest reporting limit, no action taken.

Field Blank Samples

There were no detections in field blank sample QCFB-01-20230517.

Field Duplicate Samples

The RPDs for the duplicate pair MW-5-20230516 and DUP-01-20230500 ranged from 0-9.96%. The RPDs were within acceptance criteria, no action taken.

Chromatograms Provided

Petroleum analyses were not performed for this sample delivery group.

Dissolved Metals Field Filtered

Dissolved metals were not analyzed for samples in this sample delivery group.

Data Usability Statement:

Based on the data validation review, the data are acceptable as delivered. The findings with respect to the quality assurance/quality control (QA/QC) data identified in this report do not adversely affect the use of the analytical results except for results rejected due to holding time exceedances.

Table 2. Description of samples

Sample ID	Sample Date	Lab Sample ID	Sample Type	Matrix	SW9056
DUP-01-20230500	2023-05-17	L1617988-06	FD	WG	X
MW-3R-20230517	2023-05-17	L1617988-02	N	WG	X
MW-4-20230517	2023-05-17	L1617988-03	N	WG	X
MW-5-20230516	2023-05-16	L1617988-01	N	WG	X
MW-6-20230517	2023-05-17	L1617988-05	N	WG	X
QCFB-01-20230517	2023-05-17	L1617988-04	FB	WG	X

Table 3. Parent sample identification

Sample ID	Parent Sample ID	Sample Type
DUP-01-20230500	MW-5-20230516	FD
R3932522-5 MS	MW-5-20230516	MS
R3932522-6 MSD	MW-5-20230516	MSD

Table 4. Data that have been qualified are listed below.

Sample ID	Lab Sample ID	Analytic Method	CasRN	Parameter Name	Validated Result	Unit	Validator Reason
MW-5-20230516	L1617988-01	SW9056	14797-55-8	Nitrogen, Nitrate (as NO3)	3690 J-	ug/l	J- due to holding time
MW-5-20230516	L1617988-01	SW9056	14797-65-0	Nitrogen, Nitrite (as NO2)	< 100 R	ug/l	R due to holding time
MW-6-20230517	L1617988-05	SW9056	14797-65-0	Nitrogen, Nitrite (as NO2)	< 1000 R	ug/l	R due to holding time

Abbreviations

FB	Field Blank
FD	Field Duplicate Sample
J-	An estimated concentration that may be biased low based on data validation findings.
MS	Project Specific Matrix Spike
MSD	Project Specific Matrix Spike Duplicate considered as same as spike
N	Normal Environmental Sample
NA	Not Applicable
R	The result has been rejected based on data validation findings.
ug/l	micrograms per liter
WG	Ground Water
X	Item checked

ANALYTICAL REPORT

June 07, 2023

Kennedy/Jenks Con-BNSF Region 1

Sample Delivery Group:	L1617988
Samples Received:	05/19/2023
Project Number:	
Description:	BNSF Hillyard Dross

Report To:

