

2019 Annual Groundwater Report



CCR Surface Impoundment System

James DeYoung Power Plant

Holland Board of Public Works

Holland, Michigan

January 31, 2019

NTH Project No. 73-160017-04

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1.0 INTRODUCTION

Holland Board of Public Works (BPW) owns and operated the James DeYoung (JDY) power plant located in Holland, Michigan, on the eastern end of Lake Macatawa. JDY was initially built in 1939 with a generating capacity of 15 megawatts (MW). Between 1953 and 1968, BPW added three new boilers. From the late 1970's to the early 2000's, the plant consisted of three coal-fired boilers capable of producing up to 62.5 MW. On May 20, 2016, BPW discontinued the use of Unit 3; and on June 1, 2017, BPW officially shutdown and retired all generation units at JDY. When Units 3-5 were operating, bottom ash from these boilers was sluiced to the first of three surface impoundments located to the south of the plant, as shown on Figure 1 (Appendix A). These surface impoundments became subject to 40 CFR Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments upon promulgation on April 17, 2015.

2.0 PURPOSE AND OBJECTIVES

Groundwater monitoring and corrective action requirements for existing CCR units are contained in 40 CFR §257.90 through §257.98. 40 CFR Part §257.90 (e) establishes the requirement to prepare an annual groundwater monitoring and corrective action report. Consistent with this requirement, this report:

- documents the status of the groundwater monitoring and corrective action program for the CCR unit;
- summarizes actions completed;
- describes problems encountered;
- discusses actions to resolve the problems; and
- describes key activities for the upcoming year.



3.0 STATUS OF THE GROUNDWATER MONITORING PROGRAM

A limited hydrogeological investigation work plan was developed for the site in 2009 that established a groundwater detection monitoring program to address the requirements of Michigan Administrative Code R 323.2237(4) of Michigan's Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended (Act 451). The work plan pre-dated the final federal CCR rules and had the purpose of satisfying a request by Michigan Department of Environmental Quality to determine whether the presence of bottom ash lagoons (CCR units) may have affected groundwater quality in the surrounding area. The results of this investigation were inconclusive and additional investigative activities were merited.

In 2011, BPW completed subsequent investigation activities at the Site, including the installation of additional monitoring wells, collection of groundwater elevation data, and collection of groundwater samples for the analysis of a subset of metals on a quarterly basis, for a period of three years. The results of the subsequent investigation identified that certain metals were present in the groundwater above the U.S. EPA's Safe Drinking Water Act's maximum contaminant level (MCL) established in 40 CFR §141.62, and concluded that the groundwater quality in the surrounding area may have been affected by the historical use of the CCR units.

Based on the findings of this investigation, the anticipated retirement of the plant, and 40 CFR Part 257, Subpart D requirements, BPW decided to close the CCR units through removal of CCR and decontamination of the CCR units, in accordance with 40 CFR §257.102; and initiate an assessment of corrective measures, in accordance with 40 CFR §257.96. BPW initiated removal of CCR material from the CCR units in June 2017. During construction, two of the existing downgradient monitoring wells were removed due to location of on-site activities. Additionally, based on previous investigation findings, an upgradient monitoring well used during the 2011 study may not have been installed at a location that provided a true background determination for the area around JDY, and was also removed during closure of the CCR units. Final closure of the CCR units was completed in May 2018 and site restoration completed in June 2018, in substantial conformance with 40 CFR §257.101 and 40 CFR §257.103, and the written closure plan prepared by NTH Consultants, Ltd., (NTH) dated October 17, 2016.



3.1 Post-Closure Monitoring

Consistent with the requirements of 40 CFR §257.93, a Groundwater Sampling and Analysis Plan (SAP) was developed in October 2017 to evaluate background and downgradient groundwater quality within the JDY plant property (Site), and confirm compliance with the groundwater monitoring and corrective action requirements. As discussed previously, BPW conducted groundwater monitoring prior to the effective date of the CCR rules and elected to proceed with CCR removal and clean closure at the site. The SAP was developed to collect necessary information to confirm clean closure.

To comply with the requirements of 40 CFR §257.93, NTH designed an updated groundwater monitoring system that is representative of groundwater potentially affected by the CCR units. A review of information regarding the hydrogeologic conditions of the site available at the time the SAP was developed indicates that groundwater generally flows east-to-west across the site and discharges to the Macatawa River/Lake Macatawa. Based on this information, existing piezometer PZ-1 is located hydraulically upgradient of the former CCR bottom ash lagoons. PZ-1 was previously identified and sampled as monitoring well MW-7. Groundwater samples from this well represent background groundwater quality that has not been affected by the CCR units. Three additional wells, MW-1, MW-2, and MW-3 were installed downgradient of the CCR units on November 27, 2017. Figure 2 provides the location of the monitoring wells in the updated groundwater monitoring system. Water level data obtained from the monitoring wells during the 2018 quarterly events were used to develop groundwater contour maps (Figures 3A through 3D, dated January 2018, April 2018, July 2018, and October 2018, respectively). The quarterly maps are consistent from one sampling event to the next, and confirm groundwater flow direction.



4.0 ACTIONS COMPLETED

NTH conducted groundwater monitoring at the facility on a quarterly basis during the months of January, April, July, and October 2018, consistent with the facility's SAP. The quarterly monitoring included the collection of static water levels, field measurements of pH, temperature, conductivity, and turbidity, and groundwater samples for analysis of constituents contained in Appendix III and Appendix IV of 40 CFR 257.

4.1 Groundwater Sample Collection

During each of the quarterly sampling events, representatives from NTH collected groundwater samples for assessment monitoring from the groundwater monitoring system at the Site. The samples were submitted to the analytical laboratory for analysis of constituents listed in Appendix III and IV of 40 CFR §257.95.

Groundwater elevation data were collected from each monitoring well prior to sample collection. Upon arrival at the site, each monitoring well was opened, and allowed to equilibrate with ambient air pressures, prior to measuring the depths to water. Groundwater elevation measurements were taken to the nearest 0.01 foot from the entire monitoring well network prior to sampling. The wells were gauged on the same day to provide an interpretative groundwater flow map and to minimize temporal bias of measured groundwater elevation changes for the monitoring well network.

Depth to water was measured from established and surveyed top of casing reference points. Groundwater levels, well conditions, and pertinent observations were recorded on groundwater-sampling logs, and are included in Appendices C-1 through C-4. The water elevation data obtained was used to develop groundwater contour maps for each sampling event (Groundwater Flow Maps – Figures 3A through 3D), which present the site's groundwater flow direction.



Sampling personnel collected groundwater samples from the monitoring wells using low-flow (minimal drawdown) groundwater sampling procedures (US EPA, 1996, rev. 2010). Tubing connected to a peristaltic pump was installed to a depth representing the middle of the saturated screen interval. The polyethylene tubing discharge line from the peristaltic pump was connected to a flow-cell and multi-meter to collect water quality indicator parameters during well purging to determine water quality stabilization.

Samples were collected immediately following stabilization of three of the four field parameters. Groundwater samples were collected into laboratory provided sample containers required for the specified analyses. The groundwater samples were collected from the discharge tubing upstream of the water quality meter flow cell. Care was taken to allow for a non-turbulent filling of laboratory containers. Samples were not filtered in the field to provide a measure of total recoverable metals that will include both the dissolved and particulate fractions of metals in natural waters, consistent with 40 CFR §257.93 (h)(2)(i).

The samples were labeled, stored, and transported to the laboratory under proper chain-of-custody. Following collection, samples were immediately labeled, logged on the chain-of-custody, and placed in a cooler with ice prior to delivery to the laboratory with a signed Chain-of-Custody. The chain-of-custody provides documentation of actual sample storage and transport, and contains the dates and times of collection, laboratory receipt, and acknowledgment of analyses to be completed.

Quality assurance/quality control (QA/QC) samples were collected to ensure sample containers are free of analytes of interest, assess the variability of the sampling and laboratory methods, and monitor the effectiveness of decontamination protocols. One field duplicate, one matrix spike, one matrix spike duplicate, one field blank, and one equipment blank were collected for QA/QC purposes.



4.2 Groundwater Sample Analysis and Data Evaluation

Groundwater samples were submitted to ALS Environmental Laboratory, in Holland, Michigan, for the analyses specified in Appendix III and IV to Part 257. The laboratory results, corresponding analytical methods, and practical quantitation limits (PQL) for each constituent are provided in the corresponding analytical reports for each sampling event, included in Appendix C-1 through C-4.

In general, the laboratory PQLs (reporting limits) are consistent with the reporting limits stated in the March 2018 revised SAP and are below the established MCLs. We note that, due to dilution for high concentrations of non-target analytes, effervescent matrix, or matrix interference, a few parameters in selected monitoring wells had elevated reporting limits, above the PQLs established in the SAP, as shown on the laboratory analytical report included in **Appendix A** and noted below for each quarterly sampling event:

January 2018:

- chloride in PZ-1,
- sulfate in MW-1,
- fluoride and sulfate in MW-2,
- chloride and fluoride in MW-3, and

April 2018:

- chloride and sulfate in MW-1
- fluoride and sulfate in MW-2,
- chloride and fluoride in MW-3, and

July 2018:

- sulfate in MW-1
- fluoride in MW-2 and MW-3

October 2018:

- fluoride in MW-2 and MW-3

In addition, during the January 2018 sampling event, lithium was reported above the PQL in MW-2 and MW-3.



Once an appropriate number of background samples have been collected, generally eight events, the results of the quarterly groundwater sampling events will be compared to applicable groundwater standards for determination of clean closure. The groundwater protection standards for each constituent in Appendix IV will be established in accordance with 40 CFR §257.95(h). For constituents for which MCLs have been established under 40 CFR §141.62 and 40 CFR §141.66, the groundwater protection standard will be the MCL for that constituent. Where MCLs have not been established for the Appendix III constituents, the groundwater protection standard will be the statistically developed background concentration for that constituent in accordance with 40 CFR §257.91, or as noted in the preamble to the rule “in excess of Agency-recommended limits or factors.” It should be noted that Michigan’s groundwater cleanup criteria developed according to Part 201 of Act 451 will be considered by BPW when evaluating potential “Agency-recommended limits or factors.” For those constituents where the statistically developed background level is higher than the MCL, the groundwater protection standard will be the statistically developed background concentration.

As discussed in the facility’s SAP and in accordance with 40 CFR §257.93, the data collected from the background monitoring well will be used to calculate background concentrations for each constituent. If appropriate and supported by the data distribution, fewer samples may be utilized for the statistically calculated background concentrations. Background concentrations for each constituent will be calculated using an appropriate statistical method for each background monitoring well, selected based on the distribution of the data in accordance with 40 CFR §257.93, once an appropriate number of data has been collected.

For each of the four quarterly events completed to date, we completed a preliminary evaluation of the data by comparing the results to the current MCL, as summarized on Table 1. A review of the results indicate that, in general, most of the Appendix IV constituents are below the current MCL with the exception of arsenic, which has been reported above the MCL of 0.01 mg/L in upgradient piezometer PZ-1, and in downgradient monitoring well MW-1. We note that groundwater in upgradient piezometer PZ-1, which represents background groundwater quality that has not been affected by CCR units, has higher concentration of arsenic than downgradient monitoring well MW-1; this indicates that background levels of arsenic are higher than the MCL. Note also that,



for a few other constituents with no established MCLs, the concentrations in upgradient well PZ-1 are generally higher than the downgradient monitoring wells. As discussed previously, where background levels are higher than MCL, or for constituents without established MCLs, we will statistically develop groundwater protection standards in accordance with 40 CFR §257.91.

5.0 PROBLEMS ENCOUNTERED

During the initial, January 2018 sampling event, piezometer PZ-1 was purged using a volumetric procedure (removal of three well volumes) due to excessive drawdown. Additionally, stabilization criteria for turbidity could not be achieved in any of the monitoring wells. Therefore, the four wells in the monitoring network were redeveloped on April 2, 2018, prior to the collection of the second, April 2018, sampling event. No additional problems were encountered with the implementation of the groundwater-monitoring program at the site.

6.0 ACTIONS TO RESOLVE THE PROBLEM

As discussed above, monitoring well PZ-1 was redeveloped using the surge and purge method to remove excess suspended solids present in the well prior to the second (April 2018) quarterly sampling event. No additional corrective actions were required at the site.

7.0 KEY ACTIVITIES FOR THE UPCOMING YEAR

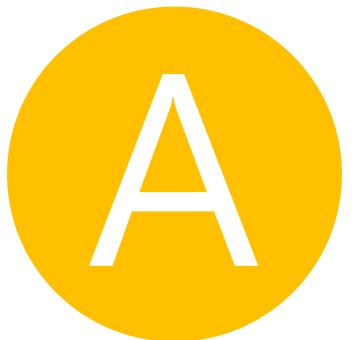
During the initial assessment monitoring period, the facility will continue to collect quarterly groundwater samples from the existing groundwater monitoring well network. Consistent with the requirements of the SAP, samples will be collected in January, April, July, and October of 2019. The results of the 2019 sampling events will be provided in the update to the annual groundwater report by January 31, 2020.



8.0 RECORDKEEPING, NOTIFICATION, AND POSTING TO THE INTERNET

Consistent with the requirements of 40 CFR §257.105 (h), this groundwater monitoring and corrective action report will be placed in the Site's operating record by January 31, 2019. In accordance with 40 CFR §257.106 (h), BPW will notify the State Director that this report has been developed, and that this information has been placed in the operating record and on the owner or operator's publicly accessible internet site, in accordance with 40 CFR §257.107 (h).

APPENDIX



Figures

1. Site Location Plan
2. Monitoring Well Location Map
3. A – Groundwater Flow Map (January 2018)
B – Groundwater Flow Map (April 2018)
C – Groundwater Flow Map (July 2018)
D – Groundwater Flow Map (October 2018)



NTH PROJECT No.: 62-160017	CAD FILE NAME: 160017-JDY
DESIGNED BY: SLG	PLOT DATE: 9/28/2016
DRAWN BY: SLG	DRAWING SCALE: 1" = 200'
CHECKED BY: DRL	INCEPTION DATE: 9/7/2016



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SITE LOCATION PLAN

**JAMES DEYOUNG POWER PLANT
HOLLAND, MI**

FIGURE:
1



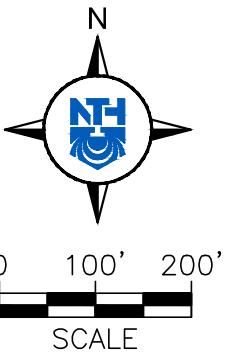
LEGEND

- (M) MW-1 MONITORING WELL LOCATION
- * PZ-1 EXISTING PIEZOMETER (UPGRADIENT MONITORING WELL)

FIGURE:

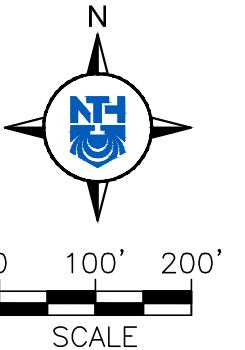
2

NOTE: LOCATIONS AND DIMENSIONS ARE APPROXIMATE. NOT A LEGAL SURVEY.



NTH PROJECT No.:	73-160017	CAD FILE NAME:	160017-MWLM
DESIGNED BY:	KWO	PLOT DATE:	1/23/2018
DRAWN BY:	CRD	DRAWING SCALE:	1" = 200'
CHECKED BY:	KWO	INCEPTION DATE:	10/13/2017

MONITORING WELL LOCATION MAP
JAMES DEYOUNG POWER PLANT
HOLLAND, MICHIGAN



LEGEND

- MW-1 MONITORING WELL LOCATION
- ✚ PZ-1 PIEZOMETER (UPGRADIENT MONITORING WELL)
- [582.50] WATER LEVELS
- 580— WATER LEVEL CONTOUR

1ST QUARTER GROUNDWATER LEVELS		NTH PROJECT No.: 73-160017	CAD FILE NAME: 160017-GWFM
DESIGNED BY:	KWO	PILOT DATE:	1/25/2018
DRAWN BY:	CRD	DRAWING SCALE:	1" = 200'
CHECKED BY:	KWO	INCEPTION DATE:	10/13/2017
JAMES DEYOUNG POWER PLANT HOLLAND, MICHIGAN			NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services			

FIGURE:

3A

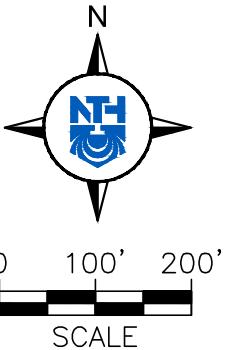
NOTE: LOCATIONS AND DIMENSIONS ARE APPROXIMATE. NOT A LEGAL SURVEY.



LEGEND

- MW-1 MONITORING WELL LOCATION
- PZ-1 PIEZOMETER (UPGRADIENT MONITORING WELL)
- [582.50] WATER LEVELS
- 580— WATER LEVEL CONTOUR

NOTE: LOCATIONS AND DIMENSIONS ARE APPROXIMATE. NOT A LEGAL SURVEY.



3B

2ND QUARTER GROUNDWATER LEVELS

NTH PROJECT No:	73-160017-04	CAD FILE NAME:	160017-Q218
DESIGNED BY:	CRD	PLOT DATE:	7/30/2018
DRAWN BY:	CRD	DRAWING SCALE:	1" = 200'
CHECKED BY:	KWO	INCEPTION DATE:	10/13/2017

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LEGEND

- MW-1 MONITORING WELL LOCATION
- PZ-1 PIEZOMETER (UPGRADIENT MONITORING WELL)
- [582.50] WATER LEVELS
- 580— WATER LEVEL CONTOUR

NOTE: LOCATIONS AND DIMENSIONS ARE APPROXIMATE. NOT A LEGAL SURVEY.

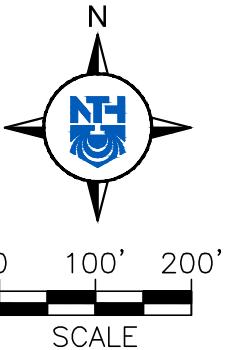


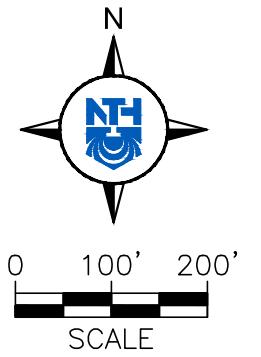
FIGURE:

3C

4TH QUARTER GROUNDWATER LEVELS		NTH Consultants, Ltd.	
NTH PROJECT No.:	73-160017-04	CAD FILE NAME:	160017-Q318
DESIGNED BY:	CRD	PLOT DATE:	10/4/2018
DRAWN BY:	CRD	DRAWING SCALE:	1" = 200'
CHECKED BY:	KWO	INCEPTION DATE:	10/13/2017
JAMES DEYOUNG POWER PLANT		HOLLAND, MICHIGAN	



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3D

4TH QUARTER GROUNDWATER LEVELS

NTH PROJECT No.:	CAD FILE NAME:
73-160017-04	160017-Q418
DESIGNED BY:	PLOT DATE:
CRD	10/4/2018
DRAWN BY:	DRAWING SCALE:
CRD	1" = 200'
CHECKED BY:	INCEPTION DATE:
KWO	10/13/2017

NTH Consultants, Ltd.

