Herrenkohl Consulting LLC

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May 12, 2017

Analiese Burns, PWS
Natural Resources Division
Public Works Department
City of Bellingham
2200 Nevada Street
Bellingham, WA 98229

Subject: 2017 Groundwater Characterization Report & Evaluation of Additional Sampling or Other Steps, Eldridge Municipal Landfill Compliance Monitoring, Bellingham, Washington

Dear Analiese:

This final letter report presents the results of the 2017 groundwater characterization completed in support of the Eldridge Municipal Landfill Site (Site) compliance monitoring located in Bellingham, Washington (Figure 1). It describes the field and analytical activities, site groundwater flow characteristics, presents the chemical analytical results with comparison to previous sampling results and compliance criteria, and evaluates the need for additional sampling or other steps. All fieldwork was conducted on March 7, 2017.

Herrenkohl Consulting LLC has written this letter report under Contract No. 2011-0142 (including modifications) with the City of Bellingham Public Works Department (City) and with direction from Ecology's Toxics Cleanup Program (Ecology). The compliance monitoring and this letter report have been prepared to satisfy the requirements of the Site Consent Decree (No. 152024091) between the City and Ecology filed by the Whatcom County Clerk on December 31, 2015.

Field Sampling Activities and Methods

This section describes the sampling activities conducted at the site as part of the compliance monitoring. Groundwater sampling was conducted in general accordance with the project sampling and analysis plan (SAP; Herrenkohl Consulting 2012) and addendum SAP (Herrenkohl Consulting 2016a). There were no deviations from the addendum SAP during the field program.

Groundwater Investigation

Groundwater levels for evaluating groundwater flow direction across the Site were measured at each well on March 7, 2017 during the groundwater sampling event. Each groundwater level was measured from a surveyed reference point (located on a marked edge of the top of the PVC well casing) to the top of the groundwater using a hand-held water level indicator. These measurements were recorded to the nearest 0.01 ft. Groundwater depth measurements are provided on the field forms in Attachment A.

Prior to sampling, each well was purged with a dedicated Teflon bailer (to provide surging action to remove residual formation material) and then using a peristaltic pump with dedicated Teflon-lined tubing. Field parameters, including pH, temperature, conductivity, dissolved oxygen (DO), oxidation/reduction potential (ORP), and turbidity were regularly measured and recorded during purging with the peristaltic pump. Purging was considered complete when these field parameters became stable as specified in the SAP.

Groundwater samples were collected using a peristaltic pump and dedicated Teflon-lined tubing into appropriate sample containers provided by the laboratory. In accordance with the addendum to the SAP, groundwater samples were analyzed for dissolved arsenic and iron following EPA Method 200.8. Groundwater for dissolved metals analysis was filtered in the laboratory using a 0.45-micron, disposable filter and preserved before analysis.

Investigation-Derived Waste

Investigation-derived waste was handled according to the addendum SAP. All decontamination and purge waters were allowed to re-infiltrate into the soils near the center of the landfill site (in the vicinity of station EML-SB-03).

Groundwater Flow

The following groundwater elevations were measured at the wells on March 7, 2017:

- EML-SB-01 → 36.02 ft
- EML-SB-02 → 34.88 ft
- EML-SB-03 → 34.76 ft
- EML-SB-04 → 36.30 ft

To evaluate the groundwater flow direction at the site, groundwater elevations were plotted on a Site map and contoured (Figure 2). As shown on the figure, Site groundwater flows to the southwest toward Bellingham Bay. This is similar to the groundwater flow measured at the Site in May 2012 and March 2016 (Herrenkohl Consulting and Integral Consulting 2015, Herrenkohl Consulting 2016b).

Chemical Results

This section identifies the constituents detected in groundwater and evaluates any exceedances based on compliance levels developed for the Site. A comparison to compliance levels and previous sampling data are summarized in Table 1. A summary of the data quality review that was conducted is also provided below with details in Attachment B. Laboratory data are provided in Attachment C.

Data Quality

Data quality was assessed by performing a data validation review on the analytical results. The data were validated using guidance and quality control criteria documented in the analytical methods, the SAP (Herrenkohl Consulting 2012), and the National Functional Guidelines for Inorganic Data Review (USEPA 2016). Groundwater samples were analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington.

The results reported by the laboratory were 100% complete for the groundwater analyses. No qualifications are recommended in the data set (refer to Attachment B).

Groundwater Testing Results

Groundwater results were compared to compliance levels protective of groundwater and surface water (Table 1). Dissolved arsenic was below corresponding compliance levels in 2017, similar to concentrations reported in 2016. Additionally, arsenic concentrations within the Site boundary for both monitoring years were considerably lower than results reported in the May 2012 sampling event (Herrenkohl Consulting and Integral Consulting 2015).

Dissolved iron concentrations in wells EML-SB-01 (1,180 µg/L), -02 (867 µg/L), and -04 (906 µg/L) were elevated in comparison to the 2016 monitoring results and exceeded the compliance level of 300 µg/L. Concentrations for EML-SB-01 and EML-SB-02 were similar to the dissolved iron concentration in the upgradient well EML-SB-04. However, the dissolved iron concentration detected in at EML-SB-03 (25.7 µg/L), located in the middle of the former landfill footprint, was only slightly above the laboratory detection limit of 20 µg/L, similar in concentration to the 2016 result, and well below the upgradient well concentration and compliance level.

Conclusions

In the May 2012 groundwater sampling event, dissolved iron was elevated in the three wells (EML-SB-01, -02, -03) completed in the footprint of the former landfill with respect to the upgradient well (EML-SB-04). The dissolved iron concentrations in all four wells were also above the compliance level of 300 µg/L. At that time, it was thought these results may indicate a residual impact from the former landfill, a variation in subsurface geochemical conditions unrelated to the landfill, or a variation in natural geochemical

conditions related to the new pit run fill or surface soil amendments placed to help with revegetation.

The previous sampling in May 2012 also showed an elevated arsenic detection in one well (EML-SB-03) completed in the footprint of the former landfill with respect to the upgradient well and compliance level of 5 µg/L. The other wells (EML-SB-01 and -02) had arsenic concentrations below the compliance level and also slightly lower than the upgradient well. These contradictory data were thought to represent an artifact related to sampling methods for EML-SB-03, a residual impact from the former landfill, or a natural or recent geochemical variation in the uppermost water-bearing zone (as described above).

