SGW-62135
Revision 0

RCRA QUARTERLY GROUNDWATER MONITORING FOR JULY THROUGH SEPTEMBER 2016

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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APPROVED
By Erin C Meegan at 4:10 pm, May 29, 2018

Release Approval Date

TRADEMARK DISCLAIMER

Contents

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Tables

Terms

AEA	*Atomic Energy Act of 1954*
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DWS	drinking water standard
GEL	GEL Laboratories
HEIS	Hanford Environmental Information System
LERF	Liquid Effluent Retention Facility
LLWMA	low-level waste management area
LOQ	limit of quantitation
NRDWL	nonradioactive dangerous waste landfill
RCRA	*Resource Conservation and Recovery Act of 1976*
SST	single-shell tank
TASL	TestAmerica St. Louis
TOC	total organic carbon
TOX	total organic halides
WMA	waste management area

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1 Introduction

This document describes sampling performed in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA) during the July through September 2016 reporting period.

Groundwater monitoring objectives of RCRA, the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), and the *Atomic Energy Act of 1954* (AEA) often differ slightly and the contaminants monitored are not always the same. For RCRA-regulated units, monitoring focuses on nonradioactive dangerous waste constituents. While radionuclides (source, special nuclear, and byproduct materials) may be monitored in some RCRA unit wells to support the objectives of monitoring under AEA and/or CERCLA, they are not subject to RCRA regulation. Pursuant to RCRA, the source, special nuclear, and byproduct material components of radioactive mixed waste are regulated by the U.S. Department of Energy (DOE), acting in accordance with its AEA authority. Therefore, while this report is used to satisfy RCRA reporting requirements, the inclusion of information on radionuclides in such a context is for information only and may not be used to create conditions or other restrictions set forth in any RCRA Permit.

Quarterly information is provided to status sampling, summarize recent and pending monitoring changes, and report statistical exceptions. Groundwater monitoring result highlights and site maps are provided only if changes are determined to be significant. Data are officially reported and accessed through the DOE Environmental Dashboard Application https://ehs.hanford.gov/eda/.

Chapters 2 and 3 identify any quality control or laboratory issues and the sampling and analysis status for the reporting period. Chapters 4, 5, and 6 present a general status update including sampling activity, significant results, and applicable trend charts.

Sites monitored under detection or indicator evaluation programs rely on comparison of indicator parameters to critical mean values. Critical mean values were derived in ECF-Hanford-16-0015, *Calculation of Critical Means for Calendar Year 2016 RCRA Groundwater Monitoring*.

2 Quality Control and Laboratory Issues

No quality control or laboratory issues were identified for the reporting period.

3 Sampling and Analysis Status

This chapter lists missed or delayed samples.

3.1 Missed Sampling

Table 1 presents samples scheduled but not collected during the quarter. The table includes the site, scheduled period that was not collected, frequency of sampling, and any comments. Further information is included in the site-specific discussion.

Table 1. Sampling Not Completed

Well	Site	Scheduled	Frequency	Comments
299-E27-4	WMA C	June 2016	Quarterly	Video survey showed advanced casing corrosion.

WMA = waste management area

3.2 Sampling Completed After Quarterly Reporting Period

Table 2 shows wells scheduled but collected after completion of the quarter. The table includes the site, scheduled period that was not collected, frequency of sampling, and any comments. Further information is included in the site-specific discussion.

Table 2. Sampling Completed After Quarter

Well	Site	Scheduled	Frequency	Comments
299-W18-21	LLWMA-4	July	Semiannual	Unable to be sampled by dedicated pump, well maintenance permanently removed pump and piping from the casing. Future sampling will utilize bailing.

LLWMA = low-level waste management area

3.3 Stop Work

No stop work orders affecting groundwater sampling were in effect during the reporting period.

4 Inactive Waste Management Areas

The following inactive treatment, storage, and disposal units received nonradioactive dangerous waste for active management after RCRA regulation became jurisdictionally applicable to that activity. Groundwater monitoring around the units under detection monitoring/indicator evaluation monitoring must continue in order to detect releases to groundwater of residual dangerous wastes in each unit. Groundwater monitoring around the units under corrective action must continue in order to determine compliance with groundwater protection standards and the effectiveness of the corrective action. Summary status and monitoring highlights of results by exception are provided for each area.

4.1 1301-N Liquid Waste Disposal Facility (Final Status, Detection Monitoring)

All five wells were sampled in September as scheduled. Contamination indicator parameter and analytical results were loaded into Hanford Environmental Information System (HEIS). Results did not exceed critical mean values. The next scheduled sampling event is March 2017.

4.2 1324-N/NA Facilities (Final Status, Detection Monitoring)

All five wells were sampled in September as scheduled and results were loaded into HEIS. The next scheduled sampling event is March 2017.

The pH measurement at upgradient monitoring well 199-N-71 on September 13, 2016, was below the lower critical range of 7.67 to 8.54. Verification samples taken in November showed that the pH measurement was within the pH measurement critical range.

Specific conductance results continued to be above the critical mean in downgradient wells 199-N-72, 199-N-73, and 199-N-165. A previous groundwater quality assessment indicated that the high specific conductance is caused by the nonregulated constituents sulfate and sodium (WHC-SD-EN-EV-003, *Results of Groundwater Quality Assessment Monitoring at the 1301-N and 1324-N/NA Facilities*). Verification samples were collected on November 9 through 11, 2016 for laboratory analysis. The specific conductance values from the verification samples confirmed the critical mean value was exceeded at the wells. The verification samples were also analyzed for sulfate and sodium to evaluate if the exceedance was a continuation of previously assessed exceedance attribute to the non-regulated constituent sulfate. The sulfate/specific conductance trends continue to support the source of high specific conductance is sulfate as reflected in Figures 1 through 3, showing comparison of specific conductance to sulfate trends for wells 199-N-72, 199-N-73, and 199-N-165. Results did not exceed critical mean values for the remaining indicator parameters. These data indicate that this conclusion in the 1992 assessment report (WHC-SD-EN-EV-003) remains valid, and the site remains in detection monitoring.

Waste site 100-N-58 is a secondary source of sulfate to groundwater at 1324-N/NA. The 100-N-58 south setting pond is a past practice waste site that received the same effluent disposed to the 1324-NA percolation pond from 1997 to 1983. The 100-N-58 site was collocated with the 1324-N/NA sites and was closed out after completing interim remedial actions for the sites. Groundwater monitoring at 1324-N/NA and 100-N-58 began about 10 years after effluent disposal began at the settling pond. No sulfate data are available to evaluate groundwater impacts from the date of initial discharge to the soil column from 1977 to 1987. Sulfate groundwater data are available for 1987 to present.

Sulfate concentrations were generally decreasing near waste site 100-N-58 from a 1990 maximum of about 1,800 mg/kg in well 199-N-59. This initial maximum concentration in well 199-N-59 is a major indicator of the dominant influence of sulfate on groundwater from waste site 100-N-58. High sulfate concentrations were also detected in well 199-N-73, located at the boundary of waste site 100-N-58.

Higher concentrations of sulfate (Figure 4) historically detected in the groundwater wells (199-N-59 and 199-N-73) suggest that waste site 100-N-58 was the most significant source of sulfate of the three settling percolation ponds. The maximum concentration observed near waste site 100-N-58 in groundwater (well 199-N-59) was about four times greater than concentrations observed in other wells. Elevated sulfate concentrations were also observed at well 199-N-73 near the 100-N-58 site boundary until about 2011. After 2011, sulfate concentrations in wells 199-N-72 and 199-N-77 were the highest of all wells, which likely reflects downgradient sulfate migration in groundwater from 100-N-58 and 1324-N/N toward the river. The 100-N-58 waste site and 1324-N/NA units are secondary sources of sulfate to groundwater, but waste site 100-N-58 was likely the largest contributor of sulfate based on observed concentration trends in the groundwater monitoring wells.