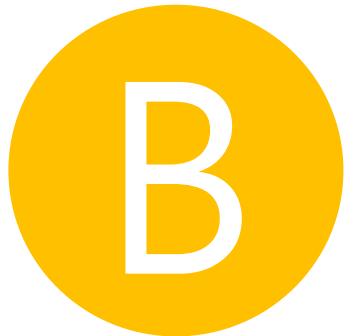
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LEGEND

-  **MW-1** MONITORING WELL LOCATION
-  **PZ-1** PIEZOMETER (UPGRADIENT MONITORING WELL)
- [582.50] WATER LEVELS
- 580— WATER LEVEL CONTOUR

NOTE: LOCATIONS AND DIMENSIONS ARE APPROXIMATE. NOT A LEGAL SURVEY.

APPENDIX



Table

Summary of Laboratory Analytical Results

HOLLAND BOARD OF PUBLIC WORKS - JAMES DeYOUNG POWER PLANT

TABLE 1
SUMMARY OF LABORATORY ANALYTICAL RESULTS
ANNUAL GROUNDWATER REPORT

PARAMETER	Reporting Limit (SAP)	Units	Upgradient Well				Downgradient Wells												Groundwater Protection Standard					
			PZ-1*				MW-1						MW-2						MW-3				Maximum Contaminant Level ^[2]	
			1/10/18	4/3/18	7/10/18	10/2/18	1/10/18	1/10/18 ⁽¹⁾	4/3/18	4/3/18 ⁽¹⁾	7/10/18	10/2/18	10/2/18 ⁽¹⁾	1/10/18	4/3/18	7/10/18	7/10/18 ⁽¹⁾	10/2/18	1/10/18	4/3/18	7/10/18	10/2/18		
APPENDIX IV TO CFR PART 257	Antimony	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006		
	Arsenic	0.005	mg/L	0.045	0.042	0.037	0.048	0.023	0.022	0.021	0.021	0.031	0.047	0.045	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01		
	Barium	0.005	mg/L	0.045	0.032	0.063	0.066	0.34	0.33	0.27	0.27	0.23	0.25	0.25	0.2	0.21	0.21	0.21	0.2	0.21	0.034	0.038	0.04	
	Beryllium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004		
	Cadmium	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005		
	Chromium	0.005	mg/L	0.0067	<0.005	0.0091	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.1		
	Cobalt	0.0005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--		
	Fluoride	1	mg/L	1.4	<1.0	1.5	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0	<1.0	<2.0	<10	<10	<5	4	
	Lead	0.005	mg/L	0.044	0.023	0.078	0.086	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015		
	Lithium	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.14	0.13	0.11	0.11	0.12	0.16	0.16	<0.10	0.011	<0.010	<0.010	0.012	<1.0	0.029	0.029	0.032	
	Mercury	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002		
	Molybdenum	0.005	mg/L	0.12	0.12	0.043	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--		
	Selenium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05		
	Thallium	0.005	mg/L	<0.005	<0.005	<0.002	<0.002	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.005	<0.002	<0.002	<0.005	<0.005	<0.002	<0.002	0.002		
	Radium 226/228 Combined ^[4]	pCi/L	0.63	0.63	<0.36 / <0.91	<0.5 / <1.51	<0.22 / <0.96	<0.24 / <1.01	1.27	1.27	<0.35 / 1.1	0.47 / 1.47	0.57 / 1.14	<0.24 / <0.91	1.66	<0.32 / 1.36	1.43	0.44 / 1.16	1.19	0.93	0.41 / <0.91	0.41 / 1.38	5	
APPENDIX III TO CFR PART 257	Boron	0.02	mg/L	0.23	0.24	0.26	0.41	1.1	1.1	0.95	0.95	1.2	1.5	1.5	0.69	0.6	0.67	0.67	0.77	0.79	0.7	0.66	0.76	--
	Calcium	1	mg/L	38	28	33	45	140	130	130	130	96	99	99	81	90	80	80	82	320	360	300	350	--
	Chloride	10	mg/L	<100	140	120	33	280	300	<250	<250	180	170	170	56	570	540	560	620	<1000	<1000	180	200	250 ^[3]
	Fluoride	1	mg/L	1.4	<1.0	1.5	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0	<1.0	<2.0	<10	<10	<10	<5	4
	pH (lab)	s.u.		8.35	8.55	8.01	7.81	6.84	6.89	6.99	6.99	6.93	7.24	7.07	7.08	7.05	6.94	6.98	7.07	6.4	6.51	6.26	6.47	6.5-8.5
	pH (field)	s.u.		8.2	6.89	8.12	8.1	6.83	6.83	6.89	6.89	7.33	7.06	7.06	6.98	7.17	6.65	6.65	7.1	6.14	6.45	7.12	6.5	6.5-8.5
	Sulfate	10	mg/L	18	11	5.8	7.3	<250	<250	<50	<50	<50	26	29	<50	<50	<10	<2	<4	1200	1300	980	1100	250 ^[3]
	Total Dissolved Solids	10	mg/L	1200	550	1500	1100	1100	980	480	480	880	800	810	1300	680	1400	1400	1300	2300	1300	2200	2300	500 ^[3]

1) Duplicate Sample

2) Maximum Contaminant Level (MCL) promulgated by the USEPA pursuant to the provisions of Section 1412 of the Safe Drinking Water Act (40 CFR Part 141).

3) Secondary drinking water standards established for aesthetic purposes

4) Sum of values reported above the minimum detectable concentration (MDC) for radium 226 and radium 228.

5) * - PZ-1 was previously identified and sampled with the MW-7 identifier.

< = parameter not detected at or above laboratory report limit or, in the case of radium 226/228, above the MDC.

APPENDIX



Groundwater Sampling Data

Appendix C-1 – January 2018 Sampling Event

Appendix C-2 – April 2018 Sampling Event

Appendix C-3 – July 2018 Sampling Event

Appendix C-4 – October 2018 Sampling Event



26-Feb-2018

Karen Okonta
NTH Consultants, Ltd.
41780 Six Mile Road
Northville, MI 48168

Re: **Holland Board of Public Works (73-160017-04)**

Work Order: **1801438**

Dear Karen,

ALS Environmental received 7 samples on 10-Jan-2018 05:21 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 21.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Certificate No: MI: 0022

Report of Laboratory Analysis

ADDRESS 3352 128th Ave Holland, Michigan 49424 | PHONE (616) 399-6070 | FAX (616) 399-6185

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04)
Work Order: 1801438

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1801438-01	MW-3	Groundwater		1/10/2018 13:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-01	MW-3	Groundwater		1/10/2018 13:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-02	MW-2	Groundwater		1/10/2018 15:20	1/10/2018 17:21	<input type="checkbox"/>
1801438-02	MW-2	Groundwater		1/10/2018 15:20	1/10/2018 17:21	<input type="checkbox"/>
1801438-03	Equipment Blank	Water		1/10/2018 15:30	1/10/2018 17:21	<input type="checkbox"/>
1801438-03	Equipment Blank	Water		1/10/2018 15:30	1/10/2018 17:21	<input type="checkbox"/>
1801438-04	Field Blank	Water		1/10/2018 15:40	1/10/2018 17:21	<input type="checkbox"/>
1801438-04	Field Blank	Water		1/10/2018 15:40	1/10/2018 17:21	<input type="checkbox"/>
1801438-05	MW-1	Groundwater		1/10/2018 16:25	1/10/2018 17:21	<input type="checkbox"/>
1801438-05	MW-1	Groundwater		1/10/2018 16:25	1/10/2018 17:21	<input type="checkbox"/>
1801438-06	PZ-1	Groundwater		1/10/2018 16:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-06	PZ-1	Groundwater		1/10/2018 16:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-07	Field Duplicate	Groundwater		1/10/2018	1/10/2018 17:21	<input type="checkbox"/>
1801438-07	Field Duplicate	Groundwater		1/10/2018	1/10/2018 17:21	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04)
Work Order: 1801438

Case Narrative

Radium-226/228 analysis performed by ALS Fort Collins laboratory.

Batch 112942, Method ICP_6020_W, Sample 1801438-01A MS/MSD: The MS/MSD recovery was outside of the control limit for Calcium; however, the result in the parent sample is greater than 4x the spike amount. No qualification is required.

Batch R228140, Method IC_300.0_WW, Sample 1801438-01B: The reporting limit for Fluoride is elevated due to dilution for high concentrations of non-target analytes or an effervescent matrix.

Batch R228140, Method IC_300.0_WW, Sample 1801438-01B: The reporting limits for Fluoride and Sulfate are elevated due to dilution for high concentrations of non-target analytes or an effervescent matrix.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04)
WorkOrder: 1801438

**QUALIFIERS,
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

<u>Units Reported</u>	<u>Description</u>
mg/L	Milligrams per Liter
s.u.	Standard Units

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-3 **Lab ID:** 1801438-01
Collection Date: 1/10/2018 01:50 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND	0.00020	mg/L	1		1/24/2018 03:45 PM
METALS BY ICP-MS						
Antimony	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Arsenic	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Barium	0.034	0.0050	mg/L	1		1/19/2018 02:14 PM
Beryllium	ND	0.0020	mg/L	1		1/18/2018 08:31 PM
Boron	0.79	0.020	mg/L	1		1/18/2018 08:31 PM
Cadmium	ND	0.0020	mg/L	1		1/18/2018 08:31 PM
Calcium	320	5.0	mg/L	10		1/19/2018 02:19 PM
Chromium	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Cobalt	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Lead	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Lithium	ND	1.0	mg/L	100		1/22/2018 01:11 PM
Molybdenum	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Selenium	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
Thallium	ND	0.0050	mg/L	1		1/18/2018 08:31 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND	1,000	mg/L	100		1/12/2018 01:39 PM
Fluoride	ND	10	mg/L	10		1/12/2018 01:20 PM
Sulfate	1,200	1,000	mg/L	100		1/12/2018 01:39 PM
PH (LABORATORY)						
pH (laboratory)	6.40	0.100	s.u.	1		1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	2,300	20	mg/L	1		1/17/2018 01:13 PM
					Prep: FILTER	1/17/18 08:00
						Analyst: MT

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-2 **Lab ID:** 1801438-02
Collection Date: 1/10/2018 03:20 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND	0.00020	mg/L	1		1/24/2018 03:53 PM
METALS BY ICP-MS						
Antimony	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Arsenic	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Barium	0.20	0.0050	mg/L	1		1/18/2018 08:36 PM
Beryllium	ND	0.0020	mg/L	1		1/18/2018 08:36 PM
Boron	0.69	0.020	mg/L	1		1/18/2018 08:36 PM
Cadmium	ND	0.0020	mg/L	1		1/18/2018 08:36 PM
Calcium	81	0.50	mg/L	1		1/18/2018 08:36 PM
Chromium	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Cobalt	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Lead	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Lithium	ND	0.10	mg/L	10		1/22/2018 01:16 PM
Molybdenum	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Selenium	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
Thallium	ND	0.0050	mg/L	1		1/18/2018 08:36 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	56	50	mg/L	5		1/12/2018 02:56 PM
Fluoride	ND	5.0	mg/L	5		1/12/2018 01:58 PM
Sulfate	ND	50	mg/L	5		1/12/2018 01:58 PM
PH (LABORATORY)						
pH (laboratory)	7.08	0.100	s.u.	1		1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,300	20	mg/L	1		1/17/2018 01:13 PM
				Prep: FILTER	1/17/18 08:00	Analyst: MT

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Equipment Blank **Lab ID:** 1801438-03
Collection Date: 1/10/2018 03:30 PM **Matrix:** WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	1/24/2018 03:56 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Arsenic	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Barium	ND		0.0050	mg/L	1	1/19/2018 02:26 PM
Beryllium	ND		0.0020	mg/L	1	1/18/2018 08:38 PM
Boron	ND		0.020	mg/L	1	1/18/2018 08:38 PM
Cadmium	ND		0.0020	mg/L	1	1/18/2018 08:38 PM
Calcium	ND		0.50	mg/L	1	1/18/2018 08:38 PM
Chromium	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Cobalt	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Lead	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Lithium	ND		0.010	mg/L	1	1/19/2018 02:26 PM
Molybdenum	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Selenium	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
Thallium	ND		0.0050	mg/L	1	1/18/2018 08:38 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		10	mg/L	1	1/12/2018 03:15 PM
Fluoride	ND		1.0	mg/L	1	1/12/2018 03:15 PM
Sulfate	ND		10	mg/L	1	1/12/2018 03:15 PM
PH (LABORATORY)						
pH (laboratory)	7.29		A4500-H B-11 0.100 s.u.		1	1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		A2540 C-11 10	mg/L	1	1/17/2018 01:13 PM
			Prep: FILTER			
			1/17/18 08:00			

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Field Blank **Lab ID:** 1801438-04
Collection Date: 1/10/2018 03:40 PM **Matrix:** WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	1/24/2018 03:58 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Arsenic	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Barium	ND		0.0050	mg/L	1	1/19/2018 02:27 PM
Beryllium	ND		0.0020	mg/L	1	1/18/2018 08:39 PM
Boron	ND		0.020	mg/L	1	1/18/2018 08:39 PM
Cadmium	ND		0.0020	mg/L	1	1/18/2018 08:39 PM
Calcium	ND		0.50	mg/L	1	1/18/2018 08:39 PM
Chromium	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Cobalt	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Lead	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Lithium	ND		0.010	mg/L	1	1/19/2018 02:27 PM
Molybdenum	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Selenium	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
Thallium	ND		0.0050	mg/L	1	1/18/2018 08:39 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		10	mg/L	1	1/12/2018 03:34 PM
Fluoride	ND		1.0	mg/L	1	1/12/2018 03:34 PM
Sulfate	ND		10	mg/L	1	1/12/2018 03:34 PM
PH (LABORATORY)						
pH (laboratory)	6.84		A4500-H B-11 0.100 s.u.		1	1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		A2540 C-11 10	mg/L	1	1/17/2018 01:13 PM
Prep: FILTER						
1/17/18 08:00						
Analyst: MT						

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-1 **Lab ID:** 1801438-05
Collection Date: 1/10/2018 04:25 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND	0.00020	mg/L	1		1/24/2018 04:01 PM
METALS BY ICP-MS						
Antimony	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Arsenic	0.023	0.0050	mg/L	1		1/18/2018 08:45 PM
Barium	0.34	0.0050	mg/L	1		1/18/2018 08:45 PM
Beryllium	ND	0.0020	mg/L	1		1/18/2018 08:45 PM
Boron	1.1	0.20	mg/L	10		1/22/2018 01:17 PM
Cadmium	ND	0.0020	mg/L	1		1/18/2018 08:45 PM
Calcium	140	0.50	mg/L	1		1/18/2018 08:45 PM
Chromium	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Cobalt	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Lead	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Lithium	0.14	0.10	mg/L	10		1/22/2018 01:17 PM
Molybdenum	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Selenium	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
Thallium	ND	0.0050	mg/L	1		1/18/2018 08:45 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	280	250	mg/L	25		1/15/2018 12:26 PM
Fluoride	ND	1.0	mg/L	1		1/15/2018 12:07 PM
Sulfate	ND	250	mg/L	25		1/15/2018 12:26 PM
PH (LABORATORY)						
pH (laboratory)	6.84	0.100	s.u.	1		1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,100	20	mg/L	1		1/17/2018 01:13 PM
				Prep: FILTER	1/17/18 08:00	Analyst: MT

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: PZ-1 **Lab ID:** 1801438-06
Collection Date: 1/10/2018 04:50 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND	0.00020	mg/L	1		1/24/2018 04:03 PM
METALS BY ICP-MS						
Antimony	ND	0.0050	mg/L	1		1/18/2018 08:47 PM
Arsenic	0.045	0.0050	mg/L	1		1/18/2018 08:47 PM
Barium	0.045	0.0050	mg/L	1		1/19/2018 03:20 PM
Beryllium	ND	0.0020	mg/L	1		1/18/2018 08:47 PM
Boron	0.23	0.020	mg/L	1		1/19/2018 03:20 PM
Cadmium	ND	0.0020	mg/L	1		1/18/2018 08:47 PM
Calcium	38	0.50	mg/L	1		1/18/2018 08:47 PM
Chromium	0.0067	0.0050	mg/L	1		1/18/2018 08:47 PM
Cobalt	ND	0.0050	mg/L	1		1/18/2018 08:47 PM
Lead	0.044	0.0050	mg/L	1		1/18/2018 08:47 PM
Lithium	ND	0.010	mg/L	1		1/19/2018 03:20 PM
Molybdenum	0.12	0.0050	mg/L	1		1/18/2018 08:47 PM
Selenium	ND	0.0050	mg/L	1		1/18/2018 08:47 PM
Thallium	ND	0.0050	mg/L	1		1/18/2018 08:47 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND	100	mg/L	10		1/15/2018 01:04 PM
Fluoride	1.4	1.0	mg/L	1		1/15/2018 12:45 PM
Sulfate	18	10	mg/L	1		1/15/2018 12:45 PM
PH (LABORATORY)						
pH (laboratory)	8.35	0.100	s.u.	1		1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,200	20	mg/L	1		1/17/2018 01:13 PM
					Prep: FILTER	1/17/18 08:00

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Field Duplicate **Lab ID:** 1801438-07
Collection Date: 1/10/2018 **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	1/24/2018 04:14 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Arsenic	0.022		0.0050	mg/L	1	1/18/2018 08:49 PM
Barium	0.33		0.0050	mg/L	1	1/18/2018 08:49 PM
Beryllium	ND		0.0020	mg/L	1	1/18/2018 08:49 PM
Boron	1.1		0.020	mg/L	1	1/19/2018 03:21 PM
Cadmium	ND		0.0020	mg/L	1	1/18/2018 08:49 PM
Calcium	130		0.50	mg/L	1	1/18/2018 08:49 PM
Chromium	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Cobalt	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Lead	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Lithium	0.13		0.010	mg/L	1	1/19/2018 03:21 PM
Molybdenum	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Selenium	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
Thallium	ND		0.0050	mg/L	1	1/18/2018 08:49 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	300		250	mg/L	25	1/15/2018 01:43 PM
Fluoride	ND		1.0	mg/L	1	1/15/2018 01:23 PM
Sulfate	ND		250	mg/L	25	1/15/2018 01:43 PM
PH (LABORATORY)						
pH (laboratory)	6.89		0.100	s.u.	1	1/12/2018 02:20 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	980		20	mg/L	1	1/17/2018 01:13 PM
				Prep: FILTER	1/17/18 08:00	Analyst: MT

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 26-Feb-18

Client: NTH Consultants, Ltd.