For dissolved arsenic, concentrations in the March 2016 and March 2017 sampling events were observed to be below the compliance level and lower than concentrations reported in the May 2012 sampling event. These most recent groundwater results suggest that previous results were likely a residual impact from the former landfill or temporary variation in natural geochemical conditions at the Site.

For dissolved iron, concentrations in the March 2016 sampling event were observed to be below the compliance level and concentrations reported in the May 2012 sampling event. However, in the March 2017 sampling event, dissolved iron concentrations in wells EML-SB-01, -02, and the upgradient well EML-SB-04 were above the compliance level but lower than reported concentrations in May 2012. The varying dissolved iron concentrations in site wells and the upgradient well during the last two monitoring years indicates a variation in subsurface geochemical conditions unrelated to the landfill.

The two years of groundwater monitoring fulfills the requirements of the Consent Decree for the Site. Based on the monitoring results and conclusions above, there should be no reason or requirement to continue Site groundwater monitoring into the future.

Please let me know if you have any questions about the contents of this letter report. As always, it has been a pleasure working with the City and Ecology on this project.

Sincerely,
HERRENKOHL CONSULTING LLC

Mark J. Herrenkohl, LEG
Principal Manager

Enc.: Table 1. Summary of Groundwater Sample Results
Figure 1. Site and Vicinity Map
Figure 2. Groundwater Surface Map, March 2017
Attachments A-C

References

EPA. 2016. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. EPA-540/R-2016-001. U.S. Environmental Protection Agency. Office of Superfund Remediation and Technology Innovation (OSRTI). Washington, D.C. September.

Herrenkohl Consulting. 2012. Sampling and Analysis Plan, Groundwater Site Characterization, Eldridge Municipal Landfill RI/FS. Prepared for the City of Bellingham, Public Works Dept. Prepared by Herrenkohl Consulting LLC of Bellingham, WA. April 27.

Herrenkohl Consulting. 2016a. Addendum to the Sampling and Analysis Plan, Groundwater Site Characterization, Eldridge Municipal Landfill RI/FS. Prepared for the City of Bellingham, Public Works Dept. Prepared by Herrenkohl Consulting LLC of Lopez Island, WA. February 23.

Herrenkohl Consulting. 2016b. 2016 Groundwater Characterization Report, Eldridge Municipal Landfill RI/FS. Prepared for the City of Bellingham, Public Works Dept. Prepared by Herrenkohl Consulting LLC of Lopez Island, WA. May 17.

Herrenkohl Consulting and Integral Consulting. 2015. Final Remedial Investigation/Feasibility Study Report, Eldridge Municipal Landfill. Prepared for the City of Bellingham, Washington. Prepared by Herrenkohl Consulting LLC of Bellingham, Washington and Integral Consulting Inc. of Seattle, Washington. December.

Table 1. Summary of Groundwater Sample Results

Sampling Date →		Compliance Level		EML-SB-01			EML-SB-02			EML-SB-03			EML-SB-04		
				5/29/2012	3/7/2016	3/7/2017	5/29/2012	3/7/2016	3/7/2017	5/29/2012	3/7/2016	3/7/2017	5/29/2012	3/7/2016	3/7/2017
Arsenic	ug/L	5	Background[a]	1.6	0.4	0.614	1.2	0.7	1.03	**14.7**	0.4	0.372	1.9	0.7	1.48
Iron	ug/L	300	Secondary MCL	**4350**	40	**1180**	**4770**	260	**867**	**6610**	20 U	25.7	**4140**	220	**906**
pH	Units	--		6.30	10.32[b]	6.69	6.06	10.96[b]	6.87	6.07	11.19[b]	6.57	5.91	10.68[b]	6.11
Temp	C	--		10.36	9.84	9.0	11.00	8.37	6.3	13.65	8.01	5.7	11.95	8.69	6.6
Conductivity	mS/cm	--		0.309	0.316	0.2122	0.655	0.374	0.1956	0.504	0.347	0.1783	0.462	0.351	0.2097
DO	mg/L	--		0.41	0	0.43	0.36	0	0.36	0.34	1.57	2.02	0.40	7.25	0.85
Turbidity	NTU or g/L*	--		0	170	0.1989*	0	88.4	0.1976*	0	19.8	0.1833*	0	119	0.2106*
ORP	mV	--		--	-73	30.7	--	-39	18.2	--	55	50.2	--	-21	64.9

Notes:
Results are reported as dissolved metals.
Boldface indicates a result exceeding the applicable compliance level.

[a] The natural background concentration of arsenic in groundwater for the State of Washington is 5 µg/L (MTCA Table 720-1, footnote b)

[b] pH measurements in March 7, 2016 were consistently elevated while purging the groundwater monitoring wells due to a faulty pH sensor or meter calibration problem.

U - undetected result; associated value is method detection limit
C - Celsius
mS/cm - milli Siemens per centimeter
ug/L - micrograms per liter
NTU - nephelometric turbidity units
g/L - grams per liter
mV - millivolts