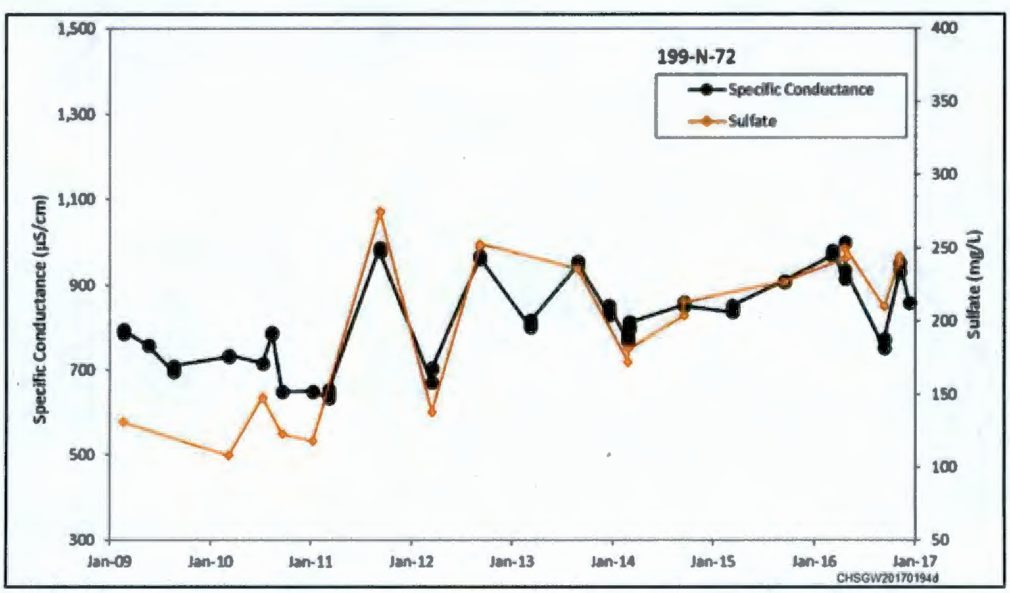

Figure 1. Specific Conductance and Sulfate in Well 199-N-72

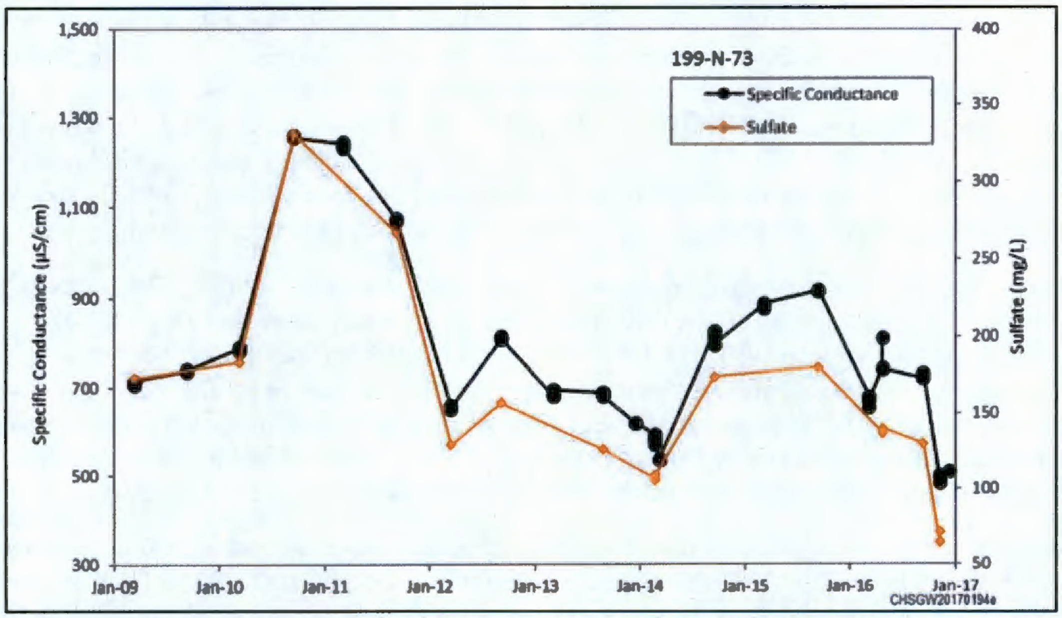

Figure 2. Specific Conductance and Sulfate in Well 199-N-73

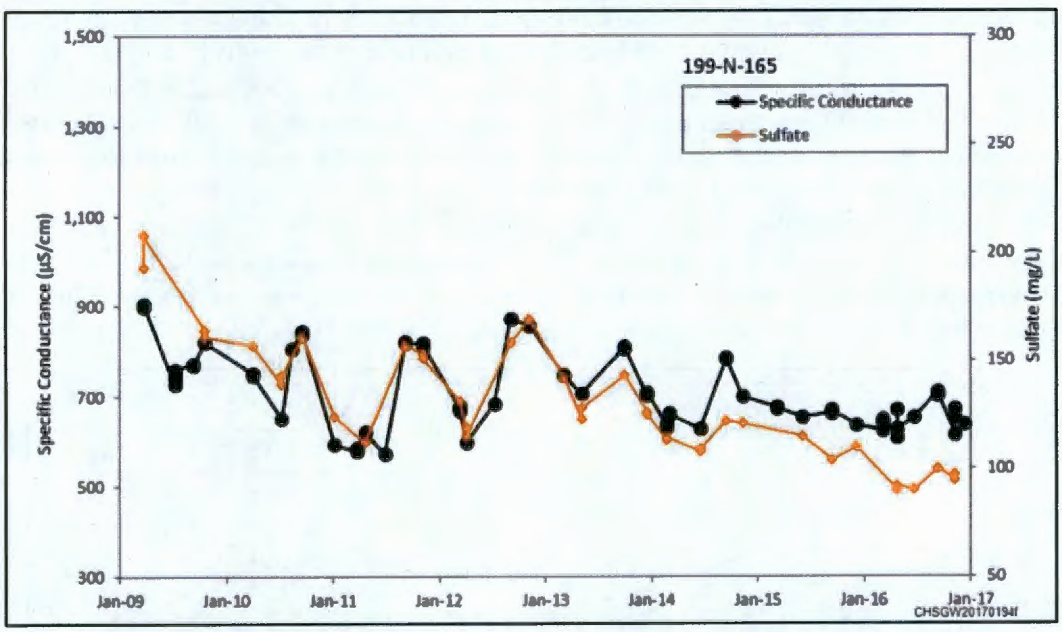

Figure 3. Specific Conductance and Sulfate in Well 199-N-165

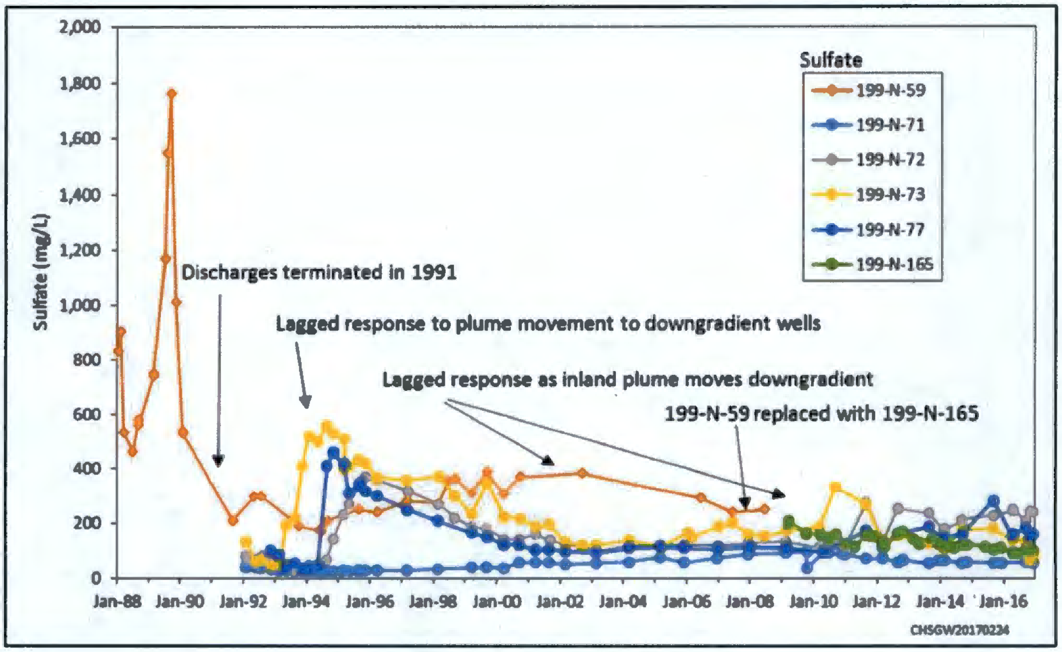

Figure 4. Sulfate in 1324-N/NA Network

4.3 1325-N Liquid Waste Disposal Facility (Final Status, Detection Monitoring)

All five wells were sampled in September as scheduled and results were loaded into HEIS. The next scheduled sampling event is March 2017.

Total organic halides (TOX) concentration in samples collected on September 9, 2016, at downgradient well 199-N-81 exceeded the critical mean of 10.73 µg/L. The average value for the four replicates was 13.65 µg/L (highest reported value of the replicates was 16 µg/L), which is below the calculated limit of quantitation (LOQ) for the third quarter of 2016 (25.7 µg/L). The third quarter LOQ was not available for the comparison; therefore, verification samples were collected on November 11, 2016. The results did not confirm an exceedance.