Work Order: 1801438

Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: 113318		Instrument ID HG1		Method: SW7470A									
MBLK		Sample ID: MBLK-113318-113318				Units: mg/L		Analysis Date: 1/24/2018 03:40 PM					
Client ID:		Run ID: HG1_180124A				SeqNo: 4862358	Prep Date: 1/24/2018	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
Mercury	ND	0.00020											
LCS		Sample ID: LCS-113318-113318				Units: mg/L		Analysis Date: 1/24/2018 03:43 PM					
Client ID:		Run ID: HG1_180124A				SeqNo: 4862359	Prep Date: 1/24/2018	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
Mercury	0.0016	0.00020	0.002	0	80	80-120	0						
MS		Sample ID: 1801438-01AMS				Units: mg/L		Analysis Date: 1/24/2018 03:48 PM					
Client ID: MW-3		Run ID: HG1_180124A				SeqNo: 4862361	Prep Date: 1/24/2018	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
Mercury	0.00162	0.00020	0.002	0.000027	79.6	75-125	0						
MSD		Sample ID: 1801438-01AMSD				Units: mg/L		Analysis Date: 1/24/2018 03:51 PM					
Client ID: MW-3		Run ID: HG1_180124A				SeqNo: 4862362	Prep Date: 1/24/2018	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
Mercury	0.00174	0.00020	0.002	0.000027	85.6	75-125	0.00162	7.14	20				

The following samples were analyzed in this batch:

1801438-01A	1801438-02A	1801438-03A
1801438-04A	1801438-05A	1801438-06A
1801438-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC Page: 1 of 8

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **112942** Instrument ID **ICPMS3** Method: **SW6020A**

MBLK		Sample ID: MBLK-112942-112942			Units: mg/L		Analysis Date: 1/18/2018 08:28 PM			
Client ID:		Run ID: ICPMS3_180118A			SeqNo: 4854229		Prep Date: 1/16/2018		DF: 1	
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony		ND	0.0050							
Arsenic		ND	0.0050							
Beryllium		ND	0.0020							
Boron		ND	0.020							
Cadmium		ND	0.0020							
Calcium		ND	0.50							
Chromium		ND	0.0050							
Cobalt		ND	0.0050							
Lead		ND	0.0050							
Molybdenum		ND	0.0050							
Selenium		ND	0.0050							
Thallium		ND	0.0050							

MBLK		Sample ID: MBLK-112942-112942			Units: mg/L		Analysis Date: 1/19/2018 02:07 PM			
Client ID:		Run ID: ICPMS3_180119A			SeqNo: 4856850		Prep Date: 1/16/2018		DF: 1	
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Barium		ND	0.0050							
Lithium		ND	0.010							

LCS		Sample ID: LCS-112942-112942			Units: mg/L		Analysis Date: 1/18/2018 08:30 PM			
Client ID:		Run ID: ICPMS3_180118A			SeqNo: 4854230		Prep Date: 1/16/2018		DF: 1	
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony		0.09752	0.0050	0.1	0	97.5	80-120	0		
Arsenic		0.09723	0.0050	0.1	0	97.2	80-120	0		
Barium		0.0943	0.0050	0.1	0	94.3	80-120	0		
Beryllium		0.09434	0.0020	0.1	0	94.3	80-120	0		
Boron		0.4929	0.020	0.5	0	98.6	80-120	0		
Cadmium		0.09856	0.0020	0.1	0	98.6	80-120	0		
Calcium		9.939	0.50	10	0	99.4	80-120	0		
Chromium		0.09758	0.0050	0.1	0	97.6	80-120	0		
Cobalt		0.09937	0.0050	0.1	0	99.4	80-120	0		
Lead		0.09811	0.0050	0.1	0	98.1	80-120	0		
Molybdenum		0.1018	0.0050	0.1	0	102	80-120	0		
Selenium		0.09845	0.0050	0.1	0	98.4	80-120	0		
Thallium		0.09704	0.0050	0.1	0	97	80-120	0		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **112942** Instrument ID **ICPMS3** Method: **SW6020A**

LCS	Sample ID: LCS-112942-112942			Units: mg/L			Analysis Date: 1/19/2018 02:08 PM		
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Client ID:	Run ID: ICPMS3_180119A			SeqNo: 4856851			Prep Date: 1/16/2018			DF: 1
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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Lithium	0.1009	0.010	0.1	0	101	80-120	0	0		
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MS	Sample ID: 1801438-01AMS			Units: mg/L			Analysis Date: 1/18/2018 08:33 PM		
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Client ID: MW-3	Run ID: ICPMS3_180118A			SeqNo: 4854232			Prep Date: 1/16/2018			DF: 1
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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Antimony	0.09538	0.0050	0.1	0.000005	95.4	75-125	0	0		
Arsenic	0.1015	0.0050	0.1	0.000639	101	75-125	0	0		
Beryllium	0.09179	0.0020	0.1	0.000158	91.6	75-125	0	0		
Boron	1.254	0.020	0.5	0.786	93.7	75-125	0	0		
Cadmium	0.09295	0.0020	0.1	-0.000002	93	75-125	0	0		
Chromium	0.09466	0.0050	0.1	0.00012	94.5	75-125	0	0		
Cobalt	0.09193	0.0050	0.1	0.000484	91.4	75-125	0	0		
Lead	0.09866	0.0050	0.1	0.000081	98.6	75-125	0	0		
Molybdenum	0.1011	0.0050	0.1	0.000361	101	75-125	0	0		
Selenium	0.1045	0.0050	0.1	0.0001	104	75-125	0	0		
Thallium	0.09835	0.0050	0.1	0.000066	98.3	75-125	0	0		

MS	Sample ID: 1801438-01AMS			Units: mg/L			Analysis Date: 1/19/2018 02:16 PM		
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Client ID: MW-3	Run ID: ICPMS3_180119A			SeqNo: 4856856			Prep Date: 1/16/2018			DF: 1
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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Barium	0.1339	0.0050	0.1	0.03424	99.7	75-125	0	0		
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MS	Sample ID: 1801438-01AMS			Units: mg/L			Analysis Date: 1/19/2018 02:21 PM		
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Client ID: MW-3	Run ID: ICPMS3_180119A			SeqNo: 4856859			Prep Date: 1/16/2018			DF: 10
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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Calcium	330.3	5.0	10	316.7	136	75-125	0	0	SO	
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MS	Sample ID: 1801438-01AMS			Units: mg/L			Analysis Date: 1/22/2018 01:13 PM		
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Client ID: MW-3	Run ID: ICPMS3_180122A			SeqNo: 4858018			Prep Date: 1/16/2018			DF: 100
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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Lithium	0.1095	1.0	0.1	0.01712	92.4	75-125	0	0	J	
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Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **112942** Instrument ID **ICPMS3** Method: **SW6020A**

MSD		Sample ID: 1801438-01AMSD			Units: mg/L		Analysis Date: 1/18/2018 08:35 PM			
Client ID: MW-3		Run ID: ICPMS3_180118A			SeqNo: 4854233		Prep Date: 1/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.09458	0.0050	0.1	0.000005	94.6	75-125	0.09538	0.837	20	
Arsenic	0.1015	0.0050	0.1	0.000639	101	75-125	0.1015	0.0394	20	
Beryllium	0.09152	0.0020	0.1	0.000158	91.4	75-125	0.09179	0.296	20	
Boron	1.264	0.020	0.5	0.786	95.6	75-125	1.254	0.776	20	
Cadmium	0.09283	0.0020	0.1	-0.000002	92.8	75-125	0.09295	0.131	20	
Chromium	0.09416	0.0050	0.1	0.00012	94	75-125	0.09466	0.532	20	
Cobalt	0.09169	0.0050	0.1	0.000484	91.2	75-125	0.09193	0.253	20	
Lead	0.0987	0.0050	0.1	0.000081	98.6	75-125	0.09866	0.0314	20	
Molybdenum	0.1008	0.0050	0.1	0.000361	100	75-125	0.1011	0.208	20	
Selenium	0.103	0.0050	0.1	0.0001	103	75-125	0.1045	1.43	20	
Thallium	0.09852	0.0050	0.1	0.000066	98.5	75-125	0.09835	0.18	20	
MSD		Sample ID: 1801438-01AMSD			Units: mg/L		Analysis Date: 1/19/2018 02:18 PM			
Client ID: MW-3		Run ID: ICPMS3_180119A			SeqNo: 4856857		Prep Date: 1/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Barium	0.1343	0.0050	0.1	0.03424	100	75-125	0.1329	1	20	
MSD		Sample ID: 1801438-01AMSD			Units: mg/L		Analysis Date: 1/19/2018 02:22 PM			
Client ID: MW-3		Run ID: ICPMS3_180119A			SeqNo: 4856860		Prep Date: 1/16/2018		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Calcium	323.2	5.0	10	316.7	65	75-125	330.3	2.18	20	SO
MSD		Sample ID: 1801438-01AMSD			Units: mg/L		Analysis Date: 1/22/2018 01:14 PM			
Client ID: MW-3		Run ID: ICPMS3_180122A			SeqNo: 4858019		Prep Date: 1/16/2018		DF: 100	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lithium	0.1117	1.0	0.1	0.01712	94.6	75-125	0.1095	0	20	J

The following samples were analyzed in this batch:

1801438-01A	1801438-02A	1801438-03A
1801438-04A	1801438-05A	1801438-06A
1801438-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: 112955 Instrument ID TDS Method: A2540 C-11

MLBK		Sample ID: MBLK-112955-112955			Units: mg/L		Analysis Date: 1/17/2018 01:13 PM			
Client ID:		Run ID: TDS_180117A			SeqNo: 4851445		Prep Date: 1/17/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	ND	10								
LCS		Sample ID: LCS-112955-112955			Units: mg/L		Analysis Date: 1/17/2018 01:13 PM			
Client ID:		Run ID: TDS_180117A			SeqNo: 4851444		Prep Date: 1/17/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	481	10	495	0	97.2	80-120	0			
DUP		Sample ID: 1801421-01A DUP			Units: mg/L		Analysis Date: 1/17/2018 01:13 PM			
Client ID:		Run ID: TDS_180117A			SeqNo: 4851424		Prep Date: 1/17/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	419	10	0	0	0	0-0	419	0	0	10
DUP		Sample ID: 1801421-02A DUP			Units: mg/L		Analysis Date: 1/17/2018 01:13 PM			
Client ID:		Run ID: TDS_180117A			SeqNo: 4851426		Prep Date: 1/17/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	423	10	0	0	0	0-0	425	0.472	0	10

The following samples were analyzed in this batch:

1801438-01B	1801438-02B	1801438-03B
1801438-04B	1801438-05B	1801438-06B
1801438-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **R228067** Instrument ID **WETCHEM** Method: **A4500-H B-11**

LCS		Sample ID: WLCSW1-180112-R228067			Units: s.u.			Analysis Date: 1/12/2018 02:20 PM		
Client ID:		Run ID: WETCHEM_180112F			SeqNo: 4847053		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.94	0.10	4	0	98.5	90-110	0	0	0	
DUP		Sample ID: 1801284-01C DUP			Units: s.u.			Analysis Date: 1/12/2018 02:20 PM		
Client ID:		Run ID: WETCHEM_180112F			SeqNo: 4847055		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	7.78	0.10	0	0	0	0-0	7.78	0	0	20
DUP		Sample ID: 1801438-01B DUP			Units: s.u.			Analysis Date: 1/12/2018 02:20 PM		
Client ID: MW-3		Run ID: WETCHEM_180112F			SeqNo: 4847060		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	6.37	0.10	0	0	0	0-0	6.4	0.47	0	20

The following samples were analyzed in this batch:

1801438-01B	1801438-02B	1801438-03B
1801438-04B	1801438-05B	1801438-06B
1801438-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **R228140** Instrument ID **IC3** Method: **E300.0**

MBLK	Sample ID: CCB/MBLK-R228140			Units: mg/L		Analysis Date: 1/12/2018 10:27 AM		
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Client ID:	Run ID: IC3_180112A			SeqNo: 4848121	Prep Date:	DF: 1		
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
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Chloride	ND	1.0								
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Fluoride	ND	0.10								
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Sulfate	ND	1.0								
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LCS	Sample ID: LCS-R228140			Units: mg/L		Analysis Date: 1/12/2018 10:47 AM		
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Client ID:	Run ID: IC3_180112A			SeqNo: 4848122	Prep Date:	DF: 1		
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
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Chloride	9.565	1.0	10	0	95.7	90-110		0		
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Fluoride	2.011	0.10	2	0	101	90-110		0		
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Sulfate	9.821	1.0	10	0	98.2	90-110		0		
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MS	Sample ID: 1801438-01B MS			Units: mg/L		Analysis Date: 1/12/2018 04:12 PM		
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Client ID: MW-3	Run ID: IC3_180112A			SeqNo: 4848139	Prep Date:	DF: 250		
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
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Chloride	2621	250	2500	201	96.8	80-120		0		
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Fluoride	520.4	25	500	0	104	80-120		0		
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Sulfate	3738	250	2500	1193	102	80-120		0		
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MSD	Sample ID: 1801438-01B MSD			Units: mg/L		Analysis Date: 1/12/2018 04:31 PM		
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Client ID: MW-3	Run ID: IC3_180112A			SeqNo: 4848140	Prep Date:	DF: 250		
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Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
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Chloride	2621	250	2500	201	96.8	80-120	2621	0.0143	20	
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Fluoride	520	25	500	0	104	80-120	520.4	0.0721	20	
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Sulfate	3711	250	2500	1193	101	80-120	3738	0.705	20	
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The following samples were analyzed in this batch:

1801438-01B	1801438-02B	1801438-03B
1801438-04B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1801438
Project: Holland Board of Public Works (73-160017-04)

QC BATCH REPORT

Batch ID: **R228227** Instrument ID **IC3** Method: **E300.0**

MBLK	Sample ID: CCB/MBLK-R228227			Units: mg/L		Analysis Date: 1/15/2018 10:49 AM		
Client ID:	Run ID: IC3_180115A			SeqNo: 4849873		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride ND 1.0
Fluoride ND 0.10
Sulfate ND 1.0

LCS	Sample ID: LCS-R228227			Units: mg/L		Analysis Date: 1/15/2018 11:08 AM		
Client ID:	Run ID: IC3_180115A			SeqNo: 4849874		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 9.535 1.0 10 0 95.4 90-110 0
Fluoride 1.949 0.10 2 0 97.4 90-110 0
Sulfate 9.664 1.0 10 0 96.6 90-110 0

MS	Sample ID: 1801512-01B MS			Units: mg/L		Analysis Date: 1/15/2018 02:59 PM		
Client ID:	Run ID: IC3_180115A			SeqNo: 4849884		Prep Date:		DF: 250
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 2465 250 2500 88.65 95.1 80-120 0
Fluoride 504.4 25 500 0 101 80-120 0
Sulfate 3348 250 2500 847.7 100 80-120 0

MSD	Sample ID: 1801512-01B MSD			Units: mg/L		Analysis Date: 1/15/2018 03:57 PM		
Client ID:	Run ID: IC3_180115A			SeqNo: 4849887		Prep Date:		DF: 250
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 2467 250 2500 88.65 95.1 80-120 2465 0.076 20
Fluoride 504.4 25 500 0 101 80-120 504.4 0.00496 20
Sulfate 3340 250 2500 847.7 99.7 80-120 3348 0.256 20

The following samples were analyzed in this batch:

1801438-05B	1801438-06B	1801438-07B
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Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Cincinnati, OH
+1 513 733 5336Everett, WA
+1 425 356 2600Fort Collins, CO
+1 970 490 1511Holland, MI
+1 616 399 6070

Chain of Custody Form

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COC ID: 47226

Houston, TX
+1 281 530 5656Middletown, PA
+1 717 944 5541Spring City, PA
+1 610 948 4903Salt Lake City, UT
+1 801 266 7700South Charleston, WV
+1 304 356 3168York, PA
+1 717 505 5280

Customer Information		Project Information		Parameter/Method Request for Analysis									
Purchase Order		Project Name		A	Metals								
Work Order		Project Number	73-160017-04	B	Li+ Na+								
Company Name	NTH Consultants, Ltd.	Bill To Company	NTH Consultants, Ltd.	C	Chloride, Fluoride, Sulfate								
Send Report To	Karen Okonta	Invoice Attn	Accounts Payable	D	pH								
Address	41780 Six Mile Road	Address	41780 Six Mile Road	E	TDS								
City/State/Zip	Northville, MI 48168	City/State/Zip	Northville, MI 48168	F	Radium 226 & 228								
Phone	(248) 662-2668	Phone	(248) 662-2668	G									
Fax	(248) 324-5305	Fax	(248) 324-5305	H									
e-Mail Address	KOKONTA@NTHCONSULTANTS.COM	e-Mail Address		I									
J													

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	MW-3	1-10-18	1:50 P	GW	NITRIC	3											
2	MW-2	1-10-18	3:20 P	GW													
3	EQUIPMENT BLANK	1-10-18	3:30 P	DW													
4	FIELD BLANK	1-10-18	3:40 P	DW													
5	MW-1	1-10-18	4:25P	GW													
6	PZ-1	1-10-18	4:50 P	GW													
7	MATRIX SPIKE	1-10-18	—	GW													
8	MATRIX SPIKE DUPLICATE	1-10-18	—	GW													
9	FIELD DUPLICATE	1-10-18	—	GW													
10																	

Sampler(s) Please Print & Sign

PHILIP HEROUT

Shipment Method

Turnaround Time in Business Days (BD)

 Other _____

Results Due Date:

 10 BD 5 BD 3 BD 2 BD 1 BD

Relinquished by:

Date: 1-10-18

Time: 5:21

Received by:

Notes:

Relinquished by:

Date:

Time:

Received by (Laboratory):

Cooler ID

Cooler Temp

QC Package: (Check One Box Below)

 Level II Std QC TRRP Checklist Level III Std QC/Raw Data TRRP Level IV Level IV SW846/CLP Other _____

Logged by (Laboratory):

Date: 1-11-18

Time: 0830

Checked by (Laboratory):

SPZ

1-2°C

Preservative Key: 1-HCl 2-HNO₃ 3-H₂SO₄ 4-NaOH 5-Na₂S₂O₃ 6-NaHSO₄ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2012 by ALS Environmental.