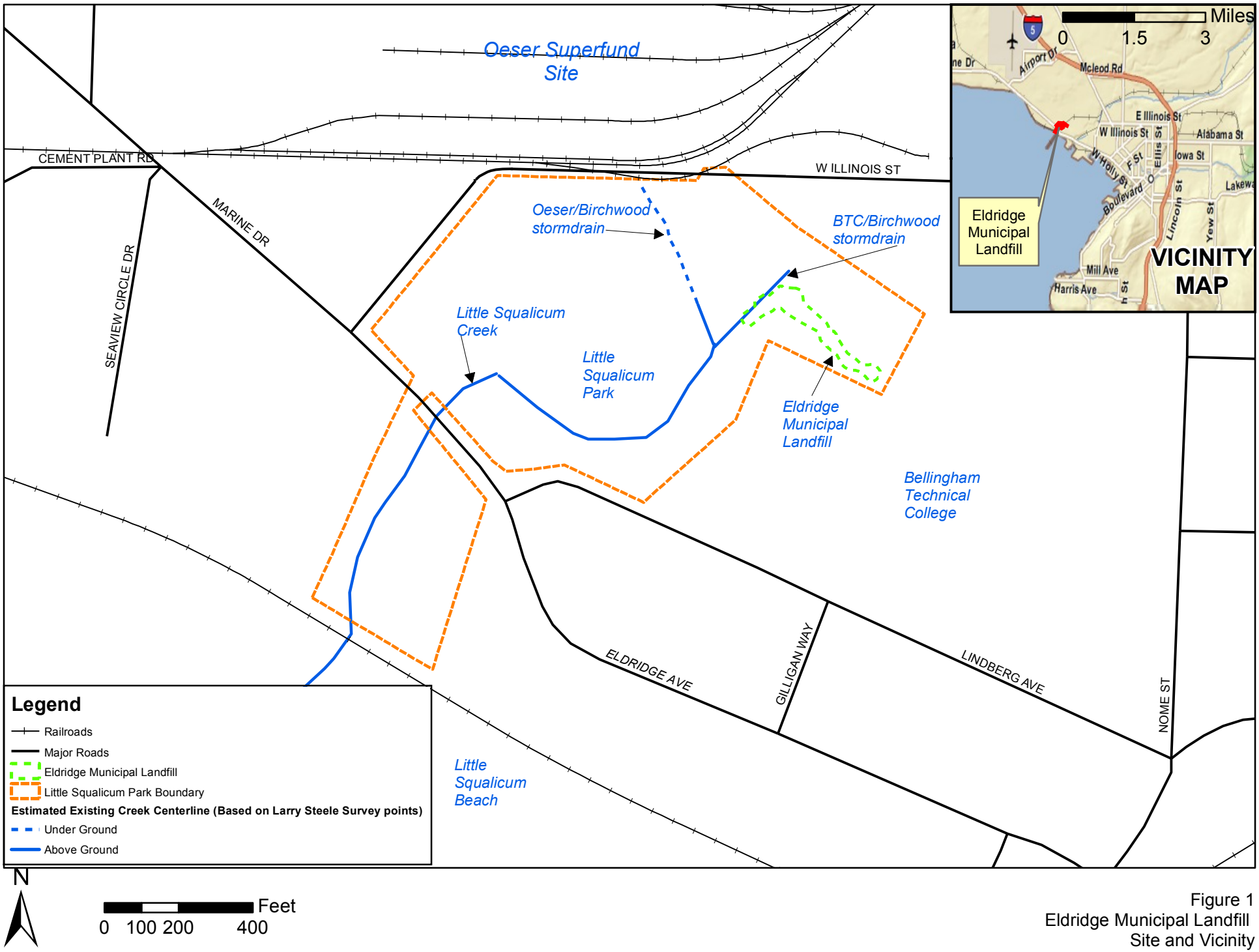


Figure 1
Eldridge Municipal Landfill
Site and Vicinity
Bellingham, WA

NO.	REVISIONS	BY	DATE

PROPERTY LINE

NOTES:

1. RECONSTRUCTED WETLAND PLANTED IN ACCORDANCE WITH THE WETLAND MITIGATION PLAN SHEET C7.1.
2. OUTSIDE OF THE RECONSTRUCTED WETLAND, ALL DISTURBED AREAS GRADED AND HYDROSEEDED.
3. A FEASIBLE ALTERNATIVE EXCAVATION METHOD FOR USE ADJACENT TO STEEPER SLOPES WOULD BE TO EXCAVATE THE LANDFILL IN ALTERNATING SLOTS, 10–15 FEET WIDE, LEAVING SOIL IN BETWEEN AS A BUTTRESS. AFTER BACKFILLING EACH SLOT WITH CLEAN SOIL, THE REMAINING SLOTS OF IMPACTED SOIL CAN BE EXCAVATED TO COMPLETE THE CLEANUP. IF EMPLOYING THIS EXCAVATION METHOD, THE CONTRACTOR SHALL NOTIFY THE OWNER TO ENSURE THAT ALL COMPLIANCE SAMPLING IS COMPLETED IN ACCORDANCE WITH THE CLEANUP PLAN.

NEW LIMESTONE TRAIL;

EXIST. SDMH #2709
RIM= 41.12
E 36" INV= 36.23
W 36" INV= 36.23

EXIST. SDMH #2016
RIM= 49.44
W 36" INV= 45.44

EXIST. CONTECH FILTER VAULT
RIM= 47.7±

EXIST. CONTECH FILTER VAULT
RIM= 47.8±

EXIST. SDMH #2002
RIM= 39.22
E 36" INV= 34.47
S 36" INV= 34.45

STRAW BALES (TYP)

EXIST. 36" SD

EXIST. 36" PVC
INV= 33.46

BTC/BIRCHWOOD STORM CHANNEL

RECONSTRUCTED WETLAND "B"

WETLAND 'A' 960 SF

SITE EVENLY GRADED TO ENSURE POSITIVE DRAINAGE WITH NO CONCENTRATED FLOW PATHS

36.30
EML-SB-04

36.0

36.02
EML-SB-01

35.5

35.0

34.88
EML-SB-02

EML-SB-03
34.76

SET HUB @ ℄

NEW GRADES MATCH EXISTING GRADES ALONG LIMITS OF WORK AREA (TYP.)

FINISH GRADE CONTOUR (TYP)

ORIGINAL SITE BOUNDARY

TOP OF EXCAVATION CUT SLOPE DURING LANDFILL REMOVAL

EML-SB-05

SET HUB @ ℄

TOP OF EXCAVATION CUT SLOPE DURING LANDFILL REMOVAL

EXCAVATED & STOCKPILED ON-SITE (6,000 SF)

N

SCALE 20 0 20 40 FEET
HORIZONTAL SCALE

Soil Boring / Monitoring Well Location

35.0 INFERRED GROUNDWATER ELEVATION CONTOURS (0.5 FOOT INTERVALS)

INFERRED GROUNDWATER FLOW DIRECTION

36.02 MEASURED GROUNDWATER ELEVATION (MARCH 2017)

CITY OF BELLINGHAM PROJECT NAME & NUMBER
ELDRIDGE MUNICIPAL LANDFILL INTERIM ACTION
PROJECT NO. EC-0015

WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

Wilson SURVEY/ENGINEERING

ELIZABETH ANNE STERLING — STATE OF WASHINGTON — 41548 — REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY	DRAWN BY	CHECKED BY
EAS	JGS/BAH/RDN	