Shaelyn Thomas
1500 NE Irving Street
Suite 200
Portland, OR 97232

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

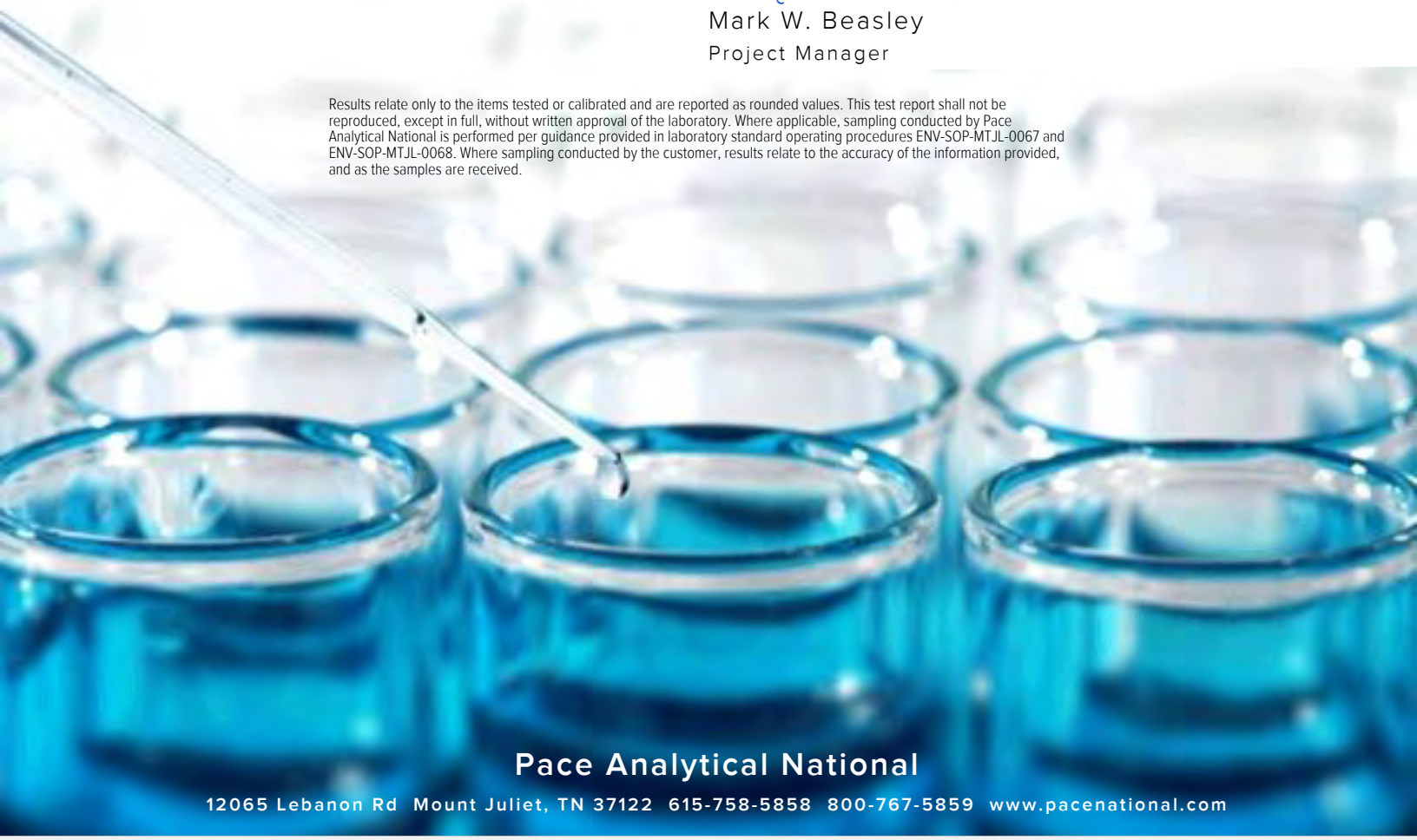


TABLE OF CONTENTS

SAMPLE SUMMARY

MW-5-20230516 L1617988-01 GW

Collected by: Brandon K | Collected date/time: 05/16/23 13:45 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 13:08	05/19/23 13:08	MDM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG2071996	1	06/05/23 21:51	06/05/23 21:51	MDM	Mt. Juliet, TN

MW-3R-20230517 L1617988-02 GW

Collected by: Brandon K | Collected date/time: 05/17/23 13:19 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 12:01	05/19/23 12:01	MDM	Mt. Juliet, TN

MW-4-20230517 L1617988-03 GW

Collected by: Brandon K | Collected date/time: 05/17/23 14:20 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 12:15	05/19/23 12:15	MDM	Mt. Juliet, TN

QCFB-01-20230517 L1617988-04 GW

Collected by: Brandon K | Collected date/time: 05/17/23 14:23 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 12:28	05/19/23 12:28	MDM	Mt. Juliet, TN