ALS Group, USA

Sample Receipt Checklist

Client Name: NTH - NORTHLILLE

Date/Time Received: 10-Jan-18 17:21

Work Order: 1801438

Received by: JG

Checklist completed by Diane Shaw

eSignature

11-Jan-18

Date

Reviewed by: Chad Whetton

eSignature

11-Jan-18

Date

Matrices: Groundwater

Carrier name: Client

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample(s) received on ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>1.2/1.2 c</u> <u>SR2</u>		
Cooler(s)/Kit(s):	<u></u>		
Date/Time sample(s) sent to storage:	<u>1/11/2018 11:30:39 AM</u>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted by:	<u>-</u>		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:



09-Mar-2018

Karen Okonta
NTH Consultants, Ltd.
41780 Six Mile Road
Northville, MI 48168

Re: **Holland Board of Public Works (73-160017-04)**

Work Order: **1801438**

Dear Karen,

ALS Environmental received 7 samples on 10-Jan-2018 05:21 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 28.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Report of Laboratory Analysis

Certificate No: MI: 0022

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04)
Work Order: 1801438

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1801438-01	MW-3	Groundwater		1/10/2018 13:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-02	MW-2	Groundwater		1/10/2018 15:20	1/10/2018 17:21	<input type="checkbox"/>
1801438-03	Equipment Blank	Water		1/10/2018 15:30	1/10/2018 17:21	<input type="checkbox"/>
1801438-04	Field Blank	Water		1/10/2018 15:40	1/10/2018 17:21	<input type="checkbox"/>
1801438-05	MW-1	Groundwater		1/10/2018 16:25	1/10/2018 17:21	<input type="checkbox"/>
1801438-06	PZ-1	Groundwater		1/10/2018 16:50	1/10/2018 17:21	<input type="checkbox"/>
1801438-07	Field Duplicate	Groundwater		1/10/2018	1/10/2018 17:21	<input type="checkbox"/>

Client: NTH Consultants, Ltd.**Project:** Holland Board of Public Works (73-160017-04)**Work Order:** 1801438**Case Narrative**

Radium-226/228 analysis performed by ALS Fort Collins laboratory.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-3 **Lab ID:** 1801438-01
Collection Date: 1/10/2018 01:50 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 09-Mar-18

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-2 **Lab ID:** 1801438-02
Collection Date: 1/10/2018 03:20 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES Subcontracted Analyses		See attached			SUBCONTRACT as noted	1 Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 09-Mar-18

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Equipment Blank **Lab ID:** 1801438-03
Collection Date: 1/10/2018 03:30 PM **Matrix:** WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 09-Mar-18

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Field Blank **Lab ID:** 1801438-04
Collection Date: 1/10/2018 03:40 PM **Matrix:** WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES Subcontracted Analyses		See attached			SUBCONTRACT as noted	1 Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 09-Mar-18

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: MW-1 **Lab ID:** 1801438-05
Collection Date: 1/10/2018 04:25 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES Subcontracted Analyses		See attached		SUBCONTRACT as noted	1	Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: PZ-1 **Lab ID:** 1801438-06
Collection Date: 1/10/2018 04:50 PM **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 09-Mar-18

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works (73-160017-04) **Work Order:** 1801438
Sample ID: Field Duplicate **Lab ID:** 1801438-07
Collection Date: 1/10/2018 **Matrix:** GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES Subcontracted Analyses		See attached		SUBCONTRACT as noted	1	Analyst: ALS 2/12/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Cincinnati, OH
+1 513 733 5336Everett, WA
+1 425 356 2600Fort Collins, CO
+1 970 490 1511Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 1

COC ID: 47226

Houston, TX
+1 281 530 5656Middletown, PA
+1 717 944 5541Spring City, PA
+1 610 948 4903Salt Lake City, UT
+1 801 266 7700South Charleston, WV
+1 304 356 3168York, PA
+1 717 505 5280

Customer Information		Project Information		Parameter/Method Request for Analysis													
Purchase Order		Project Name		A	Matrix												
Work Order		Project Number	73-160017-04	B	1110												
Company Name	NTH Consultants, Ltd.	Bill To Company	NTH Consultants, Ltd.	C	Chloride, Fluoride, Sulfate												
Send Report To	Karen Okonta	Invoice Attn	Accounts Payable	D	pH												
Address	41780 Six Mile Road	Address	41780 Six Mile Road	E	TDS												
City/State/Zip	Northville, MI 48168	City/State/Zip	Northville, MI 48168	F	Radium 226 & 228												
Phone	(248) 662-2668	Phone	(248) 662-2668	G													
Fax	(248) 324-5305	Fax	(248) 324-5305	H													
e-Mail Address	KOKONTA@NTHCONSULTANTS.COM	e-Mail Address		I													
J																	
No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	MW-3	1-10-18	1:50 P	GW	NITRIC	3											
2	MW-2	1-10-18	3:20 P	GW													
3	EQUIPMENT BLANK	1-10-18	3:30 P	DI													
4	FIELD BLANK	1-10-18	3:40 P	DI													
5	MW-1	1-10-18	4:25P	GW													
6	PZ-1	1-10-18	4:50 P	GW													
7	MATRIX SPIKE	1-10-18	—	GW													
8	MATRIX SPIKE DUPLICATE	1-10-18	—	GW													
9	FIELD DUPLICATE	1-10-18	—	GW													
10																	

Sampler(s) Please Print & Sign

PHILIP HEROUT

Shipment Method

Turnaround Time in Business Days (BD)

 Other _____

Results Due Date:

 10 BD 5 BD 3 BD 2 BD 1 BD

Relinquished by:

Date: 1-10-18

Time: 5:21

Received by:

Notes:

Relinquished by:

Date:

Time:

Received by (Laboratory):

Cooler ID

Cooler Temp

QC Package: (Check One Box Below)

- Level II Std QC
 Level III Std QC/Raw Data
 Level IV SW846/CLP
 Other

- TRRP Checklist
 TRRP Level IV

Logged by (Laboratory):

Date: 1-11-18

Time: 0830

Checked by (Laboratory):

SPZ

12°C

Preservative Key: 1-HCl 2-HNO₃ 3-H₂SO₄ 4-NaOH 5-Na₂S₂O₃ 6-NaHSO₄ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2012 by ALS Environmental.



Wednesday, February 07, 2018

Chad Whelton
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Re: ALS Workorder: 1801141
Project Name:
Project Number: 1801438

Dear Mr. Whelton:

Seven water samples were received from ALS Environmental, on 1/12/2018. The samples were scheduled for the following analyses:

Radium-226

Radium-228

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "JJ Kujawa".

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1801141

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to the current revision of SOP 724.

All acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1801141

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 1801438

Client PO Number: 20-1801438

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
MW-2	1801141-1		WATER	10-Jan-18	15:20
Equipment Blank	1801141-2		WATER	10-Jan-18	15:30
Field Blank	1801141-3		WATER	10-Jan-18	15:40
MW-1	1801141-4		WATER	10-Jan-18	16:25
PZ-1	1801141-5		WATER	10-Jan-18	16:50
Field Duplicate	1801141-6		WATER	10-Jan-18	
MW-3	1801141-7		WATER	10-Jan-18	13:50



Subcontractor:

ALS Environmental, Fort Collins
225 Commerce Dr.
Fort Collins, CO 80524

TEL: (800) 443-1511
FAX:
Acct #:

1801141

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Date: 11-Jan-18
COC ID: 8433
Due D 09-Feb-18

Salesperson Brian Root

Customer Information		Project Information		Parameter/Method Request for Analysis										
Purchase Order		Project Name 1801438		A Subcontracted Analyses (SUBCONTRACT) <i>Radium 226/228</i>										
Work Order		Project Number		B <i>MS/MSD</i>										
Company Name	ALS Group USA, Corp	Bill To Company	ALS Group USA, Corp	C										
Send Report To	Chad Whelton	Inv Attn	Accounts Payable	D										
Address	3352 128th Ave	Address	3352 128th Ave	E										
				F										
City/State/Zip	Holland, Michigan 49424	City/State/Zip	Holland, Michigan 49424	G										
Phone	(616) 399-6070	Phone	(616) 399-6070	H										
Fax	(616) 399-6185	Fax	(616) 399-6185	I										
eMail Address	chad.whelton@alsglobal.com	eMail CC		J										
ALS Sample ID	Client Sample ID	Matrix	Collection Date 24hr	Bottle	A	B	C	D	E	F	G	H	I	J
1 1801438-02C	MW-2	Groundwater	10/Jan/2018 15:20	(1) 1LPHNO3	X									
2 1801438-03C	Equipment Blank	Water	10/Jan/2018 15:30	(1) 1LPHNO3	X									
3 1801438-04C	Field Blank	Water	10/Jan/2018 15:40	(1) 1LPHNO3	X									
4 1801438-05C	MW-1	Groundwater	10/Jan/2018 16:25	(1) 1LPHNO3	X									
5 1801438-06C	PZ-1	Groundwater	10/Jan/2018 16:50	(1) 1LPHNO3	X									
6 1801438-07C	Field Duplicate	Groundwater	10/Jan/2018	(1) 1LPHNO3	X									
7 1801438-01C	MW-3	Groundwater	10/Jan/2018 13:50	(3) 1LPHNO3	X	X								

Comments:

Please analyze these samples per our instructions and indicated turnaround requirements. Please include all QC with data. The samples do not need to be returned and can be disposed after 30 days.

Relinquished by:	Date/Time 1-11-18 1500	Received by:	Date/Time 1-12-18 1030	Cooler IDs	Report/QC Level Std
Relinquished by: _____	Date/Time _____	Received by: _____	Date/Time _____	_____	_____



ALS Environmental - Fort Collins

Client: ALS - Holland

Workorder No: 1801141

Project Manager:

Initials: CRT Date: 1-12-18

1. Does this project require any special handling in addition to standard ALS procedures?	YES	NO		
2. Are custody seals on shipping containers intact?	<u>NONE</u>	YES	NO	
3. Are Custody seals on sample containers intact?	<u>NONE</u>	YES	NO	
4. Is there a COC (Chain-of-Custody) present or other representative documents?	<u>YES</u>	NO		
5. Are the COC and bottle labels complete and legible?	<u>YES</u>	NO		
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)	<u>YES</u>	NO		
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<u>YES</u>	NO	
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<u>YES</u>	NO	
9. Are all aqueous non-preserved samples pH 4-9?	<u>N/A</u>	YES	NO	
10. Is there sufficient sample for the requested analyses?	<u>YES</u>	NO		
11. Were all samples placed in the proper containers for the requested analyses?	<u>YES</u>	NO		
12. Are all samples within holding times for the requested analyses?	<u>YES</u>	NO		
13. Were all sample containers received intact? (not broken or leaking, etc.)	<u>YES</u>	NO		
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	<u>N/A</u>	YES	NO	
15. Do any water samples contain sediment?	Amount	N/A	YES	NO
Amount of sediment: ____ dusting ____ moderate ____ heavy				
16. Were the samples shipped on ice?	<u>YES</u>	<u>NO</u>		
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #2 #4	RAD ONLY	YES	<u>NO</u>
Cooler #: <u>1</u>				
Temperature (°C): <u>Amb</u>				
No. of custody seals on cooler: <u>0</u>				
External µR/hr reading: <u>10</u>				
Background µR/hr reading: <u>10</u>				
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES / NO / NA</u> (If no, see Form 008.)				

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

THE 1990S: A DECADE OF CHALLENGE, DISAPPOINTMENT AND HIGH

If applicable, was the client contacted? YES / NO / Contact: _____ Date/Time: _____

Project Manager Signature / Date: **1-16-08**

*IR Gun #2: Oakton, SN 29922500201-0066

1801141

Ref:	Date: 11Jan18	SHIPPING:	75.11
Dep:	Wgt: 28.10 LBS	SPECIAL:	4.32
DV:		HANDLING:	0.00
		TOTAL:	79.43

Svcs: PRIORITY OVERNIGHT
TRCK: 7261 2424 2700

ORIGIN ID:GRRA (616) 399-6070
SAMPLE RECEIVING
ALS ENVIRONMENTAL
3352 128TH AVENUE
HOLLAND, MI 494249263
UNITED STATES US

SHIP DATE: 11JAN18
ACT WGT: 28.10 LB
CAD: 0122071/CAFE3108

BILL TO SENDER

TO **SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR**

FORT COLLINS CO 80524

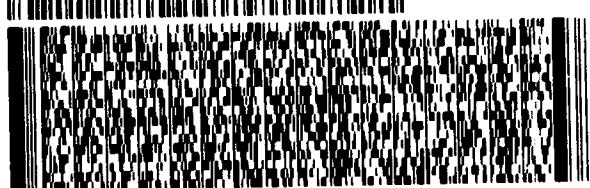
(970) 490-1611

REF:

TRK#:

PO#:

DEPT:



TRK# **7261 2424 2700**
PO# **0201**

FRI - 12 JAN 10:30A
PRIORITY OVERNIGHT

NA FTCA

80524
CO-US DEN



Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: MW-2 **Lab ID:** 1801141-1
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 15:20 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.13)	U	0.24	pCi/l	NA	2/6/2018 13:43
Carr: BARIUM	91.6		40-110	%REC	DL = NA	2/6/2018 13:43
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.4)	U	0.91	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	96.8		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: Equipment Blank **Lab ID:** 1801141-2
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 15:30 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.43 (+/- 0.21)		0.2	pCi/l	NA	2/6/2018 13:43
Carr: BARIUM	91.8		40-110	%REC	DL = NA	2/6/2018 13:43
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.49)	U	0.93	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	92.4		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: Field Blank **Lab ID:** 1801141-3
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 15:40 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.23 (+/- 0.16)		0.19	pCi/l	NA	2/6/2018 13:43
Carr: BARIUM	93.6		40-110	%REC	DL = NA	2/6/2018 13:43
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.39)	U	0.89	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	97.3		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: MW-1 **Lab ID:** 1801141-4
Legal Location:
Collection Date: 1/10/2018 16:25 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.13)	U	0.22	pCi/l	NA	2/6/2018 13:43
Carr: BARIUM	91		40-110	%REC	DL = NA	2/6/2018 13:43
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.42)	U	0.96	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	94.8		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental
Project: 1801438
Sample ID: PZ-1
Legal Location:
Collection Date: 1/10/2018 16:50

Date: 07-Feb-18
Work Order: 1801141
Lab ID: 1801141-5
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			PAI 783		Prep Date: 1/26/2018	PrepBy: SKC
Ra-226	0.63 (+/- 0.27)			0.2 pCi/l	NA	2/6/2018 14:15
Carr: BARIUM	90.7			40-110 %REC	DL = NA	2/6/2018 14:15
Radium-228 Analysis by GFPC			PAI 724		Prep Date: 1/22/2018	PrepBy: ARS
Ra-228	ND (+/- 0.48)	U		0.9 pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	95.2			40-110 %REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: Field Duplicate **Lab ID:** 1801141-6
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.17)	U	0.24	pCi/l	NA	2/6/2018 14:15
Carr: BARIUM	86.3		40-110	%REC	DL = NA	2/6/2018 14:15
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.47)	U,M	1.01	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	89.5		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: MW-3 **Lab ID:** 1801141-7
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 13:50 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.46 (+/- 0.18)		0.07	pCi/l	NA	2/6/2018 14:15
Carr: BARIUM	92.9		40-110	%REC	DL = NA	2/6/2018 14:15
Radium-228 Analysis by GFPC						
Ra-228	0.73 (+/- 0.36)		0.61	pCi/l	NA	1/26/2018 09:05
Carr: BARIUM	95.5		40-110	%REC	DL = NA	1/26/2018 09:05

Client: ALS Environmental **Date:** 07-Feb-18
Project: 1801438 **Work Order:** 1801141
Sample ID: MW-3 **Lab ID:** 1801141-7
Legal Location: **Matrix:** WATER
Collection Date: 1/10/2018 13:50 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: 2/7/2018 2:37:3

Client: ALS Environmental
Work Order: 1801141
Project: 1801438

QC BATCH REPORT

Batch ID: RE180126-1-1			Instrument ID Alpha Scin			Method: Radium-226 by Radon Emanation					
DUP	Sample ID: 1801141-7						Units: pCi/l		Analysis Date: 2/6/2018 14:15		
Client ID: MW-3	Run ID: RE180126-1A						Prep Date: 1/26/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.26 (+/- 0.13)	0.14						0.46	0.9	2.1	LT
Carr: BARIUM	28760		31260		92	40-110		29120			
LCS	Sample ID: RE180126-1						Units: pCi/l		Analysis Date: 2/6/2018 14:15		
Client ID:	Run ID: RE180126-1A						Prep Date: 1/26/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	36.6 (+/- 9)	0.2	30.89		118	67-120					P
Carr: BARIUM	26160		31060		84.2	40-110		26160			
LCSD	Sample ID: RE180126-1						Units: pCi/l		Analysis Date: 2/6/2018 14:15		
Client ID:	Run ID: RE180126-1A						Prep Date: 1/26/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	34.1 (+/- 8.4)	0.1	30.89		110	67-120		36.6	0.2	2.1	P
Carr: BARIUM	26740		31070		86.1	40-110		26160			
MB	Sample ID: RE180126-1						Units: pCi/l		Analysis Date: 2/6/2018 14:15		
Client ID:	Run ID: RE180126-1A						Prep Date: 1/26/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.103									U
Carr: BARIUM	29080		31060		93.6	40-110					
The following samples were analyzed in this batch:			1801141-1 1801141-2 1801141-3			1801141-4 1801141-5 1801141-7					

Client: ALS Environmental
Work Order: 1801141
Project: 1801438

QC BATCH REPORT

Batch ID: **RA180122-1-3**

Instrument ID **LB4100-c**

Method: **Radium-228 Analysis by GFPC**

DUP	Sample ID: 1801141-7			Units: pCi/l		Analysis Date: 1/26/2018 09:05					
Client ID:	Run ID: RA180122-1A			Prep Date: 1/22/2018					DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	ND	0.6							0.73	0.4	2.1
Carr: BARIUM	30430		32030	95	40-110				30690		

LCS	Sample ID: RA180122-1			Units: pCi/l		Analysis Date: 1/26/2018 08:52					
Client ID:	Run ID: RA180122-1A			Prep Date: 1/22/2018					DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	4.6 (+/- 1.4)	1.1	6.358	73.1	70-130						P,M3
Carr: BARIUM	30790		31830	96.7	40-110				30790		

LCSD	Sample ID: RA180122-1			Units: pCi/l		Analysis Date: 1/26/2018 08:52					
Client ID:	Run ID: RA180122-1A			Prep Date: 1/22/2018					DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	6.6 (+/- 1.8)	1.1	6.358	103	70-130				4.6	0.9	2.1
Carr: BARIUM	30840		31840	96.9	40-110				30790		