CITY OF BELLINGHAM
BELLINGHAM WASHINGTON
ELDRIDGE MUNICIPAL LANDFILL
GROUNDWATER SURFACE MAP, MARCH 2017

DATE	SCALE	JOB NUMBER
APRIL 2017	AS SHOWN	2014-016

SHEET FIG 2 OF -

ATTACHMENT A
FIELD LOGS

GROUNDWATER SAMPLE COLLECTION FORM

Well No. EMW-SB-01 Project Name Eldridge Landfill
Sample No. GW Project No. HCL041
Date 3/7/17 Collector HERRENKOHL

Well Information

Monument Condition: ✓ Good ___ Needs Repair _____
Well Cap Condition: ✓ Good ✓ Locked ___ Replaced ___ Needs Replacement
Elevation Mark: ✓ Yes ___ Added ___ Other
Well Diameter: ✓ 2-inch ___ 4-inch ___ 6-inch ___ Other
NO Odor? Comments: Windy

Purge Data

Total Well Depth 11 ft ___ Clean Bottom ✓ Muddy Bottom ___ Not Measured
Depth to Water 1.51 ft
Casing Volume 9.5 ft (H2O) X 0.16 gpf = 1.5 X 3 = 4.6 gallons (5 gallons Bailed)
3/4" = 0.02 gpf 1" = 0.04 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

Purge Method

Pump Type: Peristaltic Tubing: Teflon-lined Total Volume Purged: 8 gallons
Sample Intake Depth: 6 ft Purge Rate: 1 gal/5 min
Purge Start Time: 1030* Purge Stop Time: 1200 Sample Rate: ½ gal/5min

Field Parameters * Bailed then purged

Time	Gallons	pH	Temp °C	Cond µs/cm	DO	Turb g/L	ORP
1130	5	7.53	8.5	212.0	3.87	0.2000	25.0
1137	6	6.93	8.8	213.8	0.80	0.2000	29.5
1142	7	6.76	8.9	212.2	0.56	0.1999	31.2
1147	8	6.69	9.0	212.2	0.43	0.1989	30.7

Comments: Water quality clear

Sampling Device

Filter Type: — Device: —

Sample Containers Collection Time: 1200

Bottle Type	Preservative	Analytical Method
500mL HPPE	NONE	Dissolved As+Fe
		(Filter in Lab)

GROUNDWATER SAMPLE COLLECTION FORM

Well No. EML-SB-02 Project Name Eldridge Landfill
Sample No. DW Project No. 1TCL041
Date 3/7/17 Collector HERRENKOHL

Well Information

Monument Condition: ✓ Good ___ Needs Repair _____
Well Cap Condition: ✓ Good ✓ Locked ___ Replaced ___ Needs Replacement
Elevation Mark: ✓ Yes ___ Added ___ Other
Well Diameter: ✓ 2-inch ___ 4-inch ___ 6-inch ___ Other
NO Odor? Comments: Breezy

Purge Data

Total Well Depth 11.5 ft ___ Clean Bottom ___ Muddy Bottom ___ Not Measured
Depth to Water 2.65 ft
Casing Volume 8.85 ft (H2O) X 0.16 gpf = 1.42 X 3 = 4.3 gallons (4.5 gal Bailed)
3/4" = 0.02 gpf 1" = 0.04 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

Purge Method

Pump Type: Peristaltic Tubing: Teflon-lined Total Volume Purged: 6.5
Sample Intake Depth: 5.5 ft Purge Rate: 1 gal/5 min
Purge Start Time: 1100 * Purge Stop Time: 1220 Sample Rate: ½ gal/5 min

Field Parameters * Bailed earlier, then purged w/ Peristaltic pump

Time	Gallons	pH	Temp °C	Cond	DO	Turb	ORP
1208	4.5	6.90	6.2	185.9	0.86	0.1885	14.2
1213	5.5	6.88	6.2	191.2	0.48	0.1943	19.5
1218	10.5	6.87	6.3	195.6	0.36	0.1976	18.2

Comments: Water quality clear

Sampling Device

Filter Type: ~~Peristaltic~~ Device: —

Sample Containers Collection Time: 1220

Bottle Type	Preservative	Analytical Method
500mL HDPE	NONE	DISSOLVED As+Fe
		(filter in lab)

GROUNDWATER SAMPLE COLLECTION FORM

Well No. EML-SB-03 Project Name Eldridge Landfill
Sample No. GW Project No. HCL041
Date 3/7/17 Collector HERRENKOHL

Well Information

Monument Condition: ✓ Good ___ Needs Repair _____
Well Cap Condition: ✓ Good ✓ Locked ___ Replaced ___ Needs Replacement
Elevation Mark: ✓ Yes ___ Added ___ Other
Well Diameter: ✓ 2-inch ___ 4-inch ___ 6-inch ___ Other
No Odor? Comments: Windy/RAIN

Purge Data

Total Well Depth 11.5 ft ___ Clean Bottom ✓ Muddy Bottom ___ Not Measured
Depth to Water 4.32 ft
Casing Volume 7.18 ft (H2O) X 0.16 gpf = 1.15 X 3 = 3.5 gallons (4 gallons Bailed)
3/4" = 0.02 gpf 1" = 0.04 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

Purge Method

Pump Type: Peristaltic Tubing: Teflon-lined Total Volume Purged: 7 gallons
Sample Intake Depth: ~7 ft Purge Rate: ~1 gal/5 min
Purge Start Time: 1300 Purge Stop Time: 1341 Sample Rate: ~½ gal/5 min

Field Parameters

Time	Gallons	pH	Temp °C	Cond µS/cm	DO	Turb	ORP (MV)
1326	4	7.07	5.6	178.0	4.84	0.1833	20.8
1331	5	6.78	5.6	177.5	2.67	0.1833	37.9
1336	6	6.62	5.7	177.5	2.03	0.1826	46.7
1341	7	6.57	5.7	178.3	2.02	0.1833	50.2

Comments: Water quality stabalized after 7 gallons purged from well. Color of water slightly tan/brown.