MW-6-20230517 L1617988-05 GW

Collected by: Brandon K | Collected date/time: 05/17/23 16:25 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 12:42	05/19/23 12:42	MDM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG2071996	10	06/05/23 22:22	06/05/23 22:22	MDM	Mt. Juliet, TN

DUP-01-20230500 L1617988-06 GW

Collected by: Brandon K | Collected date/time: 05/17/23 12:00 | Received date/time: 05/19/23 09:05

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2063095	1	05/19/23 11:45	05/19/23 11:45	MDM	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	20200		379	1000	1	05/19/2023 13:08	WG2063095
Nitrate	3690	T8	48.0	100	1	06/05/2023 21:51	WG2071996
Nitrite	U	T8	42.0	100	1	06/05/2023 21:51	WG2071996

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	15900		379	1000	1	05/19/2023 12:01	WG2063095
Nitrate	3370		48.0	100	1	05/19/2023 12:01	WG2063095
Nitrite	U		42.0	100	1	05/19/2023 12:01	WG2063095

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	4790		379	1000	1	05/19/2023 12:15	WG2063095
Nitrate	1150		48.0	100	1	05/19/2023 12:15	WG2063095
Nitrite	U		42.0	100	1	05/19/2023 12:15	WG2063095

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	U		379	1000	1	05/19/2023 12:28	WG2063095
Nitrate	U		48.0	100	1	05/19/2023 12:28	WG2063095
Nitrite	U		42.0	100	1	05/19/2023 12:28	WG2063095

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	5560		379	1000	1	05/19/2023 12:42	WG2063095
Nitrate	1220		48.0	100	1	05/19/2023 12:42	WG2063095
Nitrite	U	Q	420	1000	10	06/05/2023 22:22	WG2071996

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	20000		379	1000	1	05/19/2023 11:45	WG2063095
Nitrate	3340		48.0	100	1	05/19/2023 11:45	WG2063095
Nitrite	U		42.0	100	1	05/19/2023 11:45	WG2063095

Method Blank (MB)

(MB) R3932522-1 05/19/23 10:19

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Chloride	U		379	1000
Nitrate	U		48.0	100
Nitrite	U		42.0	100

L1617988-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1617988-01 05/19/23 13:08 • (DUP) R3932522-4 05/19/23 18:50

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	20200	20800	1	2.88		15
Nitrate	3430	3660	1	6.44		15
Nitrite	U	249	1	200	P1	15

Laboratory Control Sample (LCS)

(LCS) R3932522-2 05/19/23 10:32

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Chloride	40000	40700	102	80.0-120	
Nitrate	8000	7770	97.1	80.0-120	
Nitrite	8000	8560	107	80.0-120	

L1617988-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1617988-01 05/19/23 13:08 • (MS) R3932522-5 05/19/23 19:04 • (MSD) R3932522-6 05/19/23 19:17

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50000	20200	69900	69400	99.4	98.3	1	80.0-120			0.793	15
Nitrate	5000	3430	8260	8360	96.6	98.6	1	80.0-120			1.18	15
Nitrite	5000	U	5470	5380	109	108	1	80.0-120			1.62	15

Method Blank (MB)

(MB) R3933502-1 06/05/23 19:40

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Nitrate	U		48.0	100
Nitrite	U		42.0	100

L1617988-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1617988-01 06/05/23 21:51 • (DUP) R3933502-3 06/05/23 22:06

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate	3690	3700	1	0.200		15
Nitrite	U	U	1	0.000		15

L1618498-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1618498-10 06/06/23 03:24 • (DUP) R3933502-6 06/06/23 03:40

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate	U	U	1	0.000		15
Nitrite	U	U	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3933502-2 06/05/23 19:56

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Nitrate	8000	8100	101	80.0-120	
Nitrite	8000	8320	104	80.0-120	