MB	Sample ID: RA180122-1			Units: pCi/l		Analysis Date: 1/26/2018 09:16					
Client ID:	Run ID: RA180122-1A			Prep Date: 1/22/2018					DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	ND	0.65									U
Carr: BARIUM	31240		31840	98.1	40-110						

The following samples were analyzed in this batch:

1801141-1	1801141-2	1801141-3
1801141-4	1801141-5	1801141-6
1801141-7		



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: <u>JDY PP HOLLAND BW</u>	Date: <u>01-10-2013</u>
Project #: <u>73-160017-04</u>	Field Personnel: <u>P. HEROUT</u>
Site Location: <u>HOLLAND MI</u>	Well Const.: <u>SCH 40 PVC</u>
Well ID: <u>MW-1</u>	Casing Diameter: <u>2.0"</u>
Sample ID: <u>MW-1</u>	Screened Interval: <u>9.0'-14.0' Bas</u> (ft. from TOC) <u>(120'-17.0')</u>

PURGING DATA

Time: <u>10:30</u>	Start: <u>10:30</u>	Finish: <u>12:50</u>	Casing Vol.	3 Casing Vol.
Purging Volume		Casing Diameter (in)	Gal./Ft.	Gal./Ft.
Depth to Water (ft. from TOC) = <u>6.6</u>		1.5	0.10	0.30
Total Well Depth (ft. from TOC) = <u>16.93</u>		2	0.16	0.48
Height of Water in Well (ft.) = <u>10.33</u>		3	0.36	1.08
One Well Volume (gallons) = <u>1.65</u>		4	0.63	1.89
Gallons Purged: <u>≈ 5.0 (4.95)</u>		Purging Method: <u>PERISTALTIC</u>		
Well Volumes Purged: <u>3</u>		Purging Rate (gal./min.) <u>0.25</u>		
Was Well Purged Dry? Yes ~ <u>No</u>				

FIELD MONITORING PARAMETERS

Accum. Volume Purged (gal)	<u>≈ 12 gal</u> <u>4:00 PM</u>	<u>1.25 gal</u> <u>4:05 PM</u>	<u>2.5 gal</u> <u>4:10 PM</u>	<u>3.75 gal</u> <u>4:15 PM</u>	<u>5.0 gal</u> <u>4:20 PM</u>	FINAL SAMPLE <u>4:25</u>
pH (STU)	<u>6.83</u>	<u>6.81</u>	<u>6.82</u>	<u>6.83</u>	<u>6.84</u>	<u>6.83</u>
Temperature (C)	<u>6.9</u>	<u>6.8</u>	<u>6.9</u>	<u>6.9</u>	<u>6.8</u>	<u>6.8</u>
Conductivity (umhos)	<u>1899</u>	<u>1906</u>	<u>1894</u>	<u>1906</u>	<u>1896</u>	<u>1898</u>
ORP (mv)	—	—	—	—	—	—
Dissolved Oxygen (ppm)	—	—	—	—	—	—
Appearance/Color	—	—	—	—	—	—
Odor	—	—	—	—	—	—
Turbidity (NTU)	<u>2.3</u>	<u>5.4</u>	<u>7.3</u>	<u>11.4</u>	<u>15.7</u>	<u>16.3</u>

SAMPLING DATA

Time: <u>4:25</u>	Start: <u>4:30</u>	Finish: <u>4:30</u>	
Sample Collection Device:	<u>PERISTALTIC</u>		
Pump Rate (gpm): <u>0.2</u>	Packer Used?	Yes ~ No ~	
Sample Collection Depth (ft. from TOC):	<u>≈ 12.0 FT</u>		
Weather Conditions: <u>OVERCAST/RAIN/SNOW</u>	Air Temperature (F): <u>26-38°F</u>		
	Wind Speed/Direction: <u>0-10 MPH</u>		
	Other: <u>NA</u>		



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: <u>JDY PP HOLLAND B PW</u>	Date: <u>01-10-2019</u>
Project #: <u>73-160017-04</u>	Field Personnel: <u>P. HERAUT</u>
Site Location: <u>HOLLAND, MI</u>	Well Const.: <u>SCH 40 PVC</u>
Well ID: <u>MW-2</u>	Casing Diameter: <u>20"</u>
Sample ID: <u>MW-2</u>	Screened Interval: <u>8.0' - 13.0' BGS</u> (ft. from TOC) <u>(14.0' - 19.0')</u>

PURGING DATA

Time:	Start: <u>2:30</u>	Finish: <u>3:15</u>	Casing Diameter (in)	Casing Vol. Gal./Ft.	3 Casing Vol. Gal./Ft.
Purging Volume					
Depth to Water (ft. from TOC) =	<u>4.4</u>		1.5	0.10	0.30
Total Well Depth (ft. from TOC) =	<u>16.2</u>		2	0.16	0.48
Height of Water in Well (ft.) =	<u>11.8</u>		3	0.36	1.08
One Well Volume (gallons) =	<u>1.88</u>		4	0.63	1.89
Gallons Purged: <u>~5.70 (5.66)</u>		Purging Method: <u>PERISTALTIC</u>			
Well Volumes Purged: <u>3</u>		Purging Rate (gal./min.)	<u>0.13</u>		
Was Well Purged Dry? Yes ~ <u>No</u>					

FIELD MONITORING PARAMETERS

Accum. Volume Purged (gal)	<u>2:30</u>	<u>0.65</u>	<u>1.3</u>	<u>1.95</u>	<u>2.6</u>	FINAL <u>5.8</u> SAMPLE <u>9:30</u>
pH (STU)	<u>6.95</u>	<u>6.97</u>	<u>6.97</u>	<u>6.96</u>	<u>6.95</u>	<u>6.98</u>
Temperature (C)	<u>77.6</u>	<u>7.5</u>	<u>7.6</u>	<u>7.7</u>	<u>7.8</u>	<u>8.1</u>
Conductivity (umhos)	<u>2560</u>	<u>2559</u>	<u>2562</u>	<u>2560</u>	<u>2558</u>	<u>2557</u>
ORP (mv)	—	—	—	—	—	—
Dissolved Oxygen (ppm)	—	—	—	—	—	—
Appearance/Color	—	—	—	—	—	—
Odor	—	—	—	—	—	—
Turbidity (NTu)	<u>50</u>	<u>54</u>	<u>130</u>	<u>180</u>	<u>204</u>	<u>310</u>

SAMPLING DATA

Time: Start: <u>3:20</u> Finish: <u>3:25</u>	Packer Used? Yes ~ No ~
Sample Collection Device: <u>PERISTALTIC</u>	
Pump Rate (gpm): <u>0.23</u>	
Sample Collection Depth (ft. from TOC): <u>13 FT</u>	
Weather Conditions: <u>OVERCAST/RAIN/SNOW</u>	Air Temperature (F): <u>74-78°F</u>
	Wind Speed/Direction: <u>0-10 mph</u>
	Other: <u>NA</u>



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: JDY PP HOLLAND BSW
 Project #: 73-160017-04
 Site Location: HOLLAND, MI
 Well ID: MW-3
 Sample ID: MW-3

Date: 01-10-2013
 Field Personnel: P. HEROUT
 Well Const.: SCH 40 PVC
 Casing Diameter: 2.0"
 Screened Interval: 10.0' - 15.0' BGS
 (ft. from TOC) (13.0' - 18.0')

PURGING DATA

Time:	40 min Start:	1:00	Finish:	1:40	Casing Vol.	3 Casing Vol.
Purging Volume			Casing Diameter (in)	Gal./Ft.	Gal./Ft.	
Depth to Water (ft. from TOC)	=	4.8'	1.5	0.10	0.30	
Total Well Depth (ft. from TOC)	=	18.2'	2	0.16	0.48	
Height of Water in Well (ft.)	=	13.4'	3	0.36	1.08	
One Well Volume (gallons)	=	2.14	4	0.63	1.89	
Gallons Purged:	\approx	6.5 (6.4)	Purging Method:	PERISTALTIC		
Well Volumes Purged:		3	Purging Rate (gal./min.)	0.16		
Was Well Purged Dry?	Yes ~	No				

FIELD MONITORING PARAMETERS

Accum. Volume Purged (gal)	1:07	1:12	1:17	1:22	1:27	FINAL SAMPLE 1:40
pH (STU)	6.19	6.18	6.17	6.16	6.15	6.14
Temperature (C)	10.5	10.6	10.6	10.8	10.8	10.8
Conductivity (umhos)	3131	3130	3130	3133	3132	3135
ORP (mv)	—	—	—	—	—	—
Dissolved Oxygen (ppm)	—	—	—	—	—	—
Appearance/Color	—	—	—	—	—	—
Odor	—	—	—	—	—	—
Turbidity (NTU)	100	86	70	63	55	48

SAMPLING DATA

Time:	Start: 1:40	Finish: 1:50
Sample Collection Device:		
Pump Rate (gpm):	0.15	Packer Used? Yes ~ No ~
Sample Collection Depth (ft. from TOC):		\approx 15.0'
Weather Conditions:	Air Temperature (F):	26 - 38°F
OVERCAST / RAIN / SNOW	Wind Speed/Direction:	0 - 10 MPH S
	Other:	NA



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: JDY RP HOLLAND BSW
 Project #: 73-160017-04
 Site Location: HOLLAND MI
 Well ID: PZ-1
 Sample ID: PZ-1

Date: 01-10-2018
 Field Personnel: P. HEROUT
 Well Const.: PVC
 Casing Diameter: 2"
 Screened Interval: BOTTOM, NA
 (ft. from TOC) NA

PURGING DATA

Time:	Start:	Finish:	Casing Diameter (in)	Casing Vol. Gal/Ft.	3 Casing Vol. Gal/Ft.
	Purging Volume				
Depth to Water (ft. from TOC) =	10.3		1.5	0.10	0.30
Total Well Depth (ft. from TOC) =	13.6		2	0.16	0.48
Height of Water in Well (ft.) =	3.3		3	0.36	1.08
One Well Volume (gallons) =	0.528		4	0.63	1.89
Gallons Purged: 1.6 (1.58)		Purging Method: PERISTALTIC			
Well Volumes Purged: 3		Purging Rate (gal/min): 0.5			
Was Well Purged Dry? Yes ~ No ~	DRAW DOWN EXCEEDED PLATEL SPACES. → 3X, RETURN TO SAMPLE	LOW FLOW PURGE EXCEEDED DRAW-DOWN, PURGE 3 VOL, RETURN IN PM.			

FIELD MONITORING PARAMETERS

Accum. Volume Purged (gal)	0.5 GAL	1.5 gal			FINAL SAMPLE
pH (STU)	8.2	8.2			
Temperature (C)	5.7	10.2			
Conductivity (umhos)	1876	1918			
ORP (mv)					
Dissolved Oxygen (ppm)					
Appearance/Color					
Odor					
Turbidity (NTU)	9.7	30.9			

SAMPLING DATA

Time: Start: 4:40	Finish: 4:50
Sample Collection Device:	PERISTALTIC
Pump Rate (gpm): 0.25	Packer Used? Yes ~ No ~
Sample Collection Depth (ft. from TOC): ~ 11.5 FT BGS	
Weather Conditions: OVERCAST/RAIN/SNOW	Air Temperature (F): 26 - 38°F
	Wind Speed/Direction: 0 - 10 MPH S
	Other: NA



31-May-2018

Karen Okonta
NTH Consultants, Ltd.
41780 Six Mile Road
Northville, MI 48168

Re: **Holland Board of Public Works**

Work Order: **1804124**

Dear Karen,

ALS Environmental received 7 samples on 03-Apr-2018 05:13 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 43.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Report of Laboratory Analysis

Certificate No: MI: 0022

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1804124

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1804124-01	PZ-1	Groundwater		4/3/2018 10:50	4/3/2018 17:13	<input type="checkbox"/>
1804124-02	MW-1	Groundwater		4/3/2018 12:30	4/3/2018 17:13	<input type="checkbox"/>
1804124-03	MW-2	Groundwater		4/3/2018 14:30	4/3/2018 17:13	<input type="checkbox"/>
1804124-04	MW-3	Groundwater		4/3/2018 16:20	4/3/2018 17:13	<input type="checkbox"/>
1804124-05	Equipment Blank	Groundwater		4/3/2018	4/3/2018 17:13	<input type="checkbox"/>
1804124-06	Field Blank	Groundwater		4/3/2018	4/3/2018 17:13	<input type="checkbox"/>
1804124-07	Field Duplicate	Groundwater		4/3/2018	4/3/2018 17:13	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1804124

Case Narrative

Per 40CFR Part 136 Table II Sample Handling Guidelines:

The holding time associated with the following parameters is defined as not to exceed 15 minutes:

Hydrogen Ion (pH)

Results for analyses conducted in the laboratory, for the above noted parameters, shall be considered non-compliant.

Radium-226/228 analysis performed by ALS Fort Collins laboratory.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
WorkOrder: 1804124

**QUALIFIERS,
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

<u>Units Reported</u>	<u>Description</u>
as noted	
mg/L	Milligrams per Liter
s.u.	Standard Units

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: PZ-1
Collection Date: 4/3/2018 10:50 AM

Work Order: 1804124
Lab ID: 1804124-01
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:19 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:07 PM
Arsenic	0.042		0.0050	mg/L	1	4/7/2018 01:07 PM
Barium	0.032		0.0050	mg/L	1	4/7/2018 01:07 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:07 PM
Boron	0.24		0.20	mg/L	10	4/9/2018 02:01 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:07 PM
Calcium	28		0.50	mg/L	1	4/7/2018 01:07 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:07 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:07 PM
Lead	0.023		0.0050	mg/L	1	4/7/2018 01:07 PM
Lithium	ND		0.010	mg/L	1	4/7/2018 01:07 PM
Molybdenum	0.12		0.0050	mg/L	1	4/7/2018 01:07 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:07 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:07 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	140		100	mg/L	10	4/10/2018 01:46 PM
Fluoride	ND		1.0	mg/L	1	4/10/2018 01:27 PM
Sulfate	11		10	mg/L	1	4/10/2018 01:27 PM
PH (LABORATORY)						
pH (laboratory)	8.55	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	550		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-1
Collection Date: 4/3/2018 12:30 PM

Work Order: 1804124
Lab ID: 1804124-02
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:22 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Arsenic	0.021		0.0050	mg/L	1	4/7/2018 01:09 PM
Barium	0.27		0.0050	mg/L	1	4/7/2018 01:09 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:09 PM
Boron	0.95		0.20	mg/L	10	4/9/2018 02:02 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:09 PM
Calcium	130		0.50	mg/L	1	4/7/2018 01:09 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Lead	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Lithium	0.11		0.010	mg/L	1	4/7/2018 01:09 PM
Molybdenum	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:09 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		250	mg/L	25	4/10/2018 02:25 PM
Fluoride	ND		1.0	mg/L	1	4/10/2018 02:05 PM
Sulfate	ND		50	mg/L	5	4/11/2018 12:12 PM
PH (LABORATORY)						
pH (laboratory)	6.99	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	480		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-2
Collection Date: 4/3/2018 02:30 PM

Work Order: 1804124
Lab ID: 1804124-03
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:24 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Arsenic	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Barium	0.21		0.0050	mg/L	1	4/7/2018 01:11 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:11 PM
Boron	0.60		0.20	mg/L	10	4/9/2018 02:04 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:11 PM
Calcium	90		0.50	mg/L	1	4/7/2018 01:11 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Lead	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Lithium	0.011		0.010	mg/L	1	4/7/2018 01:11 PM
Molybdenum	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:11 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	570		500	mg/L	50	4/10/2018 03:41 PM
Fluoride	ND		5.0	mg/L	5	4/10/2018 03:22 PM
Sulfate	ND		50	mg/L	5	4/10/2018 03:22 PM
PH (LABORATORY)						
pH (laboratory)	7.05	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	680		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-3
Collection Date: 4/3/2018 04:20 PM

Work Order: 1804124
Lab ID: 1804124-04
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:32 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Arsenic	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Barium	0.038		0.0050	mg/L	1	4/7/2018 01:16 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:16 PM
Boron	0.70		0.20	mg/L	10	4/9/2018 02:14 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:16 PM
Calcium	360		5.0	mg/L	10	4/9/2018 01:28 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Lead	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Lithium	0.029		0.010	mg/L	1	4/7/2018 01:16 PM
Molybdenum	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:16 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		1,000	mg/L	100	4/10/2018 04:20 PM
Fluoride	ND		10	mg/L	10	4/10/2018 04:01 PM
Sulfate	1,300		1,000	mg/L	100	4/10/2018 04:20 PM
PH (LABORATORY)						
pH (laboratory)	6.51	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,300		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Equipment Blank
Collection Date: 4/3/2018

Work Order: 1804124
Lab ID: 1804124-05
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:35 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Arsenic	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Barium	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:19 PM
Boron	ND		0.020	mg/L	1	4/9/2018 01:15 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:19 PM
Calcium	ND		0.50	mg/L	1	4/7/2018 01:19 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Lead	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Lithium	ND		0.010	mg/L	1	4/7/2018 01:19 PM
Molybdenum	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:19 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		10	mg/L	1	4/10/2018 04:39 PM
Fluoride	ND		1.0	mg/L	1	4/10/2018 04:39 PM
Sulfate	ND		10	mg/L	1	4/10/2018 04:39 PM
PH (LABORATORY)						
pH (laboratory)	5.90	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank
Collection Date: 4/3/2018

Work Order: 1804124
Lab ID: 1804124-06
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 12:37 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Arsenic	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Barium	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Beryllium	ND		0.0020	mg/L	1	4/7/2018 01:20 PM
Boron	ND		0.020	mg/L	1	4/9/2018 01:17 PM
Cadmium	ND		0.0020	mg/L	1	4/7/2018 01:20 PM
Calcium	ND		0.50	mg/L	1	4/7/2018 01:20 PM
Chromium	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Cobalt	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Lead	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Lithium	ND		0.010	mg/L	1	4/7/2018 01:20 PM
Molybdenum	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Selenium	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
Thallium	ND		0.0050	mg/L	1	4/7/2018 01:20 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		10	mg/L	1	4/10/2018 04:58 PM
Fluoride	ND		1.0	mg/L	1	4/10/2018 04:58 PM
Sulfate	ND		10	mg/L	1	4/10/2018 04:58 PM
PH (LABORATORY)						
pH (laboratory)	5.84	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		10	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate
Collection Date: 4/3/2018