Specific conductance results continued to be above the critical mean in downgradient monitoring wells 199-N-41 and 199-N-81. The specific conductance measurements at well 199-N-32 were below the critical mean, but have exceeded the critical mean value in the past. The specific conductance exceedance is a continuation of previous exceedances noted since 1999. The assessment report for the original 1999 exceedance (at well 199-N-41) concluded that the exceedance was caused by past discharges of nonregulated contaminants to the 120-N-1 site (00-GWVZ-054, "Results of Assessment at the 1325-N Facility"). Results did not exceed critical mean values for the remaining indicator parameters.

Verification samples were collected on November 11, 2016 for laboratory analysis. The specific conductance values from the verification samples confirmed the critical mean value was exceeded at the wells. The verification samples were also analyzed for sulfate and sodium to evaluate if the exceedance was a continuation of previously assessed exceedance attribute to the nonregulated constituent sulfate. The sulfate/specific conductance trends continue to support the source of high specific conductance is sulfate as reflected in Figures 5 through 7 showing comparison of specific conductance to sulfate trends for wells 199-N-32, 199-N-41, and 199-N-81.

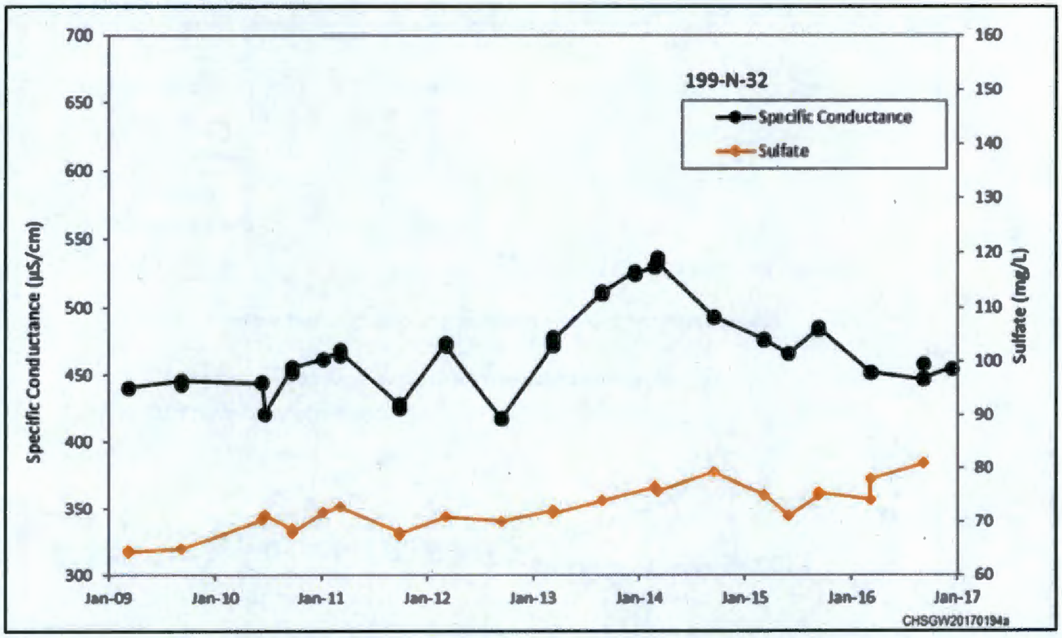

Figure 5. Specific Conductance and Sulfate in Well 199-N-32

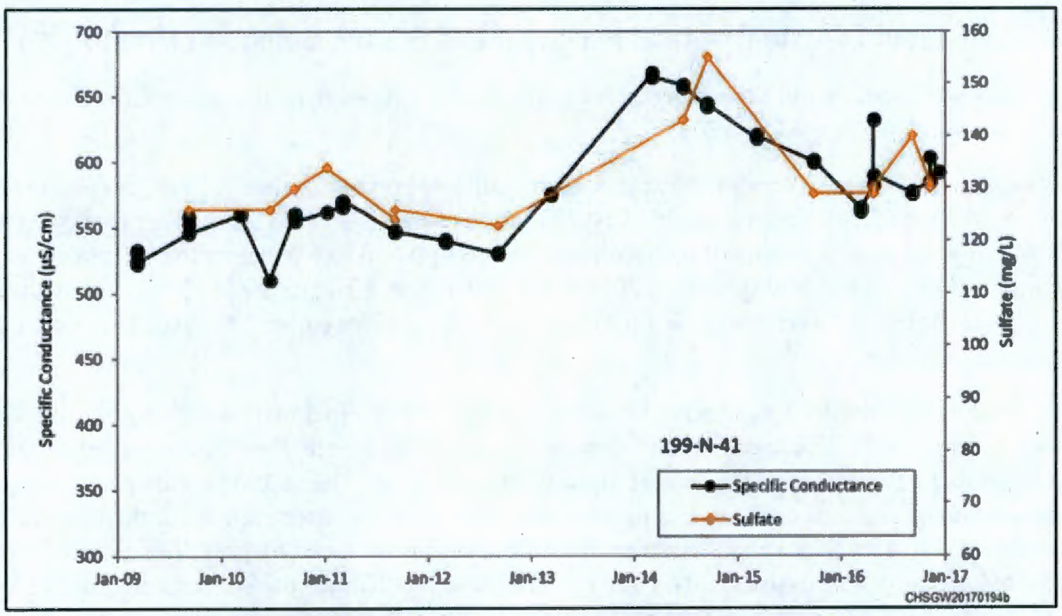

Figure 6. Specific Conductance and Sulfate in Well 199-N-41

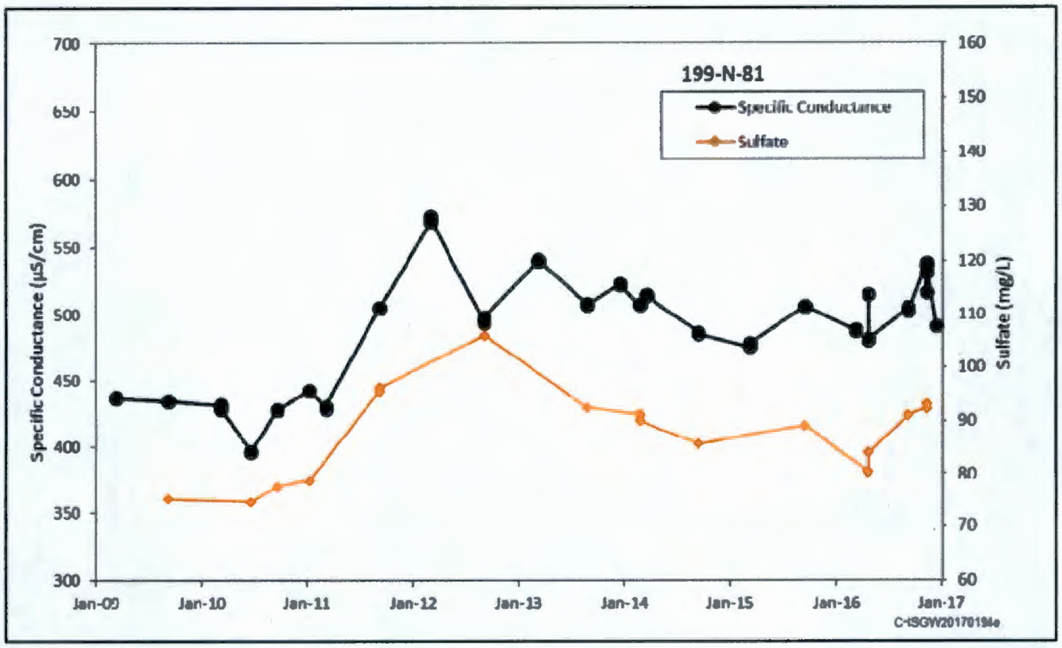

Figure 7. Specific Conductance and Sulfate in Well 199-N-81

Another source of sulfate is from past discharges to waste site 100-N-58, which received similar effluents from 1977 to 1982, and is in the same location as 1324-N/NA. Sulfate and specific conductance trends continue to show that the high specific conductance source is sulfate.

The 1324-N/NA site is not currently upgradient of the 1325-N Facility but during its use from 1977 to 1990, it created a recharge mound that may have pushed sulfate-laden water inland. Effluent discharges to 1325-N during operations (1985 to 1989) also resulted in water table mounding that contributed to cross-gradient migration of the sulfate plume inland and upgradient of 1325-N. Figure 8 shows hydrographs for select 1324-N/NA and 1325-N monitoring wells, with elevations at 1324-N/NA (wells 199-N-59, 199-N-72, and 199-N-73) higher than at 1325-N, except during periods of high discharge to 1325-N.