L1618075-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1618075-05 06/05/23 23:10 • (MS) R3933502-4 06/05/23 23:26 • (MSD) R3933502-5 06/06/23 00:13

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Nitrate	5000	3170	7770	7810	92.1	93.0	1	80.0-120			0.524	15
Nitrite	5000	U	4970	4980	99.5	99.7	1	80.0-120			0.195	15

L1618498-10 Original Sample (OS) • Matrix Spike (MS)

(OS) L1618498-10 06/06/23 03:24 • (MS) R3933502-7 06/06/23 03:56

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Nitrate	5000	U	5140	103	1	80.0-120	
Nitrite	5000	U	5190	104	1	80.0-120	

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

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Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
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Qualifier	Description
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.
Q	Sample was prepared and/or analyzed past holding time as defined in the method. Concentrations should be considered minimum values.
T8	Sample(s) received past/too close to holding time expiration.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
Kennedy/Jenks Con-BNSF Region 1

1500 NE Irving Street
Suite 200
Portland. OR 97232

Billing Information:
Accounts Payable
32001 32nd Ave. S.,Ste. 100
Federal Way, WA 98001

Pres Chk

Report to:
Shaelyn Thomas

Email To: **ShaelynThomas@kennedyjenks.com**

Project Description:
BNSF Hillyard Dross

City/State Collected: Spokane WA

Please Circle: (PT) MT CT ET

Phone: **503-423-4033**

Client Project #

Lab Project #
BNSF1KEN-HILLYARD

Collected by (print):
Brandon Kautzer

Site/Facility ID #
Hillyard Dross

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

No. of Cntrs: KF

Analysis / Container / Preservative: Cl, NO2, NO3 125mlHDPE-NoPres

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time		
MW-5-20230516	G	GW		5/16/23	1345	1	X
MW-32-20230517	G	GW		5/17/23	1319		X
MW-4-20230517	G	GW		5/17/23	1420		X
~~MW~~CfB-01-20230517	G	GW		5/17/23	1423		X
MW-6-20230517	G	GW		5/17/23	1625		X
DUP-01-20230500	G	GW		5/17	1200	↓	X
		GW					
		GW					

Chain of Custody Page ___ of ___

Pace
PEOPLE ADVANCING SCIENCE

MT JULIET, TN

12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG # L1617966

D153

Acctnum: **BNSF1KEN**
Template: **T229624**
Prelogin: **P997252**
PM: **134 - Mark W. Beasley**
PB: 5-3-2023

Shipped Via: **FedEx Ground**

Remarks | Sample # (lab only)

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Samples returned via:
__ UPS X FedEx __ Courier _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: __NP X Y __N
COC Signed/Accurate: X Y __N
Bottles arrive intact: X Y __N
Correct bottles used: X Y __N
Sufficient volume sent: X Y __N
If Applicable
VOA Zero Headspace: X Y __N
Preservation Correct/Checked: X Y __N
RAD Screen <0.5 mR/hr: X Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
	5/18/23	853A	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Trip Blank Received: Yes (No) HCL / MeoH TBR

Temp: NSAT °C 4.6+0=4.6 Bottles Received: 6

Date: 5/19/23 Time: 905

If preservation required by Login: Date/Time

Hold:

Condition: (NCF) / OK

5/19 NCF-L1617988 BNSF1KEN

Shortholds

Time estimate: oh **Time spent:** oh

Members

Nicolle Faulk (responsible) MB Mark Beasley

Due on *26 May 2023 5:00 PM* for target *Done*

- [x] Parameter(s) past holding time
- [ ] Temperature not in range
- [ ] Improper container type
- [ ] pH not in range
- [ ] Insufficient sample volume
- [ ] Sample is biphasic
- [ ] Vials received with headspace
- [ ] Broken container
- [ ] Sufficient sample remains
- [ ] If broken container: Insufficient packing material around container
- [ ] If broken container: Insufficient packing material inside cooler
- [ ] If broken container: Improper handling by carrier:_____
- [ ] If broken container: Sample was frozen
- [ ] If broken container: Container lid not intact
- [ ] Client informed by Call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:__5/19/23_____
- [ ] PM initials:__MB_____
- [ ] Client Contact:__Shaelyn Thomas_____