Work Order: 1804124
Lab ID: 1804124-07
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	4/10/2018 11:46 AM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Arsenic	0.022		0.0050	mg/L	1	4/9/2018 02:29 PM
Barium	0.27		0.0050	mg/L	1	4/9/2018 02:29 PM
Beryllium	ND		0.0020	mg/L	1	4/9/2018 02:29 PM
Boron	0.97		0.020	mg/L	1	4/9/2018 02:29 PM
Cadmium	ND		0.0020	mg/L	1	4/9/2018 02:29 PM
Calcium	130		0.50	mg/L	1	4/9/2018 02:29 PM
Chromium	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Cobalt	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Lead	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Lithium	0.10		0.010	mg/L	1	4/9/2018 02:29 PM
Molybdenum	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Selenium	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
Thallium	ND		0.0050	mg/L	1	4/9/2018 02:29 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		250	mg/L	25	4/11/2018 12:51 PM
Fluoride	ND		1.0	mg/L	1	4/11/2018 12:32 PM
Sulfate	ND		50	mg/L	5	4/11/2018 02:27 PM
PH (LABORATORY)						
pH (laboratory)	7.00	H	0.100	s.u.	1	4/5/2018 05:30 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	980		20	mg/L	1	4/6/2018 02:18 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 5/30/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: 116555		Instrument ID HG1		Method: SW7470A											
MBLK		Sample ID: MBLK-116555-116555			Units: mg/L		Analysis Date: 4/10/2018 12:14 PM								
Client ID:		Run ID: HG1_180410A			SeqNo: 4974824		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		ND	0.00020												
LCS		Sample ID: LCS-116555-116555			Units: mg/L		Analysis Date: 4/10/2018 12:17 PM								
Client ID:		Run ID: HG1_180410A			SeqNo: 4974825		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00195	0.00020	0.002	0	97.5	80-120		0						
MS		Sample ID: 1804124-03AMS			Units: mg/L		Analysis Date: 4/10/2018 12:27 PM								
Client ID: MW-2		Run ID: HG1_180410A			SeqNo: 4974829		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00165	0.00020	0.002	0.000039	80.6	75-125		0						
MS		Sample ID: 1804076-01AMS			Units: mg/L		Analysis Date: 4/11/2018 10:39 AM								
Client ID:		Run ID: HG1_180411A			SeqNo: 4976112		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00174	0.00020	0.002	0.000009	86.6	75-125		0						
MSD		Sample ID: 1804124-03AMSD			Units: mg/L		Analysis Date: 4/10/2018 12:29 PM								
Client ID: MW-2		Run ID: HG1_180410A			SeqNo: 4974830		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00185	0.00020	0.002	0.000039	90.6	75-125	0.00165	11.4	20					
MSD		Sample ID: 1804076-01AMSD			Units: mg/L		Analysis Date: 4/11/2018 10:44 AM								
Client ID:		Run ID: HG1_180411A			SeqNo: 4976113		Prep Date: 4/9/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00177	0.00020	0.002	0.000009	88	75-125	0.00174	1.71	20					
The following samples were analyzed in this batch:				1804124-01A	1804124-02A	1804124-03A									
				1804124-04A	1804124-05A	1804124-06A									

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116556** Instrument ID **HG1** Method: **SW7470A**

MLBK	Sample ID: MLBK-116556-116556			Units: mg/L		Analysis Date: 4/9/2018 07:27 PM		
Client ID:	Run ID: HG1_180409A			SeqNo: 4973577		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury ND 0.00020

MLBK	Sample ID: MLBK-116556-116556			Units: mg/L		Analysis Date: 4/10/2018 11:36 AM		
Client ID:	Run ID: HG1_180410A			SeqNo: 4974811		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury ND 0.00020

LCS	Sample ID: LCS-116556-116556			Units: mg/L		Analysis Date: 4/9/2018 07:30 PM		
Client ID:	Run ID: HG1_180409A			SeqNo: 4973579		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury 0.00202 0.00020 0.002 0 101 80-120 0

LCS	Sample ID: LCS-116556-116556			Units: mg/L		Analysis Date: 4/10/2018 11:41 AM		
Client ID:	Run ID: HG1_180410A			SeqNo: 4974812		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury 0.00185 0.00020 0.002 0 92.5 80-120 0

MS	Sample ID: 1804172-02AMS			Units: mg/L		Analysis Date: 4/9/2018 07:50 PM		
Client ID:	Run ID: HG1_180409A			SeqNo: 4973587		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury 0.0168 0.0020 0.02 -0.00003 84.2 75-125 0

MSD	Sample ID: 1804172-02AMSD			Units: mg/L		Analysis Date: 4/9/2018 07:53 PM		
Client ID:	Run ID: HG1_180409A			SeqNo: 4973588		Prep Date: 4/9/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Mercury 0.019 0.0020 0.02 -0.00003 95.2 75-125 0.0168 12.3 20

The following samples were analyzed in this batch:

1804124-07A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116465** Instrument ID **ICPMS3** Method: **SW6020A**

MBLK		Sample ID: MBLK-116465-116465			Units: mg/L		Analysis Date: 4/7/2018 12:04 PM			
Client ID:		Run ID: ICPMS3_180407A			SeqNo: 4971564		Prep Date: 4/6/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	ND	0.0050								
Arsenic	ND	0.0050								
Barium	ND	0.0050								
Beryllium	ND	0.0020								
Boron	0.01561	0.020								J
Cadmium	ND	0.0020								
Calcium	ND	0.50								
Chromium	ND	0.0050								
Cobalt	ND	0.0050								
Lead	ND	0.0050								
Lithium	0.000406	0.010								J
Molybdenum	ND	0.0050								
Selenium	ND	0.0050								
Thallium	ND	0.0050								

LCS		Sample ID: LCS-116465-116465			Units: mg/L		Analysis Date: 4/7/2018 12:06 PM			
Client ID:		Run ID: ICPMS3_180407A			SeqNo: 4971565		Prep Date: 4/6/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1001	0.0050	0.1	0	100	80-120	0	0		
Arsenic	0.1004	0.0050	0.1	0	100	80-120	0	0		
Barium	0.1019	0.0050	0.1	0	102	80-120	0	0		
Beryllium	0.1002	0.0020	0.1	0	100	80-120	0	0		
Boron	0.4971	0.020	0.5	0	99.4	80-120	0	0		
Cadmium	0.1026	0.0020	0.1	0	103	80-120	0	0		
Calcium	10.3	0.50	10	0	103	80-120	0	0		
Chromium	0.1026	0.0050	0.1	0	103	80-120	0	0		
Cobalt	0.1052	0.0050	0.1	0	105	80-120	0	0		
Lead	0.1021	0.0050	0.1	0	102	80-120	0	0		
Lithium	0.1007	0.010	0.1	0	101	80-120	0	0		
Molybdenum	0.1041	0.0050	0.1	0	104	80-120	0	0		
Selenium	0.09692	0.0050	0.1	0	96.9	80-120	0	0		
Thallium	0.09877	0.0050	0.1	0	98.8	80-120	0	0		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116465** Instrument ID **ICPMS3** Method: **SW6020A**

MS		Sample ID: 1804124-03AMS			Units: mg/L		Analysis Date: 4/7/2018 01:13 PM			
Client ID: MW-2		Run ID: ICPMS3_180407A			SeqNo: 4971601		Prep Date: 4/6/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.09772	0.0050	0.1	0.000061	97.7	75-125		0		
Arsenic	0.1039	0.0050	0.1	0.00158	102	75-125		0		
Barium	0.3095	0.0050	0.1	0.2125	97	75-125		0		
Beryllium	0.09778	0.0020	0.1	0.000017	97.8	75-125		0		
Cadmium	0.09618	0.0020	0.1	-0.000027	96.2	75-125		0		
Calcium	101.1	0.50	10	90.26	108	75-125		0		O
Chromium	0.09634	0.0050	0.1	0.00085	95.5	75-125		0		
Cobalt	0.09704	0.0050	0.1	0.000405	96.6	75-125		0		
Lead	0.1027	0.0050	0.1	0.00037	102	75-125		0		
Lithium	0.1148	0.010	0.1	0.01084	104	75-125		0		
Molybdenum	0.1066	0.0050	0.1	0.00027	106	75-125		0		
Selenium	0.1019	0.0050	0.1	0.000225	102	75-125		0		
Thallium	0.1	0.0050	0.1	-0.000011	100	75-125		0		

MS		Sample ID: 1804124-03AMS			Units: mg/L		Analysis Date: 4/9/2018 02:06 PM			
Client ID: MW-2		Run ID: ICPMS3_180409A			SeqNo: 4972537		Prep Date: 4/6/2018		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Boron	1.058	0.20	0.5	0.6021	91.1	75-125		0		

MSD		Sample ID: 1804124-03AMSD			Units: mg/L		Analysis Date: 4/7/2018 01:15 PM			
Client ID: MW-2		Run ID: ICPMS3_180407A			SeqNo: 4971602		Prep Date: 4/6/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.0982	0.0050	0.1	0.000061	98.1	75-125	0.09772	0.486	20	
Arsenic	0.1029	0.0050	0.1	0.00158	101	75-125	0.1039	0.923	20	
Barium	0.3118	0.0050	0.1	0.2125	99.3	75-125	0.3095	0.746	20	
Beryllium	0.0998	0.0020	0.1	0.000017	99.8	75-125	0.09778	2.04	20	
Cadmium	0.0969	0.0020	0.1	-0.000027	96.9	75-125	0.09618	0.755	20	
Calcium	98.14	0.50	10	90.26	78.8	75-125	101.1	2.98	20	O
Chromium	0.09618	0.0050	0.1	0.00085	95.3	75-125	0.09634	0.165	20	
Cobalt	0.09659	0.0050	0.1	0.000405	96.2	75-125	0.09704	0.467	20	
Lead	0.1038	0.0050	0.1	0.00037	103	75-125	0.1027	1.01	20	
Lithium	0.1151	0.010	0.1	0.01084	104	75-125	0.1148	0.194	20	
Molybdenum	0.1053	0.0050	0.1	0.00027	105	75-125	0.1066	1.26	20	
Selenium	0.09886	0.0050	0.1	0.000225	98.6	75-125	0.1019	3.03	20	
Thallium	0.1008	0.0050	0.1	-0.000011	101	75-125	0.1	0.794	20	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116465** Instrument ID **ICPMS3** Method: **SW6020A**

MSD	Sample ID: 1804124-03AMSD			Units: mg/L		Analysis Date: 4/9/2018 02:13 PM			
Client ID: MW-2	Run ID: ICPMS3_180409A			SeqNo: 4972545		Prep Date: 4/6/2018		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Boron	1.068	0.20	0.5	0.6021	93.1	75-125	1.058	0.919	20

The following samples were analyzed in this batch:

1804124-01A	1804124-02A	1804124-03A
1804124-04A	1804124-05A	1804124-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116524** Instrument ID **ICPMS3** Method: **SW6020A**

MBLK		Sample ID: MBLK-116524-116524			Units: mg/L		Analysis Date: 4/9/2018 02:24 PM			
Client ID:		Run ID: ICPMS3_180409A			SeqNo: 4973192		Prep Date: 4/9/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	ND	0.0050								
Arsenic	ND	0.0050								
Barium	ND	0.0050								
Beryllium	ND	0.0020								
Boron	ND	0.020								
Cadmium	ND	0.0020								
Calcium	ND	0.50								
Chromium	ND	0.0050								
Cobalt	ND	0.0050								
Lead	ND	0.0050								
Lithium	ND	0.010								
Molybdenum	ND	0.0050								
Selenium	ND	0.0050								
Thallium	ND	0.0050								

LCS		Sample ID: LCS-116524-116524			Units: mg/L		Analysis Date: 4/9/2018 02:25 PM			
Client ID:		Run ID: ICPMS3_180409A			SeqNo: 4973193		Prep Date: 4/9/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.09289	0.0050	0.1	0	92.9	80-120	0	0		
Arsenic	0.09727	0.0050	0.1	0	97.3	80-120	0	0		
Barium	0.09538	0.0050	0.1	0	95.4	80-120	0	0		
Beryllium	0.1017	0.0020	0.1	0	102	80-120	0	0		
Boron	0.4996	0.020	0.5	0	99.9	80-120	0	0		
Cadmium	0.09768	0.0020	0.1	0	97.7	80-120	0	0		
Calcium	9.959	0.50	10	0	99.6	80-120	0	0		
Chromium	0.1009	0.0050	0.1	0	101	80-120	0	0		
Lead	0.1	0.0050	0.1	0	100	80-120	0	0		
Lithium	0.1009	0.010	0.1	0	101	80-120	0	0		
Molybdenum	0.09899	0.0050	0.1	0	99	80-120	0	0		
Selenium	0.09368	0.0050	0.1	0	93.7	80-120	0	0		
Thallium	0.09651	0.0050	0.1	0	96.5	80-120	0	0		

LCS		Sample ID: LCS-116524-116524			Units: mg/L		Analysis Date: 4/10/2018 11:25 AM			
Client ID:		Run ID: ICPMS3_180410A			SeqNo: 4974121		Prep Date: 4/9/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Cobalt	0.1028	0.0050	0.1	0	103	80-120	0	0		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116524** Instrument ID **ICPMS3** Method: **SW6020A**

MS	Sample ID: 1804162-01BMS			Units: mg/L			Analysis Date: 4/9/2018 02:39 PM			
Client ID:	Run ID: ICPMS3_180409A			SeqNo: 4973200			Prep Date: 4/9/2018			DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.09466	0.0050	0.1	0.000082	94.6	75-125		0		
Arsenic	0.09915	0.0050	0.1	0.000182	99	75-125		0		
Barium	0.1894	0.0050	0.1	0.08685	103	75-125		0		
Beryllium	0.1025	0.0020	0.1	0.000006	102	75-125		0		
Boron	0.5331	0.020	0.5	0.03607	99.4	75-125		0		
Cadmium	0.09616	0.0020	0.1	0.000004	96.2	75-125		0		
Calcium	100.2	0.50	10	90.68	95.2	75-125		0		O
Chromium	0.09953	0.0050	0.1	0.000525	99	75-125		0		
Lead	0.1008	0.0050	0.1	0.000073	101	75-125		0		
Lithium	0.1028	0.010	0.1	0.003242	99.5	75-125		0		
Molybdenum	0.103	0.0050	0.1	0.003463	99.5	75-125		0		
Selenium	0.09314	0.0050	0.1	0.000954	92.2	75-125		0		
Thallium	0.09734	0.0050	0.1	0.000008	97.3	75-125		0		

MS	Sample ID: 1804162-01BMS			Units: mg/L			Analysis Date: 4/10/2018 11:28 AM			
Client ID:	Run ID: ICPMS3_180410A			SeqNo: 4974123			Prep Date: 4/9/2018			DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Cobalt	0.09894	0.0050	0.1	0.00067	98.3	75-125		0		

MSD	Sample ID: 1804162-01BMSD			Units: mg/L			Analysis Date: 4/9/2018 02:41 PM			
Client ID:	Run ID: ICPMS3_180409A			SeqNo: 4973201			Prep Date: 4/9/2018			DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.0952	0.0050	0.1	0.000082	95.1	75-125	0.09466	0.569	20	
Arsenic	0.09896	0.0050	0.1	0.000182	98.8	75-125	0.09915	0.192	20	
Barium	0.1894	0.0050	0.1	0.08685	103	75-125	0.1894	0.029	20	
Beryllium	0.1018	0.0020	0.1	0.000006	102	75-125	0.1025	0.604	20	
Boron	0.5294	0.020	0.5	0.03607	98.7	75-125	0.5331	0.702	20	
Cadmium	0.09594	0.0020	0.1	0.000004	95.9	75-125	0.09616	0.228	20	
Calcium	99.01	0.50	10	90.68	83.3	75-125	100.2	1.2	20	O
Chromium	0.09932	0.0050	0.1	0.000525	98.8	75-125	0.09953	0.203	20	
Lead	0.1012	0.0050	0.1	0.000073	101	75-125	0.1008	0.387	20	
Lithium	0.101	0.010	0.1	0.003242	97.8	75-125	0.1028	1.71	20	
Molybdenum	0.1028	0.0050	0.1	0.003463	99.4	75-125	0.103	0.168	20	
Selenium	0.0995	0.0050	0.1	0.000954	98.5	75-125	0.09314	6.6	20	
Thallium	0.09792	0.0050	0.1	0.000008	97.9	75-125	0.09734	0.599	20	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **116524** Instrument ID **ICPMS3** Method: **SW6020A**

MSD	Sample ID: 1804162-01BMSD			Units: mg/L		Analysis Date: 4/10/2018 11:30 AM			
Client ID:	Run ID: ICPMS3_180410A			SeqNo: 4974124		Prep Date: 4/9/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Cobalt	0.1009	0.0050	0.1	0.00067	100	75-125	0.09894	1.97	20

The following samples were analyzed in this batch:

1804124-07A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: 116445 Instrument ID TDS Method: A2540 C-11

MLBK	Sample ID: MBLK-116445-116445			Units: mg/L		Analysis Date: 4/6/2018 02:18 PM		
Client ID:	Run ID: TDS_180406A			SeqNo: 4970483		Prep Date: 4/6/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids	ND		10					

LCS	Sample ID: LCS-116445-116445			Units: mg/L		Analysis Date: 4/6/2018 02:18 PM		
Client ID:	Run ID: TDS_180406A			SeqNo: 4970482		Prep Date: 4/6/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids	489	10	495	0	98.8	80-120	0	

DUP	Sample ID: 18031946-01A DUP			Units: mg/L		Analysis Date: 4/6/2018 02:18 PM		
Client ID:	Run ID: TDS_180406A			SeqNo: 4970461		Prep Date: 4/6/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids	658	10	0	0	0	0-0	638	3.09 10

DUP	Sample ID: 1804082-01K DUP			Units: mg/L		Analysis Date: 4/6/2018 02:18 PM		
Client ID:	Run ID: TDS_180406A			SeqNo: 4970463		Prep Date: 4/6/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids	316	10	0	0	0	0-0	294	7.21 10

The following samples were analyzed in this batch:

1804124-01B	1804124-02B	1804124-03B
1804124-04B	1804124-05B	1804124-06B
1804124-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R233192b** Instrument ID **WETCHEM** Method: **A4500-H B-11**

LCS		Sample ID: WLCSW1-180405-R233192b			Units: s.u.			Analysis Date: 4/5/2018 05:30 PM		
Client ID:		Run ID: WETCHEM_180405H			SeqNo: 4968919			Prep Date: DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.94	0.10	4	0	98.5	90-110		0		
DUP	Sample ID: 1804058-02A DUP			Units: s.u.			Analysis Date: 4/5/2018 05:30 PM			
Client ID:	Run ID: WETCHEM_180405H			SeqNo: 4968921			Prep Date: DF: 1			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	8.03	0.10	0	0	0	0-0	8	0.374	20	H
DUP	Sample ID: 1804124-03B DUP			Units: s.u.			Analysis Date: 4/5/2018 05:30 PM			
Client ID: MW-2	Run ID: WETCHEM_180405H			SeqNo: 4968929			Prep Date: DF: 1			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	7.09	0.10	0	0	0	0-0	7.05	0.566	20	H