High sulfate was not observed in groundwater beneath 1325-N during the operational period because mounding kept it from migrating to 1325-N monitoring wells. Discharges to the 1325-N crib and 1324-NA percolation pond terminated in 1991 and 1990, respectively. After discharges to 1325-N ceased, the water table began to decline; sulfate that had been pushed upgradient of 1325-N began to flow toward 1325-N. Specific conductance and sulfate trends for 1324-N/NA downgradient monitoring well 199-N-165 continue to show decreasing concentrations, while concentrations at the 1325-N monitoring wells are increasing.

These data support the conclusion of the 1999 assessment report (00-GWVZ-054) that the high specific conductance at 1325-N is attributed to the nonregulated sulfate discharged to 1324-N/NA, and the site remains in detection monitoring.

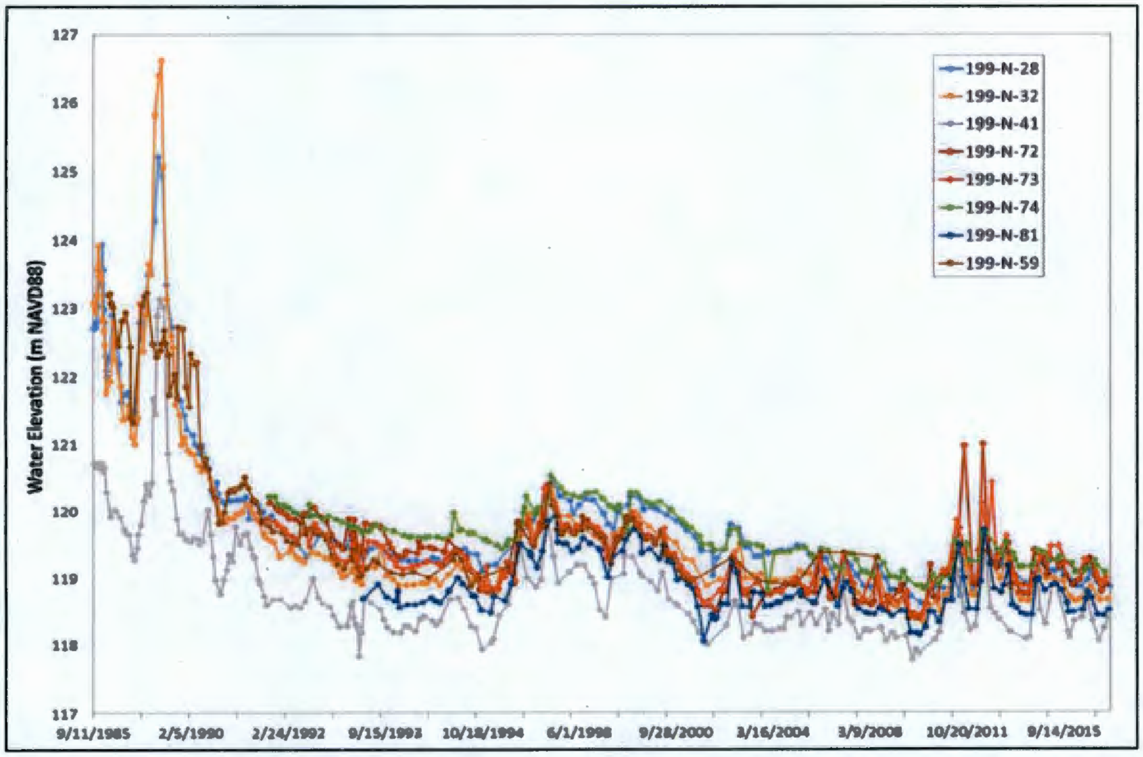

Figure 8. Water Levels in 1324-N/NA and 1325-N Network Wells

4.4 183-H Solar Evaporation Basins (Final Status, Corrective Action Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is November 2016.

4.5 300 Area Process Trenches (Final Status, Corrective Action Monitoring)

All eight wells were sampled as scheduled during the quarter. The next scheduled sampling event is December 2016.

The concentration of cis-1,2-dichloroethene continues to exceed the 70 μg/L drinking water standard (DWS) at well 399-1-16B (217 μg/L in July, 172 μg/L in August, and 192 μg/L in September), which is screened in the lower unconfined aquifer. The origin for cis-1,2-dichloroethene is attributed to degradation of trichloroethene disposed to the 300 Area Process Trenches and/or North Process Pond.

The concentration of uranium did not exceed the 30 μg/L DWS at any of the eight wells in July. The concentration of uranium exceeded the 30 μg/L DWS in August and September at well 399-1-16A (41 μg/L in August, and 44 μg/L in September), downgradient of the process trenches and at well 399-1-17A (30.3 μg/L in August and 31.7 μg/L in September) at the southern end of the process trenches.

4.6 216-A-29 Ditch (Final Status, Corrective Action Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is October 2016.

4.7 216-B-3 Pond (Interim Status, Indicator Evaluation Monitoring)

All five wells were sampled as scheduled in July. Results were loaded into HEIS, and did not exceed the 2016 critical mean values or ranges. The next scheduled annual sampling event is January 2017.

4.8 216-B-63 Trench (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is October 2016.

4.9 216-S-10 Pond and Ditch (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is November 2016.

4.10 Nonradioactive Dangerous Waste Landfill (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is October 2016.

DOE/RL-2015-32, *RCRA Interim Status Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill*. DOE/RL-2015-32 was developed in 2015 for nonradioactive dangerous waste landfill (NRDWL) and is being implemented in 2016. All network wells were sampled in April representing the first sampling event under the new draft monitoring plan.

Two new wells were installed in 2016 and include 699-26-33A and 699-25-34F to replace wells 699-26-33 and 699-25-34A which are going dry due to declining water table elevations. The average total organic carbon (TOC) concentration for the quadruplicate sample set collected from well 699-25-34F and reported in May was 1,427.5 µg/L and above the NRDWL critical mean value of 982 µg/L. Results for the TOC confirmation sampling were loaded into HEIS in July.

The averaged value for the quadruplicate results from GEL Laboratories (GEL) reported 1,487.5 µg/L, exceeding the critical mean, while the averaged value for the quadruplicate samples reported from a second lab TestAmerica St. Louis (TASL) was 962.5 µg/L, which is below the critical mean. Older well 699-25-34A was resampled as part of the verification process for a comparison of results and TOC concentrations continued to be on trend with previous values.

Based on the inconclusive results and the installation of a high volume pump within well 699-25-34F prior to the April 2016 sampling event, microbial growth within the well casing was determined to be a likely source of the elevated TOC concentrations. On July 7, 2016, the well pump was removed and the casing was evaluated via video-log. Microbial growth and slime buildup was visible on pump equipment and on the interior of the well casing beginning near the water table. All NRDWL network wells are scheduled for cleaning in September. Sampling of the network will continue following completion of the cleaning activities.

4.11 216-A-36B Crib (Interim Status, Indicator Evaluation Monitoring)

Sampling of RCRA monitoring network wells in July was completed as scheduled. Results for indicator parameters pH, TOX, TOC, and specific conductance were loaded into HEIS. The quadruplicate sample results for specific conductance, TOC, TOX, and pH did not exceed the 2016 critical mean values or ranges in downgradient wells. The pH value in upgradient well 299-E17-19 was above the 2016 critical mean (Table 3). The next scheduled semiannual sampling event is January 2017.

Table 3. 216-A-36B Indicator Parameter Summary

Indicator Parameter	2016 Critical Mean	Laboratory Limit of Quantitation	Range of Results	Comment
pH	7.71 – 7.76	–	7.93 – 8.14	No exceedances (high value from upgradient well 299-E17-19)
Specific Conductance	888	–	588 – 714 µg/L	No exceedances
TOC	925	CY16 (1st Quarter) TASL – 1,330 GEL – 390 µg/L	160 – <720 µg/L	No exceedances
TOX	33.81	CY16 (1st Quarter) TASL – 22.1 GEL – 10.9 µg/L	<2.1 – 7.9 µg/L	No exceedances

CY = calendar year
GEL = GEL Laboratories
TASL = TestAmerica St. Louis
TOC = total organic carbon
TOX = total organic halides

4.12 216-A-37-1 Crib (Interim Status, Indicator Evaluation Monitoring)

Sampling of the RCRA monitoring network wells in July was completed as scheduled. Results for indicator parameters pH and specific conductance were loaded into HEIS and discussed in Table 4. The quadruplicate sample results for specific conductance, TOC, TOX, and pH did not exceed the 2016 critical mean values or ranges in downgradient wells. The pH value in upgradient well 299-E25-47 was above the 2016 critical mean. The next scheduled semiannual sampling event is January 2017.