Sampling Device

Filter Type: _____ Device: _____

Sample Containers Collection Time: 1345

Bottle Type	Preservative	Analytical Method
500 mL HDPE	NONE	Dissolved As + Fe (filtered in Lab)

GROUNDWATER SAMPLE COLLECTION FORM

Well No. EML-SB-04 | Project Name Eldridge Landfill
Sample No. GW | Project No. HCL041
Date 3/7/17 | Collector HERRENKOHL

Well Information

Monument Condition: ✓ Good ___ Needs Repair ___
Well Cap Condition: ✓ Good ✓ Locked ___ Replaced ___ Needs Replacement
Elevation Mark: ✓ Yes ___ Added ___ Other
Well Diameter: ✓ 2-inch ___ 4-inch ___ 6-inch ___ Other
NO Odor? Comments: Water in monument (slight sulfur odor during bailing)

Purge Data

Total Well Depth 7.5 ft ___ Clean Bottom ✓ Muddy Bottom ___ Not Measured
Depth to Water 2.54 ft
Casing Volume 4.96 ft (H2O) X 0.16 gpf = 0.8 X 3 = 2.4 gallons (Bailed 4 gal)
3/4" = 0.02 gpf 1" = 0.04 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

Purge Method

Pump Type: Peristaltic Tubing: Teflon-lined Total Volume Purged: 7 gallons
Sample Intake Depth: ~4 ft Purge Rate: ~1 gal/5 minutes
Purge Start Time: 1400 Purge Stop Time: 1435 ~½ gal/5 min Sample Rate: ½ gal/min.

Field Parameters

Time	Gallons	pH	Temp °C	Cond µS/cm	DO mg/L	Turb	ORP mV
1420	4	6.53	6.6	209.8	3.44	0.2100	74.0
1425	5	6.19	6.6	214.0	1.19	0.2139	68.8
1430	6	6.12	6.6	210.0	0.87	0.2100	65.5
✓ 1435	7	6.11	6.6	209.7	0.85	0.2106	64.9

Comments: Water quality stabilized after ~3 gallons of water was purged (after 4 gallons Bailed/purged)

Sampling Device

Filter Type: — Device: —

Sample Containers

Collection Time: 1435

Bottle Type	Preservative	Analytical Method
500 mL HDPE	NONE	Dissolved As + Fe (Filter in lab)

ATTACHMENT B
LABORATORY DATA VALIDATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; the Sampling and Analysis Plan (Herrenkohl Consulting 2012), and the National Functional Guidelines for Inorganic Data Review (USEPA 2016). Groundwater samples were analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Samples submitted to ARI were analyzed for the following:

Test	Method
Dissolved Arsenic and Iron	EPA 200.8

Sample data are presented in the sample delivery group (SDG) 17C0117. Summary data package is provided in Attachment C. The complete data package and electronic data deliverables (EDD) are available upon request (compact disk).

A partial data review was completed for all data packages which included review of the following:

- Data package completeness
- Analytical holding time and sample preservation
- Reporting limits
- Blank contamination
- Accuracy (compound recovery)
- Precision (replicate analyses)

Data Package Completeness

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the groundwater analyses. No qualifications are recommended in the data set.

Holding Time and Sample Preservation

The time between sample collection, extraction, and analysis was determined to be within method and project-specified holding times. No qualifications of the data are necessary.

The initial sample preservation requirement was met for all samples upon receipt by the laboratory.

Reporting Limits

Reporting limits were at or below target reporting limits for the project.

Blank Contamination

At least one method blank was analyzed with each batch of samples for each analysis. No contamination was detected in any of the method blanks.

Accuracy

Laboratory Control Sample Recoveries

Laboratory Control Sample (LCS) analyses were performed at the proper frequency for metals analyses. All spike recoveries reported by the laboratory for LSC analyses met the criteria for acceptable performance.

Precision

No laboratory duplicates were tested for SDG 17C0117.

References

EPA. 2016. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA-540/R-2016-001. U.S. Environmental Protection Agency. Office of Superfund Remediation and Technology Innovation (OSRTI). Washington, D.C. September.

Herrenkohl Consulting. 2012. Sampling and Analysis Plan, Eldridge Municipal Landfill RI/FS. Prepared for the City of Bellingham, Public Works Department, Bellingham, WA. Prepared by Herrenkohl Consulting LLC, Bellingham, WA.

ATTACHMENT C
LABORATORY DATA

Analytical Resources, Incorporated
Analytical Chemists and Consultants

20 March 2017

Mark Herrenkohl
Herrenkohl Consulting LLC.
321 Summerland Road
Bellingham, WA 98229

RE: Eldridge Landfill

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
17C0117	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the reqirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

Kelly Bottem, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Cert# 100006

PJLA Testing
Accreditation # 66169

4611 S. 134th Place, Suite 100 • Tukwila, WA 98168 • Ph: (206) 695-6200 • Fax: (206) 695-6202

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 17C0117	Turn-around Requested: Standard	Page: 1 of 1	
ARI Client Company: HERRENKOHL CONSULTING LLC	Phone: 360-319-0721	Date: 3/7/17	Ice Present?
Client Contact: MARK HERRENKOHL		No. of Coolers:	Cooler Temps:
Client Project Name: Eldridge Landfill			
Client Project #: HEL041	Samplers: HERRENKOHL, Mark		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Dissolved As, Fe	Notes/Comments
EML-SB-01	3/7/17	1200	Water	1	✓	ATTN: Cally Bottom
EML-SB-02	"	1220	"	1	✓	Samples Need filtering 0.45µ
EML-SB-03	"	1345	"	1	✓	
EML-SB-04	"	1435	"	1	✓	
					✓	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: MARK J. HERRENKOHL	Printed Name: Paul Mark	Printed Name:	Printed Name:
	Company: HERRENKOHL CONSULTING	Company: ARI	Company:	Company:
	Date & Time: 3/7/17 1530	Date & Time: 3/8/2017 ~~1535~~ 11:10	Date & Time:	Date & Time:

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Herrenkohl Consulting LLC

Project Name: Eldridge Landfill

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____
PM 3/7/2017

Assigned ARI Job No: 17C0117

Tracking No: 7858 3537 4564 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 0.3
Time: _____

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D005276

Cooler Accepted by: PM Date: 3/8/2017 Time: 11:10

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA		
Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____			