The following samples were analyzed in this batch:

1804124-01B	1804124-02B	1804124-03B
1804124-04B	1804124-05B	1804124-06B
1804124-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R233502** Instrument ID **IC4** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R233502			Units: mg/L		Analysis Date: 4/10/2018 10:53 AM			
Client ID:		Run ID: IC4_180410A			SeqNo: 4975897		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	ND	1.0								
Fluoride	ND	0.10								
Sulfate	ND	1.0								

LCS		Sample ID: LCS-R233502			Units: mg/L		Analysis Date: 4/10/2018 11:13 AM			
Client ID:		Run ID: IC4_180410A			SeqNo: 4975898		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.211	1.0	10	0	92.1	90-110		0		
Fluoride	1.824	0.10	2	0	91.2	90-110		0		
Sulfate	9.804	1.0	10	0	98	90-110		0		

MS		Sample ID: 1804124-03B MS			Units: mg/L		Analysis Date: 4/10/2018 05:17 PM			
Client ID: MW-2		Run ID: IC4_180410A			SeqNo: 4975917		Prep Date:		DF: 100	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1599	100	1000	570.1	103	80-120		0		
Fluoride	187.2	10	200	0	93.6	80-120		0		
Sulfate	999.6	100	1000	0	100	80-120		0		

MSD		Sample ID: 1804124-03B MSD			Units: mg/L		Analysis Date: 4/10/2018 05:36 PM			
Client ID: MW-2		Run ID: IC4_180410A			SeqNo: 4975918		Prep Date:		DF: 100	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1601	100	1000	570.1	103	80-120		1599	0.127	20
Fluoride	186.6	10	200	0	93.3	80-120		187.2	0.294	20
Sulfate	1001	100	1000	0	100	80-120		999.6	0.126	20

The following samples were analyzed in this batch:

1804124-01B	1804124-02B	1804124-03B
1804124-04B	1804124-05B	1804124-06B

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1804124
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R233558** Instrument ID **IC3** Method: **E300.0**

MBLK	Sample ID: CCB/MBLK-R233558			Units: mg/L		Analysis Date: 4/11/2018 10:56 AM		
Client ID:	Run ID: IC3_180411A			SeqNo: 4977100		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride ND 1.0
Fluoride ND 0.10
Sulfate ND 1.0

LCS	Sample ID: LCS-R233558			Units: mg/L		Analysis Date: 4/11/2018 11:15 AM		
Client ID:	Run ID: IC3_180411A			SeqNo: 4977101		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 9.237 1.0 10 0 92.4 90-110 0
Fluoride 1.908 0.10 2 0 95.4 90-110 0
Sulfate 9.918 1.0 10 0 99.2 90-110 0

MS	Sample ID: 1804076-11B MS			Units: mg/L		Analysis Date: 4/11/2018 01:48 PM		
Client ID:	Run ID: IC3_180411A			SeqNo: 4977115		Prep Date:		DF: 200
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 3080 200 2000 1070 100 80-120 0
Fluoride 396.2 20 400 0 99 80-120 0
Sulfate 3239 200 2000 1140 105 80-120 0

MSD	Sample ID: 1804076-11B MSD			Units: mg/L		Analysis Date: 4/11/2018 02:07 PM		
Client ID:	Run ID: IC3_180411A			SeqNo: 4977116		Prep Date:		DF: 200
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual

Chloride 3063 200 2000 1070 99.7 80-120 3080 0.548 20
Fluoride 393.1 20 400 0 98.3 80-120 396.2 0.796 20
Sulfate 3246 200 2000 1140 105 80-120 3239 0.207 20

The following samples were analyzed in this batch:

1804124-02B 1804124-07B

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

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+1 970 490 1511Holland, MI
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Chain of Custody Form

Page 1 of 1COC ID: 48065Houston, TX
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+1 304 356 3168York, PA
+1 717 505 5280

Customer Information		Project Information		Parameter/Method Request for Analysis													
Purchase Order		Project Name		A	Metals including Hg												
Work Order		Project Number	<u>73-K60017-04</u>	B	Chloride, Fluoride, Sulfate												
Company Name	NTH Consultants, Ltd.	Bill To Company	NTH Consultants, Ltd.	C	pH												
Send Report To	Karen Okonta	Invoice Attn	Accounts Payable	D	TDS												
Address	41780 Six Mile Road	Address	41780 Six Mile Road	E	Radium 226 & 228												
City/State/Zip	Northville, MI 48168	City/State/Zip	Northville, MI 48168	F													
Phone	(248) 662-2668	Phone	(248) 662-2668	G													
Fax	(248) 324-5305	Fax	(248) 324-5305	H													
e-Mail Address	<u>KOKONTA@NTHCONSULTANTS.COM</u>	e-Mail Address		I													
J																	
No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	PZ-1	4-3-18	10:50	GW	NITR ⁽²⁾	5	X	X	X	X	X						
2	MW-1		12:30														
3	MW-2		2:30														
4	MW-3		4:20														
5	EQUIPMENT BLANK		—														
6	FIELD BLANK		—														
7	FIELD DUPLICATE		—														
8	MATRIX SPIKE		—														
9	MATRIX SPIKE DUPLICATE	4-3-18	5:13 PM														
10																	

Sampler(s) Please Print & Sign: Courtney Daniel <u>PHILIP HERON</u> <i>[Signature]</i>		Shipment Method	Turnaround Time in Business Days (BD)	<input type="checkbox"/> Other	<u>STANDARD</u>	Results Due Date:	
			<input type="checkbox"/> 10 BD	<input type="checkbox"/> 5 BD	<input type="checkbox"/> 3 BD	<input type="checkbox"/> 2 BD	<input type="checkbox"/> 1 BD
Relinquished by: <i>[Signature]</i>	Date: 4-3-18	Time: 5:13 PM	Received by:	Notes:			
Relinquished by:	Date:	Time:	Received by (Laboratory): <i>[Signature]</i>	Cooler ID: SD2	Cooler Temp: 3.2°C	QC Package: (Check One Box Below)	
Logged by (Laboratory): DFS	Date: 4/4/18	Time: 0900	Checked by (Laboratory): <i>[Signature]</i>	4.0°C	5.6°C	<input type="checkbox"/> Level II Std QC	<input type="checkbox"/> TRRP Checklist
						<input type="checkbox"/> Level III Std QC/Raw Data	<input type="checkbox"/> TRRP Level IV
						<input type="checkbox"/> Level IV SW846/CLP	
						<input type="checkbox"/> Other	

Preservative Key: 1-HCl 2-HNO₃ 3-H₂SO₄ 4-NaOH 5-Na₂S₂O₃ 6-NaHSO₄ 7-Other 8-4°C 9-5035

- Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2012 by ALS Environmental.

Sample Receipt ChecklistClient Name: NTH - NORTHLILLEDate/Time Received: 03-Apr-18 17:13Work Order: 1804124Received by: SAChecklist completed by Diane Shaw
eSignature

04-Apr-18

Reviewed by: Chad Whetton
eSignature

04-Apr-18

Date

Matrices: GroundwaterCarrier name: Client

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample(s) received on ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>3.2/3.2, 4.0/4.0, 3.6/3.6 c</u> SR2		
Cooler(s)/Kit(s):	 		
Date/Time sample(s) sent to storage:	<u>4/4/2018 11:37:17 AM</u>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted by:	-		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

--

CorrectiveAction:

--



Tuesday, May 29, 2018

Chad Whelton
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Re: ALS Workorder: 1804079
Project Name:
Project Number: 1804124

Dear Mr. Whelton:

Seven water samples were received from ALS Environmental, on 4/5/2018. The samples were scheduled for the following analyses:

Radium-226

Radium-228

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "JJR Kujawa".

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1804079

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to the current revision of SOP 724.

All acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1804079

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 1804124

Client PO Number: 20-122018329

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
PZ-1	1804079-1		WATER	03-Apr-18	10:50
MW-1	1804079-2		WATER	03-Apr-18	12:30
MW-3	1804079-3		WATER	03-Apr-18	16:00
Equipment Blank	1804079-4		WATER	03-Apr-18	
Field Blank	1804079-5		WATER	03-Apr-18	
Field Duplicate	1804079-6		WATER	03-Apr-18	
MW-2	1804079-7		WATER	03-Apr-18	14:30

1804079



Environmental

Subcontractor:
ALS Environmental, Fort Collins
225 Commerce Dr.
Fort Collins, CO 80524

TEL: (800) 443-1511
FAX:
Acct #:

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Date: 04-Apr-18
COC ID: 8775
Due D 25-Apr-18

Customer Information		Project Information												
Purchase Order		Project Name	1804124	A Subcontracted Analyses (SUBCONTRACT)										
Work Order		Project Number			B Radium 226 & 228									
Company Name	ALS Group USA, Corp	Bill To Company	ALS Group USA, Corp	C										
Send Report To	Chad Whelton	Inv Attn	Accounts Payable	D										
Address	3352 128th Ave	Address	3352 128th Ave	E										
City/State/Zip	Holland, Michigan 49424	City/State/Zip	Holland, Michigan 49424	F										
Phone	(616) 399-6070	Phone	(616) 399-6070	G										
Fax	(616) 399-6185	Fax	(616) 399-6185	H										
eMail Address	chad.whelton@alsglobal.com	eMail CC		I										
J				A	B	C	D	E	F	G	H	I	J	
1 1804124-01C	PZ-1	Groundwater	3/Apr/2018 10:50	(3) 1LPHNO3	X									
2 1804124-02C	MW-1	Groundwater	3/Apr/2018 12:30	(3) 1LPHNO3	X									
3 1804124-04C	MW-3	Groundwater	3/Apr/2018 16:20	(3) 1LPHNO3	X									
4 1804124-05C	Equipment Blank	Groundwater	3/Apr/2018	(3) 1LPHNO3	X									
5 1804124-06C	Field Blank	Groundwater	3/Apr/2018	(3) 1LPHNO3	X									
6 1804124-07C	Field Duplicate	Groundwater	3/Apr/2018	(3) 1LPHNO3	X									
7 1804124-03C	MW-2	Groundwater	3/Apr/2018 14:30	(9) 1LPHNO3	X									

Comments:

Please analyze these samples per our instructions and indicated turnaround requirements. Please include all QC with data. The samples do not need to be returned and can be disposed after 30 days.

Relinquished by:
PROEX
Date Time

Date Time

Received by:
Ali-Jean Smith *K* *45.18 / 1010*
Received by:
Date Time

Cooler IDs
Report QC Level
Std



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS USA MIWorkorder No: 1804079Project Manager: JRFInitials: JFDate: 4-5-18

1. Does this project require any special handling in addition to standard ALS procedures?	YES	NO		
2. Are custody seals on shipping containers intact?	<u>NONE</u>	YES	NO	
3. Are Custody seals on sample containers intact?	<u>NONE</u>	YES	NO	
4. Is there a COC (Chain-of-Custody) present or other representative documents?	<u>YES</u>	NO		
5. Are the COC and bottle labels complete and legible?	<u>YES</u>	NO		
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)	<u>YES</u>	NO		
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<u>YES</u>	NO	
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<u>YES</u>	NO	
9. Are all aqueous non-preserved samples pH 4-9?	N/A	<u>YES</u>	NO	
10. Is there sufficient sample for the requested analyses?	<u>YES</u>	NO		
11. Were all samples placed in the proper containers for the requested analyses?	<u>YES</u>	NO		
12. Are all samples within holding times for the requested analyses?	<u>YES</u>	NO		
13. Were all sample containers received intact? (not broken or leaking, etc.)	<u>YES</u>	NO		
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: _____ < green pea _____ > green pea	N/A	YES	NO	
15. Do any water samples contain sediment?	Amount	N/A	<u>YES</u>	NO
Amount of sediment: <u>X</u> dusting <u> </u> moderate <u> </u> heavy				
16. Were the samples shipped on ice?			YES	<u>NO</u>
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4	RAD ONLY	YES	<u>NO</u>
Cooler #:	<u>1</u> <u>2</u>			
Temperature (°C):	<u>AMBI</u> <u>AMB</u>			
No. of custody seals on cooler:	<u>0</u> <u>0</u>			
External µR/hr reading:	<u>10</u> <u>9</u>			
Background µR/hr reading:	<u>10</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> / NO / NA (If no, see Form 008.)				

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO NO Contact: _____ Date/Time: _____

Project Manager Signature / Date: JRF 5/5/18

*IR Gun #1, VWR SN 170560549

*IR Gun #3, VWR SN 170647571

*IR Gun #4, Oakton, SN 2372220101-0002

18041079

Ref: Date: 04Apr18
 Dept: Wgt: 39.85 LBS
 DV: 0.00 TOTAL: 98.77

Sys PRIORITY OVERNIGHT Master 4325 6701 4073
 TRCK 4325 6701 4073

ORIGIN ID:GRRA (616) 399-6070
 SAMPLE RECEIVING
 ALS ENVIRONMENTAL
 3352 128TH AVENUE

HOLLAND, MI 494249263
 UNITED STATES US

10 **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
225 COMMERCE DR

SHIP DATE: 04APR18
 ACTWGT: 39.85 LB
 CAD: 0122071/CAFE3111

BILL SENDER

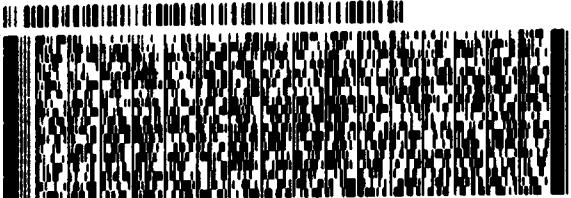
10-0

FORT COLLINS CO 80524

(970) 490-1611
 INU:
 PO:

REF:

DEPT:



1 of 2
 TRK# 4325 6701 4073
 0201 ## MASTER ##

THU - 05 APR 10:30A
 PRIORITY OVERNIGHT

NA FTCA

80524
 CO-US DEN



Ref: Date: 04Apr18
 Dept: Wgt: 39.85 LBS
 DV: 0.00 TOTAL: 98.77

Sys PRIORITY OVERNIGHT Master 4325 6701 4073
 TRCK 4325 6701 4084

ORIGIN ID:GRRA (616) 399-6070
 SAMPLE RECEIVING
 ALS ENVIRONMENTAL
 3352 128TH AVENUE

HOLLAND, MI 494249263
 UNITED STATES US

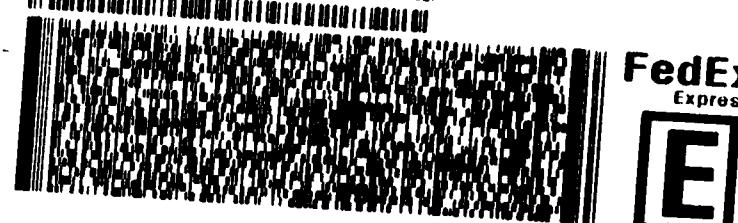
10 **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
225 COMMERCE DR

FORT COLLINS CO 80524

(970) 490-1611
 INU:
 PO:

REF:

DEPT:



2 of 2
 MPS# 4325 6701 4084
 0201 Mstr# 4325 6701 4073

THU - 05 APR 10:30A
 PRIORITY OVERNIGHT

80524
 CO-US DEN



5/10/30 4084
 A 40405

FT617
 5/13/13

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: PZ-1 **Lab ID:** 1804079-1
Legal Location:
Collection Date: 4/3/2018 10:50 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.19 (+/- 0.13)	LT	0.15	pCi/l	NA	4/25/2018 12:34
Carr: BARIUM	73.8		40-110	%REC	DL = NA	4/25/2018 12:34
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.32)	U	0.67	pCi/l	NA	5/9/2018 09:05
Carr: BARIUM	90.6		40-110	%REC	DL = NA	5/9/2018 09:05

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: MW-1 **Lab ID:** 1804079-2
Legal Location:
Collection Date: 4/3/2018 12:30 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.43 (+/- 0.2)	LT	0.16	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	74		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC						
Ra-228	0.84 (+/- 0.4)	LT	0.69	pCi/l	NA	5/9/2018 09:05
Carr: BARIUM	92.7		40-110	%REC	DL = NA	5/9/2018 09:05

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: MW-3 **Lab ID:** 1804079-3
Legal Location:
Collection Date: 4/3/2018 16:00 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.16 (+/- 0.11)	LT	0.12	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	90.5		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC						
Ra-228	0.77 (+/- 0.37)	LT	0.63	pCi/l	NA	5/9/2018 09:05
Carr: BARIUM	97		40-110	%REC	DL = NA	5/9/2018 09:05

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: Equipment Blank **Lab ID:** 1804079-4
Legal Location: **Matrix:** WATER
Collection Date: 4/3/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.099)	U	0.18	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	92.9		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.29)	U	0.61	pCi/l	NA	5/25/2018 08:37
Carr: BARIUM	96.4		40-110	%REC	DL = NA	5/25/2018 08:37

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: Field Blank **Lab ID:** 1804079-5
Legal Location: **Matrix:** WATER
Collection Date: 4/3/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.15 (+/- 0.11)	LT	0.15	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	94.3		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.28)	U	0.59	pCi/l	NA	5/25/2018 08:37
Carr: BARIUM	95.7		40-110	%REC	DL = NA	5/25/2018 08:37

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: Field Duplicate **Lab ID:** 1804079-6
Legal Location: **Matrix:** WATER
Collection Date: 4/3/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.73 (+/- 0.27)	LT	0.17	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	82.9		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC						
Ra-228	1 (+/- 0.4)	LT	0.61	pCi/l	NA	5/25/2018 08:37
Carr: BARIUM	91.9		40-110	%REC	DL = NA	5/25/2018 08:37

Client: ALS Environmental **Date:** 29-May-18
Project: 1804124 **Work Order:** 1804079
Sample ID: MW-2 **Lab ID:** 1804079-7
Legal Location:
Collection Date: 4/3/2018 14:30 **Matrix:** WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 4/17/2018	PrepBy: LOW
Ra-226	0.41 (+/- 0.19)	LT	0.17	pCi/l	NA	4/25/2018 13:23
Carr: BARIUM	90.5		40-110	%REC	DL = NA	4/25/2018 13:23
Radium-228 Analysis by GFPC			SOP 724		Prep Date: 5/21/2018	PrepBy: LAD
Ra-228	1.25 (+/- 0.46)		0.65	pCi/l	NA	5/25/2018 08:37
Carr: BARIUM	92.2		40-110	%REC	DL = NA	5/25/2018 08:37

Client: ALS Environmental
Project: 1804124
Sample ID: MW-2
Legal Location:
Collection Date: 4/3/2018 14:30

Date: 29-May-18
Work Order: 1804079
Lab ID: 1804079-7
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers**Radiochemistry:**