Table 4. 216-A-37-1 Indicator Parameter Summary

Indicator Parameter	2016 Critical Mean	Laboratory Limit of Quantitation	Range of Results	Comment
pH	7.50 – 8.40	–	7.65 – 8.47	No exceedances (high value was from upgradient well 299-E25-47).
Specific Conductance	906	–	<387 – 534	No exceedances
TOC	1,364	CY16 (1st Quarter) TASL – 1,330 GEL – 390 µg/L	499 – <720 µg/L	No exceedances

Table 4. 216-A-37-1 Indicator Parameter Summary

Indicator Parameter	2016 Critical Mean	Laboratory Limit of Quantitation	Range of Results	Comment
TOX	22.52	CY16 (1st Quarter) TASL – 22.1 GEL – 10.9 µg/L	<2.1 – 5.6 µg/L	No exceedances

CY = calendar year
GEL = GEL Laboratories
TASL = TestAmerica St. Louis
TOC = total organic carbon
TOX = total organic halides

5 Groundwater Monitoring Single-Shell Tank Farm Waste Management Areas

Single-shell tank (SST) farms are all monitored under RCRA groundwater assessment to determine the nature and extent of groundwater contamination. Summary status and monitoring highlights of results are provided for each waste management area (WMA).

5.1 SST WMA A-AX (Interim Status, Assessment Monitoring)

The nine network wells were sampled as scheduled in September. Ranges for assessment field parameters and supporting constituent values were generally within recent levels and trends and are summarized in Table 5. Dangerous waste constituents were additionally analyzed for all nine network wells. Evaluation of dangerous waste constituents will be presented within the final first determination report after eight sampling events (March 2018). The final first determination report will be prepared as soon as technically possible. The next scheduled sampling event is December 2016.

Table 5. WMA A-AX Assessment Parameter Summary

Parameter	Range
pH Measurement	7.87 – 8.25
Specific Conductance	515-794 µS/cm
Temperature	18.1 to 20.6°C (64.6 to 69.1°F)
Turbidity	0.15 – 3.62 NTU
Alkalinity	88,000 to 141,000 µg/L
Chloride	13,000 to 37,000 µg/L
Nitrate	14,200 to 62,000 µg/L
Sulfate	110,000 to 220,000 µg/L
Calcium (filtered)	54,900 to 88,000 µg/L (53,100 to 90,000 µg/L)

Table 5. WMA A-AX Assessment Parameter Summary

Parameter	Range
Magnesium (filtered)	15,600 to 25,700 µg/L (15,200 to 25,400 µg/L)
Potassium (filtered)	6,800 to 9,160 µg/L (6,950 to 9,250 µg/L)
Sodium (filtered)	18,000 to 27,900 µg/L (18,000 to 28,500 µg/L)
Chromium (filtered)	2.1 to 21 µg/L (1.6 to 23.3 µg/L)
Manganese (filtered)	0.49 to 15 µg/L (0.31 to 2.4 µg/L)
Nickel (filtered)	0.33 to 14.9 µg/L (<0.3 to 12.8 µg/L)
Iron (filtered)	17 to 80.5 µg/L (20 to 75 µg/L)

NTU = nephelometric turbidity unit

WMA = waste management area

The concentration of nitrate detected in wells 299-E25-93 (62,000 µg/L) and 299-E24-20 (48,700 µg/L) were above the DWS of 45,000 µg/L. Nitrate concentrations in wells 299-E24-33, 299-E25-41, and 299-E25-2 has been increasing since 2006, but remain below the nitrate DWS (Figure 9). Nitrate levels have been above the DWS in well 299-E24-20 since March of 2013. In March of 2013, nitrate concentrations in well 299-E25-93 dropped below the DWS. Since that time levels have fluctuated and have remained above the DWS since December 2014 and are increasing (Figure 10).

Total iron concentrations in well 299-E25-40 was 80.5 µg/L and decreased from 3,640 µg/L during the March 2016 event. Dissolved iron was non-detect, consistent with all other network wells.
A corresponding significant increase in nickel and chromium is not apparent within well 299-E25-40 for the March or October 2016 event suggesting the increase in total iron may have been due to potential microbial growth within the well casing. Additionally, a review flag was added to the March 2016 event for iron due to the presence of a diesel generator running within 7.6 m (25 ft) of the well during sampling.

5.2 SST WMA B-BX-BY (Interim Status, Assessment Monitoring)

All network wells were successfully sampled as scheduled during the quarter. The next scheduled sampling is November 2016.

The dangerous waste constituent cyanide concentrations declined from 1,060 µg/L to 893 µg/L at well 299-E33-47 between May and August 2016. This plume is believed to be sourced from the 241-B Tank Farm as discussed in DOE/RL-2012-53, *Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area B-BX-BY*. This plume is interpreted to extend to beyond 230 m (754.6 ft) to the southeast through well 299-E33-361 (Figure 11). Another cyanide source is also believed to be located in the 241-BX Tank Farm. This plume is believed to extend through well 299-E33-337. The concentrations at well 299-E33-337 increased from 249 µg/L to 322 µg/L between May and August 2016. The cleanup standard for cyanide was recently calculated at 4.8 µg/L. The low value pertains to the presence of possible free cyanide. Previously, free cyanide was found in the groundwater associated with the BY Cribs as discussed in DOE/RL-92-70, *Phase I Remedial Investigation Report for 200-BP-1 Operable Unit.*