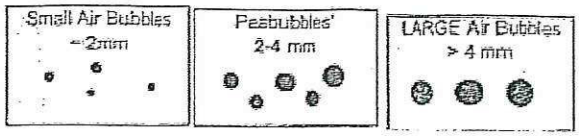
Samples Logged by: B.H. Date: 3/8/17 Time: 12:27

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm" (< 2 mm)	
Peabubbles → "pb" (2 to < 4 mm)	
Large → "lg" (4 to < 6 mm)	
Headspace → "hs" (> 6 mm)	

WORK ORDER

17C0117

Client: Herrenkohl Consulting LLC.	**Project Manager: Kelly Bottem**
Project: Eldridge Landfill	**Project Number: HCL041**

Preservation Confirmation

Container ID	Container Type	pH
17C0117-01 A	HDPE NM, 500 mL	> 2 Fail
17C0117-02 A	HDPE NM, 500 mL	> 2 Fail
17C0117-03 A	HDPE NM, 500 mL	> 2 Fail
17C0117-04 A	HDPE NM, 500 mL	> 2 Fail

B. H.
Preservation Confirmed By

3/8/17
Date

B. H.
Reviewed By

3/8/17
Date

Analytical Report

Herrenkohl Consulting LLC.	Project: Eldridge Landfill	
321 Summerland Road	Project Number: HCL041	**Reported:**
Bellingham WA, 98229	Project Manager: Mark Herrenkohl	20-Mar-2017 11:45

Case Narrative

Dissolved Metals - EPA Method 200.8

The sample(s) were digested and analyzed within the recommended holding times.

The samples were filtered and preserved in the lab.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The LCS percent recoveries were within control limits.

Analytical Resources, Incorporated

Internal Chain of Custody

Client:	Herrenkohl Consulting LLC.	Received:	08-Mar-2017 11:10
Project:	Eldridge Landfill	Received By:	Paul Mork
Number:	HCL041	Temp (°C):	0.30

17C0117-01 (EML-SB-01) Sampled 03/07/2017 12:00

Current Status	*Out*	*Location*	*In*
17C0117-01 A 01 [HDPE NM, 500 mL]			*Hazard Info:*
Metals	03/10/2017 11:24 by DP	Metals Prep Lab	by
	03/10/2017 11:24 by DP	Metals Prep Lab	by

17C0117-02 (EML-SB-02) Sampled 03/07/2017 12:20

Current Status	*Out*	*Location*	*In*
17C0117-02 A 01 [HDPE NM, 500 mL]			*Hazard Info:*
Metals	03/10/2017 11:24 by DP	Metals Prep Lab	by
	03/10/2017 11:24 by DP	Metals Prep Lab	by

17C0117-03 (EML-SB-03) Sampled 03/07/2017 13:45

Current Status	*Out*	*Location*	*In*
17C0117-03 A 01 [HDPE NM, 500 mL]			*Hazard Info:*
Metals	03/10/2017 11:24 by DP	Metals Prep Lab	by
	03/10/2017 11:24 by DP	Metals Prep Lab	by

17C0117-04 (EML-SB-04) Sampled 03/07/2017 14:35

Current Status	*Out*	*Location*	*In*
17C0117-04 A 01 [HDPE NM, 500 mL]			*Hazard Info:*
Metals	03/10/2017 11:24 by DP	Metals Prep Lab	by
	03/10/2017 11:24 by DP	Metals Prep Lab	by

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET

EML-SB-01

EPA 200.8
Dissolved Metals

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-01 File ID: XDT_m2170315-106

Sampled: 03/07/17 12:00 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:34

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron, Dissolved	1180	1	6.27	20.0	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 200.8 UCT-KED
Dissolved Metals

EML-SB-01

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-01 File ID: XDT_m2170315-106

Sampled: 03/07/17 12:00 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:34

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7440-38-2	Arsenic, Dissolved	0.614	1	0.0220	0.200	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET

EML-SB-02

EPA 200.8
Dissolved Metals

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-02 File ID: XDT_m2170315-107

Sampled: 03/07/17 12:20 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:39

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron, Dissolved	867	1	6.27	20.0	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 200.8 UCT-KED
Dissolved Metals

EML-SB-02

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-02 File ID: XDT_m2170315-107

Sampled: 03/07/17 12:20 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:39

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7440-38-2	Arsenic, Dissolved	1.03	1	0.0220	0.200	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET

EML-SB-03

EPA 200.8
Dissolved Metals

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-03 File ID: XDT_m2170315-108

Sampled: 03/07/17 13:45 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:44

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron, Dissolved	25.7	1	6.27	20.0	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 200.8 UCT-KED
Dissolved Metals

EML-SB-03

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-03 File ID: XDT_m2170315-108

Sampled: 03/07/17 13:45 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:44

Solids (wt%): 0.00 Preparation: REN_EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7440-38-2	Arsenic, Dissolved	0.372	1	0.0220	0.200	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET

EML-SB-04

EPA 200.8
Dissolved Metals

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-04 File ID: XDT_m2170315-109

Sampled: 03/07/17 14:35 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:48

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron, Dissolved	906	1	6.27	20.0	

Analytical Resources, Incorporated

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 200.8 UCT-KED
Dissolved Metals

EML-SB-04

Laboratory: Analytical Resources, Inc. Project: Eldridge Landfill

Client: Herrenkohl Consulting LLC. SDG: 17C0117

Matrix: Water Laboratory ID: 17C0117-04 File ID: XDT_m2170315-109

Sampled: 03/07/17 14:35 Prepared: 03/13/17 08:34 Analyzed: 03/15/17 18:48

Solids (wt%): 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Initial/Final: 25 mL / 25 mL

Batch: BFC0307 Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7440-38-2	Arsenic, Dissolved	1.48	1	0.0220	0.200	

PREPARATION BATCH SUMMARY

EPA 200.8

Laboratory: Analytical Resources, Inc. SDG: 17C0117

Client: Herrenkohl Consulting LLC. Project: Eldridge Landfill

Batch: BFC0307 Batch Matrix: Water Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
EML-SB-01	17C0117-01	XDT_m2170315-106	03/13/17 08:34	
EML-SB-02	17C0117-02	XDT_m2170315-107	03/13/17 08:34	
EML-SB-03	17C0117-03	XDT_m2170315-108	03/13/17 08:34	
EML-SB-04	17C0117-04	XDT_m2170315-109	03/13/17 08:34	
Blank	BFC0307-BLK1	XDT_m2170315-100	03/13/17 08:34	
LCS	BFC0307-BS1	XDT_m2170315-105	03/13/17 08:34	