Comments

Nicolle Faulk *19 May 2023 10:14 AM*

1st ID is OOH, collected 5/16/23 1345

Mark Beasley *19 May 2023 11:20 AM*

Run as rec'd

Nicolle Faulk *19 May 2023 11:22 AM*

done

Data Validation Report

Site/Facility Name: Hillyard Dross
Laboratory Sample Delivery Group: L1621149
Laboratory Report Date: 2023-06-01
Date Validated: 2023-06-12
Laboratory Name: Pace Analytical Services, Mt.Juliet, TN
Laboratory Location: Mt. Juliet, TN

Table 1. Data Validation Summary

Quality Control Element	Item Checked?	Issue Noted?	Data Qualified?
Chain of Custody	X		
Sample Preservation	X		
Holding Time	X		
Method Blanks	X		
Trip Blanks	NA		
Laboratory Control Samples	X		
Matrix Spikes	X		
Surrogate Recovery	NA		
Laboratory Duplicates	X		
Field Blank Samples	X		
Field Duplicate Samples	X		
Chromatograms Provided	NA		
Dissolved Metals Field Filtered	NA		
Other Issues or Information	X		

Data Validation Details

Trip Blanks
Trip blanks were not collected or associated with this sample delivery group.

Surrogate Recovery
Surrogates were not required by the methods in this sample delivery group.

Field Blank Samples
There were no detections in field blank sample QCFB-01-20230530.

Field Duplicate Samples
The RPDs for the duplicate pair MW-5-20230530 and DUP-01-20230530 ranged from 0-0.135%. The RPDs were within acceptance criteria, no action taken.

Chromatograms Provided
Petroleum analyses were not performed for this sample delivery group.

Dissolved Metals Field Filtered
Dissolved metals were not analyzed for samples in this sample delivery group.

Data Usability Statement:
Based on the data validation review, the data are acceptable as delivered. The findings with respect to the quality assurance/quality control (QA/QC) data identified in this report do not adversely affect the use of the analytical results.

Table 2. Description of samples

Sample ID	Sample Date	Lab Sample ID	Sample Type	Matrix	SW9056
DUP-01-20230530	2023-05-30	L1621149-02	FD	WG	X
MW-5-20230530	2023-05-30	L1621149-01	N	WG	X
QCFB-01-20230530	2023-05-30	L1621149-03	FB	WG	X

Table 3. Parent sample identification

Sample ID	Parent Sample ID	Sample Type
R3931765-7 MS	QCFB-01-20230530	MS
DUP-01-20230530	MW-5-20230530	FD

Table 4. Data that have been qualified are listed below.

Sample ID	Lab Sample ID	Analytic Method	CasRN	Parameter Name	Validated Result	Unit	Validator Reason
Not applicable							

Abbreviations

FB	Field Blank
FD	Field Duplicate Sample
MS	Project Specific Matrix Spike
N	Normal Environmental Sample
NA	Not Applicable
WG	Ground Water
X	Item checked