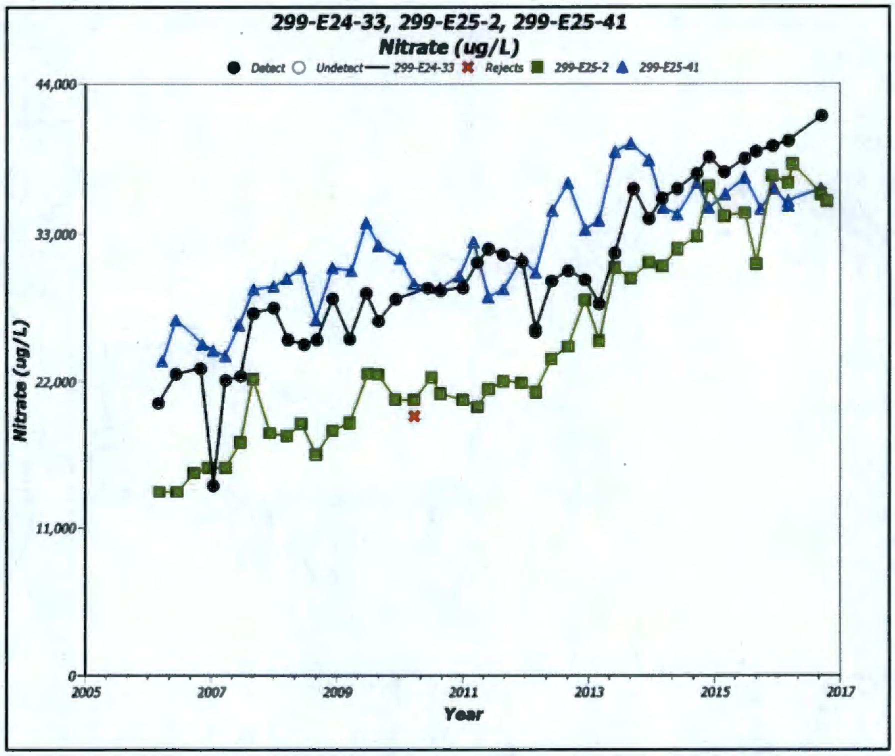

Figure 9. Nitrate in Wells 299-E24-33, 299-E25-41, and 299-E25-2

Figure 10. Nitrate in Wells 299-E24-20 and 299-E25-93

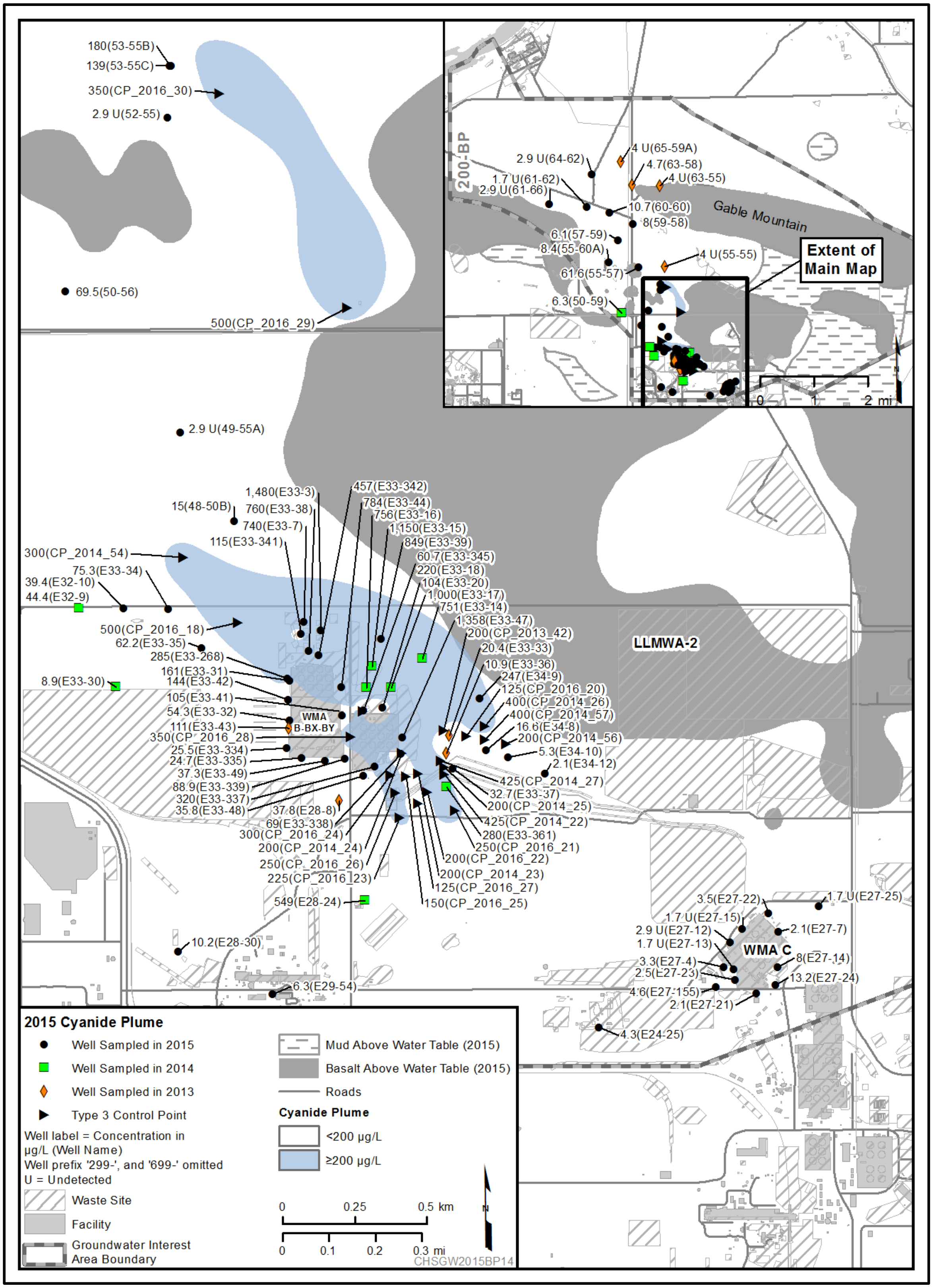

Figure 11. 200-BP Cyanide Plume, 2015

5.3 SST WMA C (Interim Status, Assessment Monitoring)

All WMA C wells were successfully sampled as scheduled in September, except well 299-E27-4. Advanced casing corrosion was discovered inside well 299-E27-4 in April 2016. The corrosion extended from 10 to 12.2 m (33 to 40 ft) below ground surface within the well. SGW-59914, *WMA C January through March 2016 Quarterly Groundwater Monitoring Report*, further discusses the corrosion associated with this well. Appendix B of SGW-60494, *WMA C July through September 2016 Quarterly Groundwater Monitoring Report*, provides all 1,231 analytical results derived from the September 2016 sampling event. The next scheduled sampling event is December 2016.

As required by 40 CFR 265.94(d)(4), "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," a groundwater flow rate was derived from past hydraulic tests and ongoing groundwater gradient evaluations for determining the rate of migration of the dangerous waste constituent cyanide. Based on the discussion in Section 3.1 of SGW-60494, the cyanide migration rate is estimated at 0.35 m/day (1.15 ft/day). The average flow direction over the past year has been predominantly to the south-southeast. The estimated extent of cyanide is provided in Figure 12.

Well cleaning was completed in August and September of 2016 at wells 299-E27-12, 299-E27-13, 299-E27-14, 299-E27-15, 299-E27-22, 299-E27-24 and 299-E27-25. These wells had heavy encrustation of amorphous material on their well screens based on May 2016 video surveys. The wells were treated with sulfamic acid, scrubbed and purged before the September 2016 quarterly sampling event. Because of residual sulfamic acid in the wells treated during this quarter several of the results were flagged and those constituents will be reassessed next quarter.

5.4 SST WMA S-SX (Interim Status, Assessment Monitoring)

All network wells were sampled as scheduled in September. The next scheduled sampling is December 2016.

Nitrate declined to 42,500 μg/L, below the 45,000 μg/L cleanup level at 299-W22-93 (Figure 13). This well is adjacent to extraction well 299-W22-90 (downgradient from the S Tank Farm) which has a nitrate concentration of 25,700 μg/L. The concentration in the extraction well is lower due to concentration averaging, i.e., water of lower nitrate concentration from beneath the plume is being drawn into the extraction well.

5.5 SST WMA T (Interim Status, Assessment Monitoring)

Four wells were scheduled for sampling during the August 2016 event. Hexavalent chromium concentrations ranged from 20 to 39 μg/L. Concentrations continued to decrease in three wells (299-W11-40, 299-W11-42 and 299-W11-47) consistent with trending since about 2012. Hexavalent chromium concentrations in well 299-W11-41 increased from 14 μg/L to 30 μg/L, but is consistent with previous results and continued general decreasing trend. The next scheduled sampling event is November 2016.

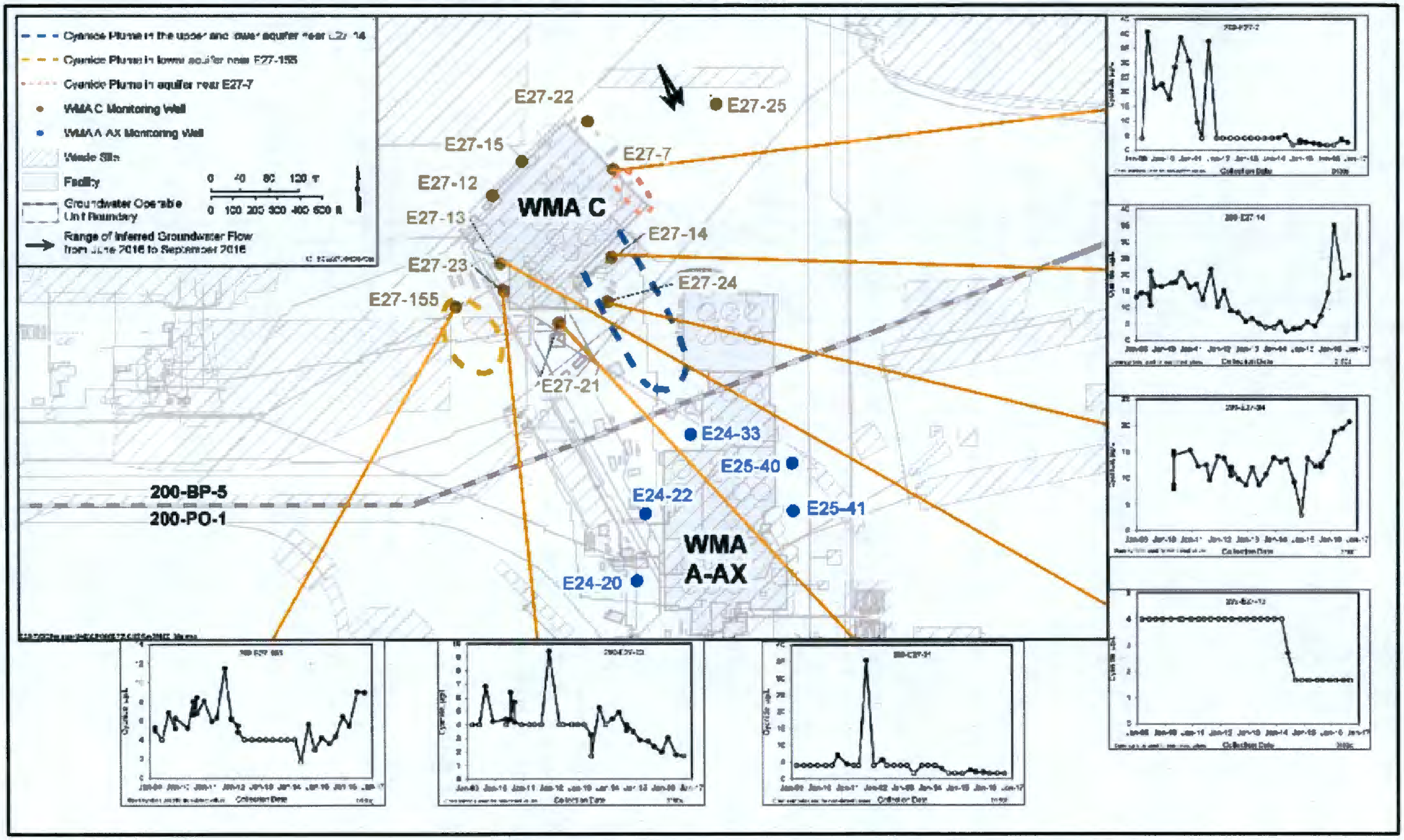

Figure 12. Interpretation of the 2 μg/L Cyanide Isopleth in the Upper 4 m and Lower 4 m of the Aquifer at Waste Management Area C and Cyanide Trend Results at Select WMA C Wells