PREPARATION BENCH SHEET

BFC0307

Matrix: Water **Prepared using: Metals - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Surrogate ID:

Lab Number	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	uL Spike	Surrogate	Comments
17C0117-01	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-01	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-02	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-02	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-03	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-03	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-04	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-04	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-17	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					

Spiking Witnessed By Date Preparation Reviewed By Date Extracts Received

PREPARATION BENCH SHEET

BFC0307

Matrix: Water **Prepared using: Metals - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Surrogate ID:

Lab Number	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	uL Spike	Surrogate	Comments
17C0137-17	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-17	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					Added for Batch
17C0137-21	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					Added for Batch
17C0137-21	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
BFC0307-BLK1	QC	13-Mar-2017 08:34	25	25					
BFC0307-BS1	QC	13-Mar-2017 08:34	25	25	E005546		25		
BFC0307-DUP1	QC	13-Mar-2017 08:34	25	25		17C0137-21			
BFC0307-MS1	QC	13-Mar-2017 08:34	25	25	E005546	17C0137-21	25		
BFC0307-MSD1	QC	13-Mar-2017 08:34	25	25	E005546	17C0137-21	25		

Checked 3/13/17 -MB

Spiking Witnessed By Date Preparation Reviewed By Date Extracts Received

PREPARATION BATCH SUMMARY

EPA 200.8 UCT-KED

Laboratory: Analytical Resources, Inc. SDG: 17C0117

Client: Herrenkohl Consulting LLC. Project: Eldridge Landfill

Batch: BFC0307 Batch Matrix: Water Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
EML-SB-01	17C0117-01	XDT_m2170315-106	03/13/17 08:34	
EML-SB-02	17C0117-02	XDT_m2170315-107	03/13/17 08:34	
EML-SB-03	17C0117-03	XDT_m2170315-108	03/13/17 08:34	
EML-SB-04	17C0117-04	XDT_m2170315-109	03/13/17 08:34	
Blank	BFC0307-BLK1	XDT_m2170315-100	03/13/17 08:34	
LCS	BFC0307-BS1	XDT_m2170315-105	03/13/17 08:34	

Analytical Resources, Incorporated
Analytical Chemists and Consultants

PREPARATION BENCH SHEET

BFC0307

Matrix: Water **Prepared using: Metals - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Surrogate ID:

Lab Number	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	uL Spike	Surrogate	Comments
17C0117-01	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-01	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-02	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-02	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-03	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-03	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0117-04	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0117-04	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-02	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-04	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-06	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					
17C0127-08	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-13	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-14	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-15	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-16	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-17	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					

Spiking Witnessed By Date Preparation Reviewed By Date Extracts Received

Analytical Resources, Incorporated
Analytical Chemists and Consultants

PREPARATION BENCH SHEET

BFC0307

Matrix: Water **Prepared using: Metals - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Surrogate ID:

Lab Number	Analysis	Prepared	Initial (mL)	Final (mL)	Spike ID	Source ID	uL Spike	Surrogate	Comments
17C0137-17	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-17	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-18	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-19	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-20	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Se UC	13-Mar-2017 08:34	25	25					Added for Batch
17C0137-21	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-21	Met Diss 200.8 - Tl	13-Mar-2017 08:34	25	25					Added for Batch
17C0137-21	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-22	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-23	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - Fe	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - Mn	13-Mar-2017 08:34	25	25					
17C0137-24	Met Diss 200.8 - As UC	13-Mar-2017 08:34	25	25					
BFC0307-BLK1	QC	13-Mar-2017 08:34	25	25					
BFC0307-BS1	QC	13-Mar-2017 08:34	25	25	E005546		25		
BFC0307-DUP1	QC	13-Mar-2017 08:34	25	25		17C0137-21			
BFC0307-MS1	QC	13-Mar-2017 08:34	25	25	E005546	17C0137-21	25		
BFC0307-MSD1	QC	13-Mar-2017 08:34	25	25	E005546	17C0137-21	25		

Checked 3/13/17 -MB

Spiking Witnessed By Date Preparation Reviewed By Date Extracts Received

Analytical Resources, Incorporated

Form I

METHOD BLANK DATA SHEET

EPA 200.8

Dissolved Metals

Blank

Batch: BFC0307 Laboratory ID: BFC0307-BLK1 Prepared: 03/13/17 08:34

Matrix: Water Preparation: REN EPA 600/4-79-020 4 Analyzed: 03/15/17 18:04

Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	ND	1	6.27	20.0	U

Analytical Resources, Incorporated

Form I

METHOD BLANK DATA SHEET

EPA 200.8 UCT-KED

Dissolved Metals

Blank

Batch: BFC0307 Laboratory ID: BFC0307-BLK1 Prepared: 03/13/17 08:34

Matrix: Water Preparation: REN EPA 600/4-79-020 4 Analyzed: 03/15/17 18:04

Sequence: SFC0199 Calibration: AC00039 Instrument: ICPMS2

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7440-38-2	Arsenic-75a	ND	1	0.0220	0.200	U

Analytical Resources, Incorporated

INSTRUMENT BLANKS
EPA 200.8

Laboratory: Analytical Resources, Inc.
SDG: 17C0117
Client: Herrenkohl Consulting LLC.
Project: Eldridge Landfill
Instrument ID: ICPMS2
Calibration: AC00039
Sequence: SFC0199
Date Analyzed: 03/15/17 10:16