ANALYTICAL REPORT

June 01, 2023

Kennedy/Jenks Con-BNSF Region 1

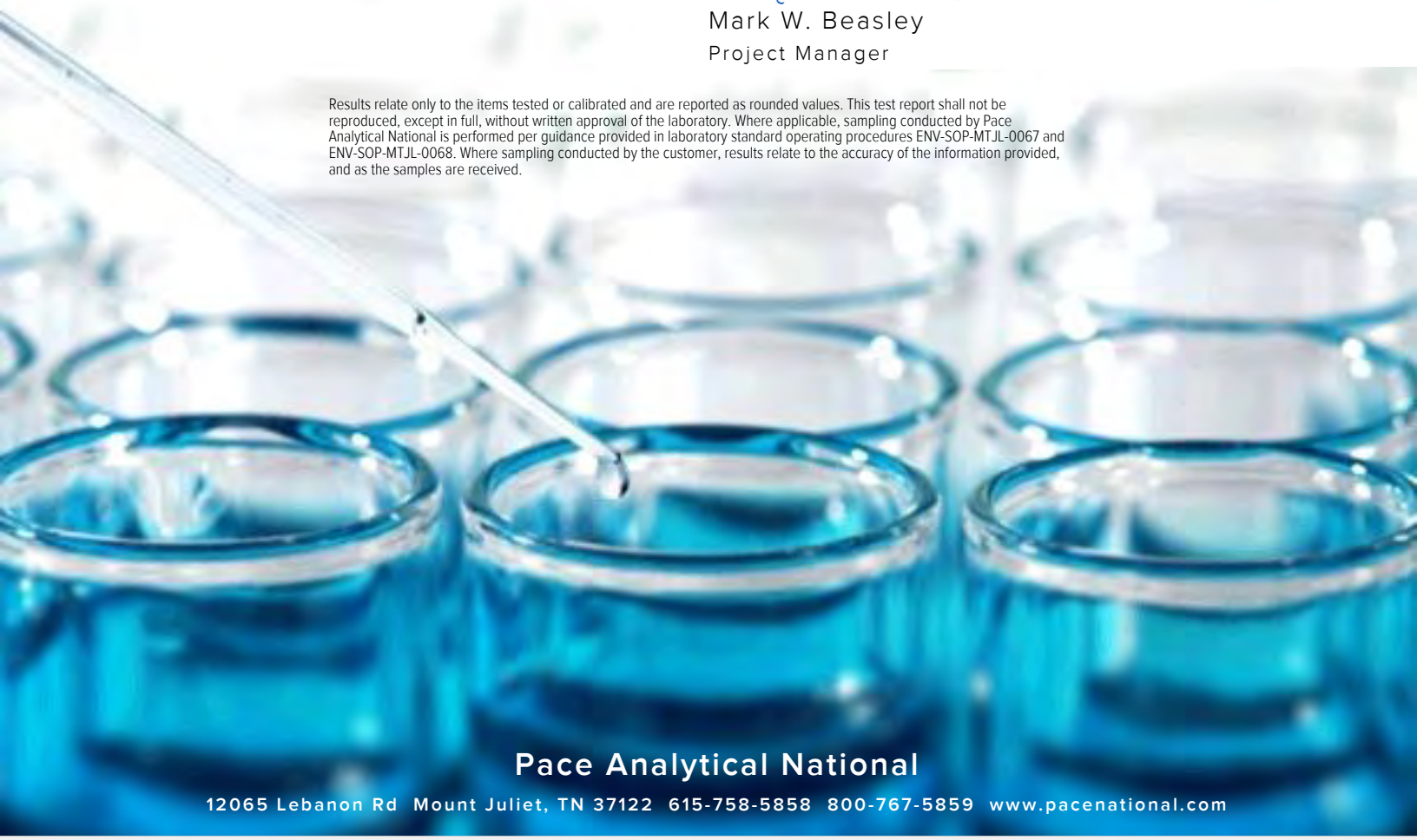
Sample Delivery Group:	L1621149
Samples Received:	05/31/2023
Project Number:	
Description:	BNSF Hillyard Dross

Report To:

Shaelyn Thomas
1500 NE Irving Street
Suite 200
Portland, OR 97232

Entire Report Reviewed By:

Mark W. Beasley
Project Manager



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

MW-5-20230530 L1621149-01 GW

Collected by: Brandon K
Collected date/time: 05/30/23 12:30
Received date/time: 05/31/23 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2069120	1	05/31/23 19:51	05/31/23 19:51	MDM	Mt. Juliet, TN