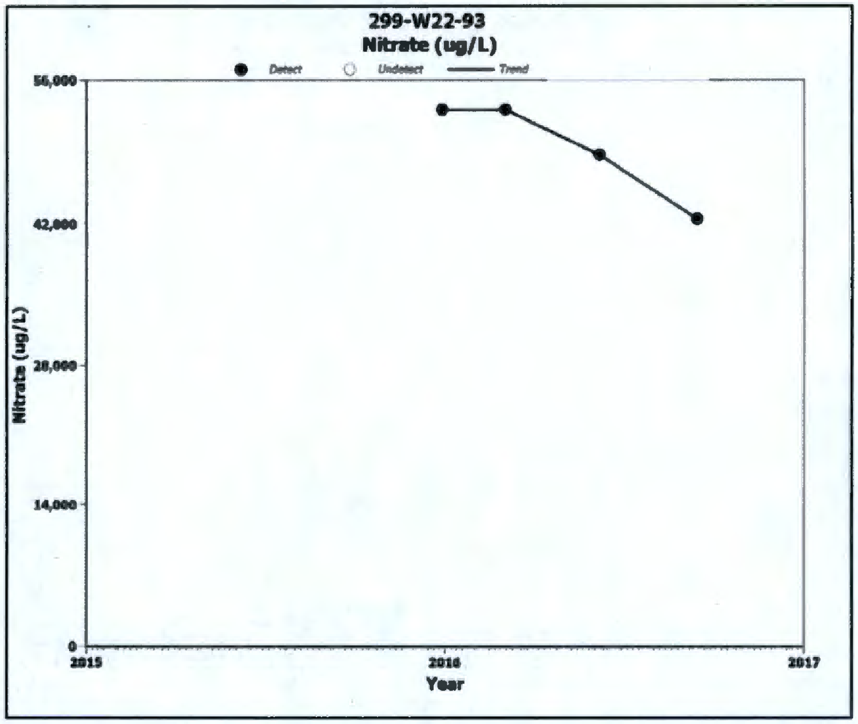

Figure 13. Nitrate in Well 299-W22-93

5.6 SST WMA TX-TY (Interim Status, Assessment Monitoring

Five wells were scheduled for sampling during August. Hexavalent chromium concentrations ranged from 23 to 53 µg/L and, for four of the five wells (299-W10-26, 299-W10-27, 299-W14-13, and 299-W14-15), varied little from the concentrations seen in May 2016 (Figures 14 and 15). Well 299-W14-18 decreased from a peak concentration of 68 µg/L in February 2016 to 53 µg/L in August 2016. The next scheduled sampling event is November 2016.

5.7 SST WMA U (Interim Status, Assessment Monitoring)

All three network wells were sampled as scheduled in July 2016. Field parameters and metals were loaded into HEIS, and all results were on trend. The next scheduled sampling is October 2016.

Chromium exhibits a slow increasing trend at 299-W19-45 (Figure 16). The July 10, 2016, sample results were 13.7 and 14.5 µg/L (filtered and unfiltered, respectively). Nickel has only been detected sporadically in unfiltered samples since 2011. Because of the lack of nickel, chromium concentrations in this well are interpreted to indicate contamination of the groundwater and not stainless steel corrosion.

6 Active Waste Management Areas

Six active WMAs are monitored to determine whether dangerous waste or dangerous waste constituents from the waste sites have entered the groundwater. Summary status and monitoring highlights of results by exception are provided for each area for the quarterly reporting period.

6.1 Integrated Disposal Facility (Final Status, Detection Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is January 2017.