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SFC0199-ICB1	Iron-54 (dissolved)	1.69	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-2.29	1.4	20.0	ug/L	
SFC0199-CCB1	Iron-54 (dissolved)	1.16	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-3.01	1.4	20.0	ug/L	
SFC0199-CCB2	Iron-54 (dissolved)	1.36	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-3.98	1.4	20.0	ug/L	
SFC0199-CCB3	Iron-54 (dissolved)	0.656	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-0.686	1.4	20.0	ug/L	
SFC0199-CCB4	Iron-54 (dissolved)	-1.98	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-1.92	1.4	20.0	ug/L	
SFC0199-CCB5	Iron-54 (dissolved)	-2.71	6.27	20.0	ug/L	
	Iron-57 (dissolved)	0.180	1.4	20.0	ug/L	
SFC0199-CCB6	Iron-54 (dissolved)	-1.75	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-4.34	1.4	20.0	ug/L	
SFC0199-CCB7	Iron-54 (dissolved)	-2.26	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-1.43	1.4	20.0	ug/L	
SFC0199-CCB8	Iron-54 (dissolved)	-2.44	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-3.80	1.4	20.0	ug/L	
SFC0199-CCB9	Iron-54 (dissolved)	-2.06	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-6.22	1.4	20.0	ug/L	
SFC0199-CCBA	Iron-54 (dissolved)	-3.53	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-3.56	1.4	20.0	ug/L	
SFC0199-CCBB	Iron-54 (dissolved)	-3.82	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-4.85	1.4	20.0	ug/L	
SFC0199-CCBC	Iron-54 (dissolved)	-2.37	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-4.56	1.4	20.0	ug/L	
SFC0199-CCBD	Iron-54 (dissolved)	-2.70	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-3.69	1.4	20.0	ug/L	
SFC0199-CCBE	Iron-54 (dissolved)	-3.77	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-6.35	1.4	20.0	ug/L	
SFC0199-CCBF	Iron-54 (dissolved)	-2.88	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-6.37	1.4	20.0	ug/L	
SFC0199-CCBG	Iron-54 (dissolved)	-2.91	6.27	20.0	ug/L	
	Iron-57 (dissolved)	-6.47	1.4	20.0	ug/L	

Analytical Resources, Incorporated

INSTRUMENT BLANKS
EPA 200.8 UCT-KED

Laboratory: Analytical Resources, Inc.
SDG: 17C0117
Client: Herrenkohl Consulting LLC.
Project: Eldridge Landfill
Instrument ID: ICPMS2
Calibration: AC00039
Sequence: SFC0199
Date Analyzed: 03/15/17 10:16

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SFC0199-ICB1	Arsenic-75a (dissolved)	-0.00700	0.022	0.200	ug/L	
SFC0199-CCB1	Arsenic-75a (dissolved)	-0.00300	0.022	0.200	ug/L	
SFC0199-CCB2	Arsenic-75a (dissolved)	0.00200	0.022	0.200	ug/L	
SFC0199-CCB3	Arsenic-75a (dissolved)	-0.00400	0.022	0.200	ug/L	
SFC0199-CCB4	Arsenic-75a (dissolved)	0.00300	0.022	0.200	ug/L	
SFC0199-CCB5	Arsenic-75a (dissolved)	-0.00400	0.022	0.200	ug/L	
SFC0199-CCB6	Arsenic-75a (dissolved)	0.00	0.022	0.200	ug/L	
SFC0199-CCB7	Arsenic-75a (dissolved)	0.00100	0.022	0.200	ug/L	
SFC0199-CCB8	Arsenic-75a (dissolved)	-0.00400	0.022	0.200	ug/L	
SFC0199-CCB9	Arsenic-75a (dissolved)	-0.00400	0.022	0.200	ug/L	
SFC0199-CCBA	Arsenic-75a (dissolved)	0.00	0.022	0.200	ug/L	
SFC0199-CCBB	Arsenic-75a (dissolved)	-0.00500	0.022	0.200	ug/L	
SFC0199-CCBC	Arsenic-75a (dissolved)	0.00100	0.022	0.200	ug/L	
SFC0199-CCBD	Arsenic-75a (dissolved)	-0.00500	0.022	0.200	ug/L	
SFC0199-CCBE	Arsenic-75a (dissolved)	-0.00400	0.022	0.200	ug/L	
SFC0199-CCBF	Arsenic-75a (dissolved)	-0.00500	0.022	0.200	ug/L	
SFC0199-CCBG	Arsenic-75a (dissolved)	-0.00300	0.022	0.200	ug/L	

LCS / LCS DUPLICATE RECOVERY

EPA 200.8

Dissolved Metals

Laboratory:	Analytical Resources, Inc.	SDG:	17C0117
Client:	Herrenkohl Consulting LLC.	Project:	Eldridge Landfill
Matrix:	Water	Analyzed:	03/15/17 18:29
Batch:	BFC0307	Laboratory ID:	BFC0307-BS1
Preparation:	REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Sequence Name:	LCS
Initial/Final:	25 mL / 25 mL		

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC. #	QC LIMITS REC.
Iron-54 (dissolved)	5000	5050	101	80 - 120

* Values outside of QC limits

LCS / LCS DUPLICATE RECOVERY

EPA 200.8 UCT-KED

Dissolved Metals

Laboratory:	Analytical Resources, Inc.	SDG:	17C0117
Client:	Herrenkohl Consulting LLC.	Project:	Eldridge Landfill
Matrix:	Water	Analyzed:	03/15/17 18:29
Batch:	BFC0307	Laboratory ID:	BFC0307-BS1
Preparation:	REN EPA 600/4-79-020 4.1.4 HNO3 matrix	Sequence Name:	LCS
Initial/Final:	25 mL / 25 mL		

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC. #	QC LIMITS REC.
Arsenic-75a (dissolved)	25.0	25.6	102	80 - 120

* Values outside of QC limits

INITIAL CALIBRATION DATA

EPA 200.8

Laboratory:	Analytical Resources, Inc.	SDG:	17C0117
Client:	Herrenkohl Consulting LLC.	Project:	Eldridge Landfill
Calibration:	AC00039	Instrument:	ICPMS2
Calibration Date:	03/15/2017 9:28		

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Iron-54, Dissolved	0	0	20	8427.95	1000	2840.046	2000	2682.924	5000	2612.608	10000	2517.581
Iron-57, Dissolved	0	0	20	2329.3	1000	1082.679	2000	1072.371	5000	1068.133	10000	1026.206

INITIAL CALIBRATION DATA

EPA 200.8

Laboratory:	Analytical Resources, Inc.	SDG:	17C0117
Client:	Herrenkohl Consulting LLC.	Project:	Eldridge Landfill
Calibration:	AC00039	Instrument:	ICPMS2
Calibration Date:	03/15/2017 9:28		

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Iron-54, Dissolved	3180.185	87.6	0.9997		0.998	
Iron-57, Dissolved	1096.448	67.4	0.9996		0.998	