DUP-01-20230530 L1621149-02 GW

Collected by: Brandon K
Collected date/time: 05/30/23 12:00
Received date/time: 05/31/23 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2069120	1	05/31/23 20:04	05/31/23 20:04	MDM	Mt. Juliet, TN

QCFB-01-20230530 L1621149-03 GW

Collected by: Brandon K
Collected date/time: 05/30/23 12:35
Received date/time: 05/31/23 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG2069120	1	06/01/23 00:54	06/01/23 00:54	MDM	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	101000		379	1000	1	05/31/2023 19:51	WG2069120
Nitrate	7420		48.0	100	1	05/31/2023 19:51	WG2069120
Nitrite	U		42.0	100	1	05/31/2023 19:51	WG2069120

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	101000		379	1000	1	05/31/2023 20:04	WG2069120
Nitrate	7430		48.0	100	1	05/31/2023 20:04	WG2069120
Nitrite	U		42.0	100	1	05/31/2023 20:04	WG2069120

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	U		379	1000	1	06/01/2023 00:54	WG2069120
Nitrate	U		48.0	100	1	06/01/2023 00:54	WG2069120
Nitrite	U		42.0	100	1	06/01/2023 00:54	WG2069120

Method Blank (MB)

(MB) R3931765-1 05/31/23 10:22

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Chloride	U		379	1000
Nitrate	U		48.0	100
Nitrite	U		42.0	100

L1621083-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1621083-01 05/31/23 17:33 • (DUP) R3931765-3 05/31/23 17:45

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	ug/l	ug/l		%		%
Chloride	51600	51700	1	0.327		15
Nitrate	1930	1950	1	1.03		15
Nitrite	131	131	1	0.153		15

L1621149-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1621149-03 06/01/23 00:54 • (DUP) R3931765-6 06/01/23 01:06

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	ug/l	ug/l		%		%
Chloride	U	U	1	0.000		15
Nitrate	U	U	1	0.000		15
Nitrite	U	U	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3931765-2 05/31/23 10:35

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	ug/l	ug/l	%	%	
Chloride	40000	39400	98.5	80.0-120	
Nitrate	8000	7640	95.5	80.0-120	
Nitrite	8000	8190	102	80.0-120	

L1621083-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1621083-01 05/31/23 17:33 • (MS) R3931765-4 05/31/23 17:58 • (MSD) R3931765-5 05/31/23 18:11

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50000	51600	98900	99200	94.8	95.4	1	80.0-120			0.296	15
Nitrate	5000	1930	6740	6750	96.3	96.5	1	80.0-120			0.173	15
Nitrite	5000	131	5320	5340	104	104	1	80.0-120			0.321	15

L1621149-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1621149-03 06/01/23 00:54 • (MS) R3931765-7 06/01/23 01:19

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Chloride	50000	U	50300	101	1	80.0-120	
Nitrate	5000	U	4920	98.4	1	80.0-120	
Nitrite	5000	U	5260	105	1	80.0-120	

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Qualifier	Description
	The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
[redacted]nedy/Jenks Con-BNSF Region 1

1500 NE Irving Street
Suite 200
Portland, OR 97232

Billing Information:
Accounts Payable
32001 32nd Ave. S.,Ste. 100
Federal Way, WA 98001

Pres Chk

Report to: Shaelyn Thomas

Email To: ShaelynThomas@kennedyjenks.com

Project Description: BNSF Hillyard Dross

City/State Collected: Spokane, WA

Please Circle: PT MT CT ET

Phone: 503-423-4033

Client Project #

Lab Project # BNSF1KEN-HILLYARD

Collected by (print): Brandon Kautzman

Site/Facility ID # Hillyard Dross

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Cl, NO2, NO3 125mlHDPE-NoPres	Remarks	Sample # (lab only)
MW-5-20230530	G	GW		5/30/23	1230		X		-01
DUP-01-20230530	"	GW		"	1200		X		-02
QCFB-01-20230530	"			"	1235		X		-03