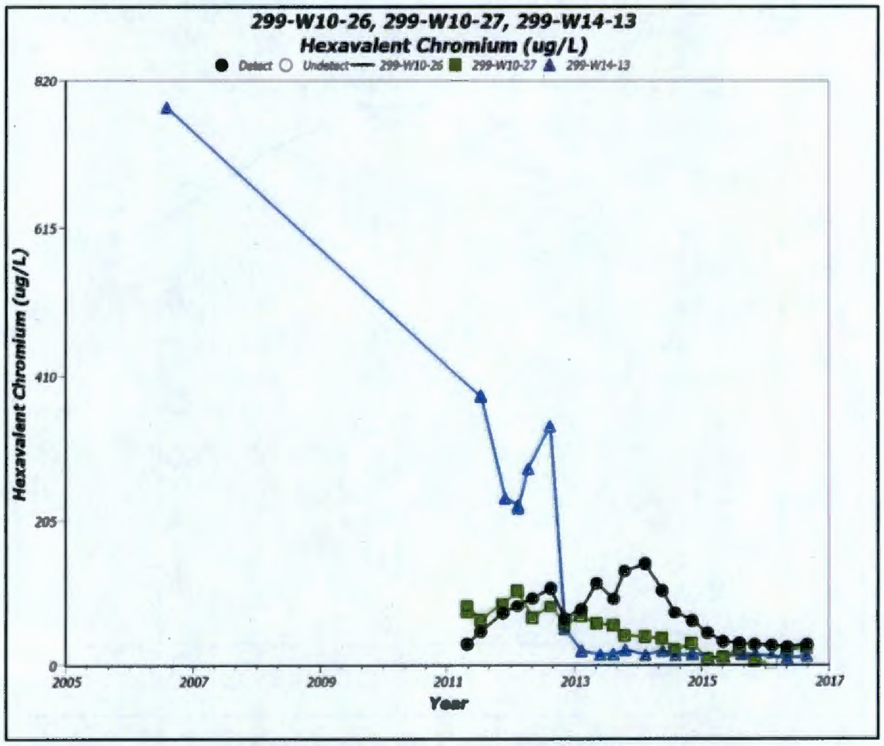

Figure 14. Hexavalent Chromium in Wells 299-W10-26, 299-W10-27, and 299-W14-13

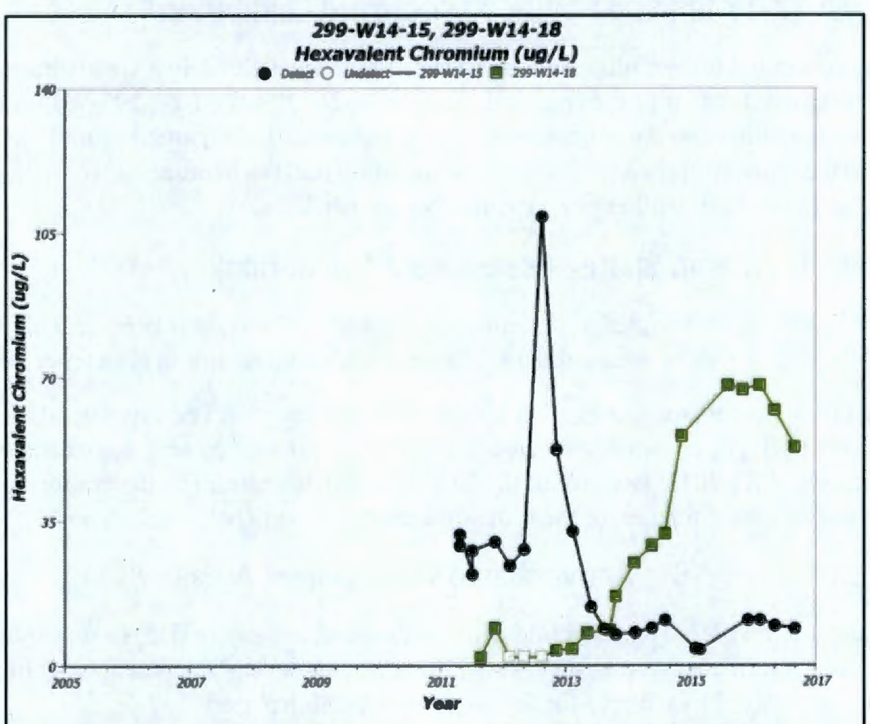

Figure 15. Hexavalent Chromium in Wells 299-W14-15 and 299-W14-18

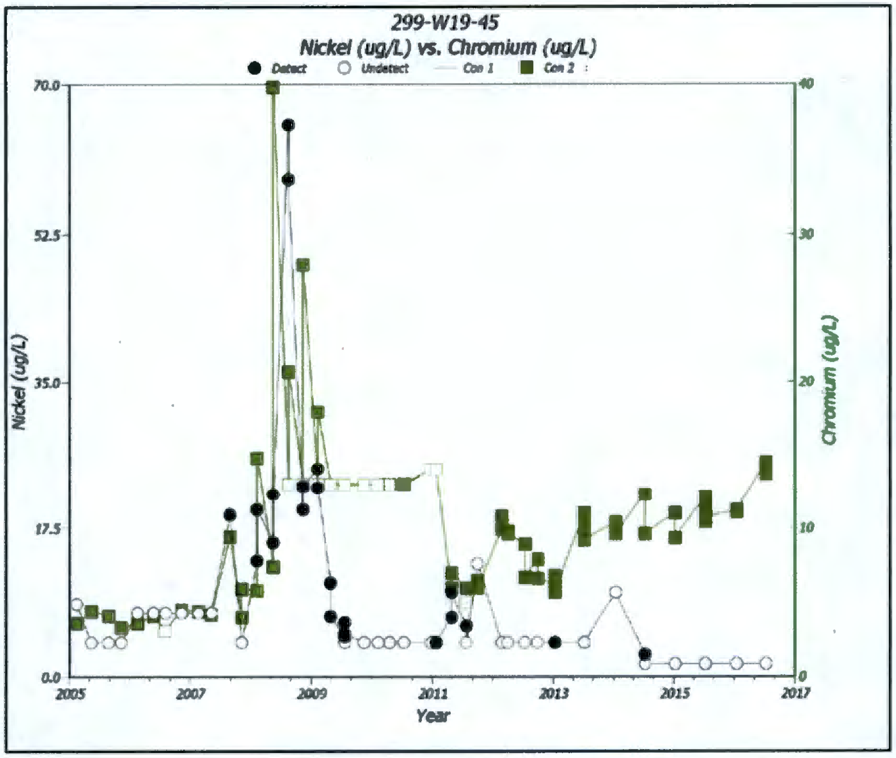

Figure 16. Chromium and Nickel in 299-W19-45

6.2 Liquid Effluent Retention Facility (Final Status, Detection Monitoring)

Semiannual sampling was successfully performed as scheduled in July. Field indicator parameter specific conductance for the new Liquid Effluent Retention Facility (LERF) well, 299-E26-15, exceeded the critical mean. CH2M HILL Plateau Remediation Company notified DOE on August 15, 2016, and DOE notified Ecology via 16-AMRP-0252, "Notification of Groundwater Sampling Results Exceeding Specific Conductance for the Liquid Effluent Retention Facility 2013 Monitoring Well Network Plan Per 40 CFR 365.93(2)(d)(1),"of the following:

- Exceedance of the critical mean for specific conductance at well 299-E26-15
- Plan to evaluate whether a demonstration under WAC 173-303-645(9)(g)(vi), "Dangerous Waste Regulations," "Releases from Regulated Units," could be made showing the exceedance was not associated with LERF
- An application for a permit modification for the detection monitoring program was needed within 90 days

Verification sampling was collected on August 22, 2016, to determine if an analytical error may have occurred. Verification sample results were received from field instruments, and two laboratories, GEL and TASL. Results indicate that initial July field measurements were possibly in error. Because quadruplicate results were not ordered for the initial verification sampling event, an additional verification sampling event was completed September 13, 2016. The September results were again below the LERF critical mean comparison value for specific conductance. As a result of the two verification sampling events, the LERF critical mean comparison value for specific conductance was not considered to have been exceeded (Table 6).

Table 6. LERF Indicator Parameter Summary and Verification Results

Well Name	Month Sampled	pH	SC	TOC	TOX	Cr+6	CCL_4
299-E26-14	07/13/2016	7.97	799	1,525	6.15	1.5 U	0.18 U
299-E26-15	07/20/2016	7.73	834	808	4.41	1.5 U	0.3 U
299-E26-77	07/13/2016	7.76	953	N/A	N/A	N/A	N/A
299-E26-79	07/13/2016	7.86	742	988.5	3.33 U	1.5 U	0.3 U
299-E26-15 Field verification	08/22/2016	NA	821.5	N/A	N/A	N/A	N/A
299-E26-15 Gel Verification	08/22/2016	N/A	799	N/A	N/A	N/A	N/A
299-E26-15 TASL Verification	08/22/2016	N/A	826	N/A	N/A	N/A	N/A
299-E26-15 Field verification	09/13/2016	N/A	831	N/A	N/A	N/A	N/A
299-E26-15 Gel Verification	09/13/2016	N/A	814	N/A	N/A	N/A	N/A
299-E26-15 TASL Verification	09/13/2016	N/A	831	N/A	N/A	N/A	N/A
Critical Mean	Low	7.66	N/A	N/A	N/A	N/A	N/A
	High	8.12	832	4,509	10.54	N/A	N/A

GEL = GEL Laboratories
LERF = Liquid Effluent Retention Facility
NA = not applicable
TASL = TestAmerica St. Louis
TOC = total organic carbon
TOX = total organic halides
U = undetected

DOE/RL-2016-71, *Demonstration of Other Source or Natural Variation Causing Elevated Specific Conductance in Groundwater at the Liquid Effluent Retention Facility (LERF) Point of Compliance*, report was written and transmitted to DOE. Based on verification sampling and analysis results, and the upgradient groundwater source of elevated specific conductance, DOE believed it was successfully demonstrated that LERF did not cause a critical mean exceedance at well 299-E26-15. DOE also provided a modified groundwater monitoring plan with appropriate changes necessary for successful future detection monitoring at LERF, and recommended no change in current groundwater monitoring until the modified groundwater monitoring plan is implemented. The next scheduled sampling event is January 2017.

6.3 LLWMA-1 (Interim Status, Detection Monitoring)

All wells in low-level waste management area (LLWMA)-1 were sampled as scheduled during the quarter and results were within or below the comparison values. A first revision of DOE/RL-2009-75, *Interim Status Groundwater Monitoring Plan for the LLBG WMA-1* was released in August 2016 to reflect a change in the groundwater flow direction. The next scheduled semiannual sampling is January 2017.

6.4 LLWMA-2 (Interim Status, Detection Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is October 2016.

6.5 LLWMA-3 (Interim Status, Detection Monitoring)

All four wells were successfully sampled in September as scheduled. Partial field parameter results were loaded into HEIS in September. The next scheduled sampling event is January 2017.

Based on results received in October 2016, the average specific conductance in downgradient well 299-W10-31 (493 µS/cm) exceeded the upgradient-based critical mean value (479 µS/cm) in September. TOX concentrations in well 299-W10-31 exceeded the critical mean value (10.96 µg/L) with average concentrations of 15.5 and 17.1 µg/L in March and September, respectively.

The elevated specific conductance in well 299-W10-31 is presumed to be from increasing nitrate concentration associated with the migration of a regional nitrate plume. The elevated TOX concentrations are consistent with observed levels of carbon tetrachloride in the area (SGW-59713-VA, *LLWMA-3 Groundwater Monitoring: 299-W10-31 Specific Conductance and TOX,* and SGW-61120, *Meeting Notes – Briefing to Ecology on LLWMA-3 RCRA Groundwater Monitoring).* Nitrate and carbon tetrachloride concentrations in downgradient well 299-W10-31 were 44.3 mg/L and 17 µg/L in 2016, respectively.

TOX concentrations in well 299-W10-29 also exceeded the critical mean value with an average concentration of 12.9 µg/L in September; however, the results were below the laboratory LOQ of 25.7 µg/L.

6.6 LLWMA-4 (Interim Status, Detection Monitoring)

Seven of the eight wells were successfully sampled in July as scheduled. Field parameter results were loaded into HEIS and were on trend with no exceedances of the critical mean. The next scheduled sampling event is January 2017.

Well 299-W18-21 was not able to be sampled via dedicated sampling pump, and was evaluated by well maintenance. The dedicated pump and piping were permanently removed from the casing. Future sampling will utilize bailing for sample collection.

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