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace
PEOPLE ADVANCING SCIENCE

MT JULIET, TN
12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG # L1621149
A083
Ta

Acctnum: BNSF1KEN
Template: T230889
Prelogin: P1000800
PM: 134 - Mark W. Beasley
PB: 5-23-23

Shipped Via: FedEX Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via: __ UPS __ FedEx __ Courier _____

Tracking # 6481 5471 8141

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
RAD Screen <0.5 mR/hr: Y N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
	5/30/23	1430		0	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: NSAFE 4.6+0=4.6	Bottles Received: 3
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 5/31/23	Time: 0930

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

Appendix E

2023 MTCA Stat Output

6	1/18/11	MW-3R Nitrate
4.2	4/21/11	
6.9	7/14/11	
9.7	1/24/12	
5.1	4/10/12	
9.5	7/11/12	
15	1/29/13	
4.7	4/11/13	
8.1	1/29/14	
5.6	4/23/14	
11	7/28/14	
2.5	1/28/15	
6.27	4/14/15	
6.51	1/26/16	
4.67	4/28/16	
9.83	7/13/16	
11.2	1/31/17	
4.57	4/18/17	
3.81	5/15/19	
3.37	5/17/23	

Number of samples		Uncensored values		
Uncensored	20	Mean	6.93	
Censored		Lognormal mean	6.97	
Detection limit or PQL		Std. devn.	3.20944867	
Method detection limit		Median	6.135	
TOTAL	20	Min.	2.5	
		Max.	15	

Lognormal distribution?		Normal distribution?	
r-squared is:	0.985	r-squared is:	0.927

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.58270074546211

8.7	4/11/13	MW-5 Nitrate
9.1	10/24/13	
9.4	1/29/14	
7.2	4/23/14	
4	7/28/14	
4.2	10/29/14	
7.6	1/28/15	
4.15	4/14/15	
5.43	7/14/15	
5.83	10/27/15	
6.04	1/26/16	
2.49	4/28/16	
5.35	7/13/16	
3.61	10/12/16	
3.8	1/31/17	
11.5	4/18/17	
41.8	6/27/18	
3.84	4/23/19	
3.39	4/29/20	
7.42	5/30/23	

Number of samples			Uncensored values	
Uncensored	20		Mean	7.74
Censored			Lognormal mean	7.31
Detection limit or PQL			Std. devn.	8.3710987
Method detection limit			Median	5.63
TOTAL	20		Min.	2.49
			Max.	41.8

Lognormal distribution?		Normal distribution?	
r-squared is:	0.855	r-squared is:	0.465

Recommendations:
Reject lognormal distribution.
W value is 0.8734. This is less than the tabled value of 0.905
Reject normal distribution.
W value is 0.4954. This is less than the tabled value of 0.905

UCL (Land's method) is 9.82067129567178

160	4/11/13	MW-5 Chloride
140	10/24/13	
130	1/29/14	
120	4/23/14	
25	7/28/14	
44	10/29/14	
160	1/28/15	
47.4	4/14/15	
65.4	7/14/15	
98.7	10/27/15	
88.7	1/26/16	
26.3	4/28/16	
152	7/13/16	
149	10/12/16	
14.9	1/31/17	
82.6	4/18/17	
923	6/27/18	
17	4/23/19	
6.07	4/29/20	
101	5/30/23	

Number of samples			Uncensored values		
Uncensored		20	Mean		127.55
Censored			Lognormal mean		132.26
Detection limit or PQL			Std. devn.		194.516093
Method detection limit			Median		93.7
TOTAL		20	Min.		6.07
			Max.		923
Lognormal distribution?			Normal distribution?		
r-squared is:		0.926	r-squared is:		0.455

Recommendations:

Assume lognormal distribution.

W value is 0.9401. This exceeds the tabled value of 0.905

UCL (Land's method) is 267.567639275378