- "Report Limit" is the MDC
 - U or ND - Result is less than the sample specific MDC.
 - Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
 - Y2 - Chemical Yield outside default limits.
 - W - DER is greater than Warning Limit of 1.42
 - * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
 - # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
 - G - Sample density differs by more than 15% of LCS density.
 - D - DER is greater than Control Limit
 - M - Requested MDC not met.
 - LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 5/29/2018 11:14

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1804079

Project: 1804124

Batch ID: RE180417-1-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

LCS Sample ID: RE180417-1

Units: pCi/l

Analysis Date: 4/25/2018 13:23

Client ID:

Run ID: RE180417-1A

Prep Date: 4/17/2018

DF: NA

Analyte

Result

ReportLimit

SPK Val

SPK Ref Value

%REC

Control Limit

Decision Level

DER Ref

DER DER

DER Limit

Qual

Ra-226

55 (+/- 14)

0

46.33

118

67-120

P

Carr: BARIUM

13650

16540

82.5

40-110

LCSD Sample ID: RE180417-1

Units: pCi/l

Analysis Date: 4/25/2018 13:23

Client ID:

Run ID: RE180417-1A

Prep Date: 4/17/2018

DF: NA

Analyte

Result

ReportLimit

SPK Val

SPK Ref Value

%REC

Control Limit

Decision Level

DER Ref

DER DER

DER Limit

Qual

Ra-226

45 (+/- 11)

0

46.33

98.1

67-120

55

0.5

2.1

P

Carr: BARIUM

14370

16540

86.9

40-110

13650

MB Sample ID: RE180417-1

Units: pCi/l

Analysis Date: 4/25/2018 13:23

Client ID:

Run ID: RE180417-1A

Prep Date: 4/17/2018

DF: NA

Analyte

Result

ReportLimit

SPK Val

SPK Ref Value

%REC

Control Limit

Decision Level

DER Ref

DER DER

DER Limit

Qual

Ra-226

ND

0.173

U

Carr: BARIUM

14950

16540

90.4

40-110

The following samples were analyzed in this batch:

1804079-1	1804079-2	1804079-3
1804079-4	1804079-5	1804079-6
1804079-7		

Client: ALS Environmental
Work Order: 1804079
Project: 1804124

QC BATCH REPORT

Batch ID: **RA180502-1-3**

Instrument ID **LB4100-c**

Method: **Radium-228 Analysis by GFPC**

LCS Sample ID: RA180502-1				Units: pCi/l		Analysis Date: 5/9/2018 08:35					
Client ID: RA180502-1A					Prep Date: 5/2/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER Limit	DER Qual	
Ra-228	6.7 (+/- 1.8)	1	6.145		110	70-130				P,M3	
Carr: BARIUM	33160		36390		91.1	40-110					
LCSD Sample ID: RA180502-1				Units: pCi/l		Analysis Date: 5/9/2018 08:35					
Client ID: RA180502-1A					Prep Date: 5/2/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER Limit	DER Qual	
Ra-228	7.8 (+/- 2)	1	6.145		126	70-130		6.7	0.4	2.1	P
Carr: BARIUM	34920		36390		96	40-110		33160			
MB Sample ID: RA180502-1				Units: pCi/l		Analysis Date: 5/9/2018 10:16					
Client ID: RA180502-1A					Prep Date: 5/2/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER Limit	DER Qual	
Ra-228	ND	0.73								U	
Carr: BARIUM	32650		36390		89.7	40-110					

The following samples were analyzed in this batch:

1804079-1 1804079-2 1804079-3

Client: ALS Environmental
Work Order: 1804079
Project: 1804124

QC BATCH REPORT

Batch ID: **RA180521-2-2**

Instrument ID **LB4100-C**

Method: **Radium-228 Analysis by GFPC**

LCS Sample ID: RA180521-2				Units: pCi/l		Analysis Date: 5/25/2018 10:13					
Client ID:		Run ID: RA180521-2A					Prep Date: 5/21/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	6.9 (+/- 1.7)	0.7	6.113		112	70-130					P
Carr: BARIUM		30240		32520	93	40-110					

LCSD Sample ID: RA180521-2				Units: pCi/l		Analysis Date: 5/25/2018 10:13					
Client ID:		Run ID: RA180521-2A					Prep Date: 5/21/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	6.6 (+/- 1.6)	0.7	6.113		107	70-130		6.9	0.1	2.1	P
Carr: BARIUM		30930		32520	95.1	40-110		30240			

MB Sample ID: RA180521-2				Units: pCi/l		Analysis Date: 5/25/2018 10:13					
Client ID:		Run ID: RA180521-2A					Prep Date: 5/21/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit	Qual
Ra-228	ND	0.75									U
Carr: BARIUM		30890		32520	95	40-110					

The following samples were analyzed in this batch:

1804079-4	1804079-5	1804079-6
1804079-7		



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: <u>Holland BPW – James DeYoung PP</u>		Date: <u>4/3/18</u>		
Project #: <u>73-160017</u>		Field Personnel: <u>P. Heacock, J. DeYoung</u>		
Site Location: <u>Holland, MI</u>		Well Const.: <u>PVC</u>		
Well ID: <u>PZ-1</u>		Casing Diameter: <u>2.0"</u>		
Sample ID (if different than Well ID): _____		Screened Interval (ft. from TOC): <u>NA</u>		
		Top of Casing (ft.): <u>588.53</u>		
PURGING DATA				
Time:	Start:	Finish:		
Purging Volume		Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)
		1	0.04	0.12
Total Well Depth (ft. from TOC) = <u>13.55</u>		1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>10.41</u>		2	0.16	0.48
Height of Water in Well (ft.) = <u>3.14</u>		3	0.36	1.08
One Well Volume (gallons) = <u>0.5</u>		4	0.63	1.89
Gallons Purged: <u>1.5 gallons</u>		Purging and Sampling Device: <u>Peristaltic</u>		
Well Volumes Purged: <u>3+</u>		Purging Rate (g.p.m.) <u>100-500 mL/min</u>		
Was Well Purged Dry? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less		
FIELD MONITORING PARAMETERS				
Time/Elapsed time (minutes)	<u>8:30</u>	<u>8:33</u>	<u>8:37</u>	<u>8:39</u>
Accum. Volume Purged (gal)				
Drawdown (ft)				
pH	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>
Temperature (C)	<u>3.95</u>	<u>3.93</u>	<u>3.86</u>	<u>3.79</u>
Conductivity (mS/cm) $\times 10^3$	<u>0.501</u>	<u>0.506</u>	<u>0.511</u>	<u>0.509</u>
ORP (mV)				
Dissolved Oxygen (mg/L)				
Turbidity (NTU)	<u>7.58</u>	<u>7.08</u>	<u>6.48</u>	<u>5.83</u>
Odor				
Appearance and/or Color	<u>clear</u>			
SAMPLING DATA				
Time: Start: <u>8:15</u>	Finish: _____	Pump Rate (g.p.m.): <u>≈ 500 mL/min</u>		
Sample Collection Depth (ft. from TOC): <u>$\approx 12.0'$</u>				
Weather Conditions: Air Temperature (F): <u>34-39</u>		Wind Speed/Direction: <u>10-20/E</u> Other: _____		
Samples Collected On chain of Custody No: _____		Analytical Laboratory: _____		

Other Notes: _____

This file can be opened directly in Microsoft Excel (or you can Export a CSV)

[How can I import these files?](#)**Location Properties**

Location Name = Pz1

Location ID = d091ccdf8-b034-4cd6-857c-9634aaec6aa9

Report Properties

Start Time = 2018-04-03 08:30:23

Duration = 00:21:00

Readings = 8

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 447275

Device Firmware = 1.88

Log Properties

Log Name = Pz1

Log Type = Linear

Log File Number = 1

Log ID = 0f6582bd-6432-48d1-8101-8eas5997b0a3c

Interval = 00:03:00

Date/Time	Actual Conductivity (mS/cm) (575965)	Specific Conductivity (mS/cm) (575965)	pH (pH) (551038)	pH mV (mV) (551038)	Turbidity (NTU) (551038)	Temperature (°C) (447275)
2018-04-03 08:30:23	0.0002987495	0.000502821	6.891233	1.30415	7.587263	3.95108
2018-04-03 08:33:23	0.0003026077	0.0005062811	6.891912	1.299381	7.087885	3.987531
2018-04-03 08:38:23	0.0003049318	0.0005113708	6.891726	1.308918	6.483128	3.884014
2018-04-03 08:39:23	0.0003029706	0.0005052466	6.891944	1.296997	5.834244	3.792603
2018-04-03 08:42:23	0.0003045019	0.0005120921	6.891229	1.313686	5.417222	3.776993
2018-04-03 08:45:23	0.0003055245	0.0005149922	6.891981	1.284613	5.135445	3.704742
2018-04-03 08:48:23	0.0003041611	0.0005139011	6.891671	1.316071	4.785634	3.631775
2018-04-03 08:51:23	0.0003035631	0.0005135099	6.891703	1.308918	4.53369	3.604614

Log Notes

2018-04-03 08:30:23 Started

2018-04-03 08:52:09 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION								
Project Name: Holland BPW – James DeYoung PP		Date: <u>4-3-18</u>						
Project #: 73-160017		Field Personnel: <u>P. Herout, C. Daniel</u>						
Site Location: Holland, MI		Well Const.: Sch 40 PVC						
Well ID: MW-1		Casing Diameter: 2.0"						
Sample ID (if different than Well ID): MW-1		Screened Interval (ft. from TOC): 9.0'-14.0' (12.0'-17.0')						
		Top of Casing (ft.): 588.53						
PURGING DATA								
Time:	Start: <u>12:08 pm</u>	Finish: <u>12:29 pm</u>						
Purging Volume	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)					
	1	0.04	0.12					
Total Well Depth (ft. from TOC) = <u>16.95</u>	1.5	0.10	0.30					
Depth to Water (ft. from TOC) = <u>6.63</u>	2	0.16	0.48					
Height of Water in Well (ft.) =	3	0.36	1.08					
One Well Volume (gallons) =	4	0.63	1.89					
Gallons Purged: <u>15.</u>	Purging and Sampling Device: <u>Peristaltic</u>							
Well Volumes Purged:	Purging Rate (g.p.m.) <u>500 mL/min</u>							
Was Well Purged Dry? Yes ~ <u>No</u>	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less							
FIELD MONITORING PARAMETERS								
Time/Elapsed time (minutes)	<u>12:08</u>	<u>12:11</u>	<u>12:14</u>	<u>12:17</u>	<u>12:20</u>	<u>12:23</u>	<u>12:26</u>	<u>12:29</u>
Accum. Volume Purged (gal)								
Drawdown (ft) - <u>elevate</u>	<u>6.72</u>	<u>6.73</u>	<u>6.73</u>	<u>6.73</u>	<u>6.73</u>	<u>6.73</u>	<u>6.73</u>	<u>6.73</u>
pH	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>	<u>6.89</u>
Temperature (C)	<u>3.49</u>	<u>3.49</u>	<u>3.70</u>	<u>3.70</u>	<u>3.67</u>	<u>3.63</u>	<u>3.60</u>	<u>3.49</u>
Conductivity (mS/cm)	<u>-</u>							
ORP (mV)								
Dissolved Oxygen (mg/L)								
Turbidity (NTU)	<u>0.66</u>	<u>0.66</u>	<u>0.65</u>	<u>0.66</u>	<u>0.66</u>	<u>0.63</u>	<u>0.64</u>	<u>0.67</u>
Odor								
Appearance and/or Color								
SAMPLING DATA								
Time: Start: <u>12:30</u>	Finish: <u>12:30</u>	Pump Rate (g.p.m.): <u>500 mL/min</u>						
Sample Collection Depth (ft. from TOC): <u>~13.0'</u>								
Weather Conditions: Air Temperature (F): <u>34-39</u>		Wind Speed/Direction: <u>10-20/E</u>	Other: _____					
Samples Collected On chain of Custody No: _____		Analytical Laboratory: _____						

Other Notes: Field Duplicate Collected 12:41 pm

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[Home \(titanic\data\Shared\0%20Working%20Documents\73-160017_Holland%20BPW\Q218\VuSitu_2018-04-03_10-08-12_Mw...\)](#)**Location Properties**

Location Name = Mw1
 Location ID = 050dd5bb6-cef7-455a-9cfd-70838a1c74f4

Report Properties

Start Time = 2018-04-03 10:08:12
 Duration = 00:21:00
 Readings = 8
 Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600
 Device SN = 447275
 Device Firmware = 1.88

Log Properties

Log Name = Mw1
 Log Type = Linear
 Log File Number = 2
 Log ID = b2946a63-1367-4f40-a732-bdcf367acf09
 Interval = 00:03:00

Date	Time	Actual Conductivity (mS/cm) {575965}	Specific Conductivity (mS/cm) {575965}	pH (pH) {551038}	pH mV (mV) {551038}	Turbidity (NTU) {551038}	Temperature (°C) {447275}
2018-04-03	10:08:12	0	0	6.39171	1.308918	0.6663538	3.683665
2018-04-03	10:11:12	0	0	6.392248	1.280308	0.668705	3.688019
2018-04-03	10:14:12	0	0	6.391667	1.311302	0.6464665	3.700531
2018-04-03	10:17:12	0	0	6.391979	1.294613	0.6533426	3.683014
2018-04-03	10:20:12	0	0	6.392112	1.28746	0.6641045	3.669342
2018-04-03	10:23:12	0	0	6.391751	1.306534	0.6255316	3.6386306
2018-04-03	10:26:12	0	0	6.391613	1.313666	0.6426759	3.603394
2018-04-03	10:29:12	0	0	6.391603	1.313666	0.6724886	3.492554

Log Notes

2018-04-03 10:08:12 Started
 2018-04-03 10:31:55 Stopped



1 of 2

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: Holland BPW – James DeYoung PP	Date: 4-3-18			
Project #: 73-160017	Field Personnel: P. Jerant, C. Danest			
Site Location: Holland, MI	Well Const.: Sch 40 PVC			
Well ID: MW-2	Casing Diameter: 2.0"			
Sample ID (if different than Well ID): MW-2	Screened Interval (ft. from TOC): 8.0'-13.0' (14.0'-19.0')			
	Top of Casing (ft.): 585.49			
PURGING DATA				
Time:	Start:	Finish:		
Purging Volume		Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)
Total Well Depth (ft. from TOC) =	16.11	1	0.04	0.12
Depth to Water (ft. from TOC) =	4.30	1.5	0.10	0.30
Height of Water in Well (ft.) =	11.81	2	0.16	0.48
One Well Volume (gallons) =	1.29	3	0.36	1.08
Gallons Purged:	6.7 GALLONS	Purging and Sampling Device: PERISTALTIC		
Well Volumes Purged:	3	Purging Rate (g.p.m.) 500 mL/min		
Was Well Purged Dry?	Yes ~ No ~	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less		
FIELD MONITORING PARAMETERS				
Time/Elapsed time (minutes)	1:22	1:25	1:28	1:31
Accum. Volume Purged (gal)				
Drawdown (ft) - Elevation	4.40	4.42	4.43	4.45
pH	7.14	7.16	7.16	7.17
Temperature (C)	5.52	5.39	5.95	6.10
Conductivity (mS/cm)	2.86	2.83	2.82	2.79
ORP (mV)				
Dissolved Oxygen (mg/L)				
Turbidity (NTU)	10.87	13.80	18.00	19.47
Odor				
Appearance and/or Color				
SAMPLING DATA				
Time: Start: 2:13	Finish:	Pump Rate (g.p.m.):	500 mL/min	
Sample Collection Depth (ft. from TOC):	$\approx 13.0'$			
Weather Conditions: Air Temperature (F):	34-39	Wind Speed/Direction:	10-20/E	Other:
Samples Collected On chain of Custody No:	Analytical Laboratory:			

Other Notes: ms/msd Collected at 2:30 pm



2 of 2

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name:	Holland BPW – James DeYoung PP	Date:	4/3/18	
Project #:	73-160017	Field Personnel:	P. Venour, C. Daniel	
Site Location:	Holland, MI	Well Const.:	Sch 40 PVC	
Well ID:	MW-2	Casing Diameter:	2.0"	
Sample ID (if different than Well ID):		Screened Interval (ft. from TOC):	8.0'-13.0 (14.0'-19.0')	
		Top of Casing (ft.):	585.49	
PURGING DATA				
Time:	Start:	Finish:		
Purging Volume		Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)
		1	0.04	0.12
Total Well Depth (ft. from TOC) =		1.5	0.10	0.30
Depth to Water (ft. from TOC) =	10.62	2	0.16	0.48
Height of Water in Well (ft.) =	10.62	3	0.36	1.08
One Well Volume (gallons) =		4	0.63	1.89
Gallons Purged:		Purging and Sampling Device:		
Well Volumes Purged:		Purging Rate (g.p.m.)		
Was Well Purged Dry?	Yes ~	No ~	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less	
FIELD MONITORING PARAMETERS				
Time/Elapsed time (minutes)	1:49	1:52	1:55	1:58
Accum. Volume Purged (gal)				
Drawdown (ft) - elevator	4.0	4.0	4.0	4.0
pH	7.17	7.17	7.17	7.17
Temperature (C)	5.76	5.82	5.87	5.86
Conductivity (mS/cm)	2.76	2.75	2.76	2.73
ORP (mV)				
Dissolved Oxygen (mg/L)				
Turbidity (NTU)	20.12	29.32	29.85	31.64
Odor				
Appearance and/or Color				
SAMPLING DATA				
Time: Start:	Finish:	Pump Rate (g.p.m.):		
Sample Collection Depth (ft. from TOC):	SEE	10+2		
Weather Conditions: Air Temperature (F):		Wind Speed/Direction:	Other:	
Samples Collected On chain of Custody No:		Analytical Laboratory:		

Other Notes:

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[How do I edit imported files?](#)

Location Properties
 Location Name = Mw2
 Location ID = bbd85e583-602d-476d-97b8-daa98d196953a

Report Properties

Start Time = 2018-04-03 11:22:50
 Duration = 01:03:00
 Readings = 22
 Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600
 Device SN = 447275
 Device Firmware = 1.88

Log Properties

Log Name = Mw2
 Log Type = Linear
 Log File Number = 3
 Log ID = 0fa3341e-e3ab-4018-9c20-41f2f26c1afc
 Interval = 00:03:00

Date	Time	Actual Conductivity (mS/cm) (675965)	Specific Conductivity (mS/cm) (675985)	pH (pH) (551038)	pH mV (mV) (551038)	Turbidity (NTU) (575776)	Temperature (°C) (447275)
2018-04-03	11:22:50	1.795463	2.859848	7.1374	-11.7898	10.88542	5.52419
2018-04-03	11:25:50	1.795209	2.82735	7.161716	-13.05872	13.80028	5.887115
2018-04-03	11:28:50	1.791795	2.816611	7.162735	-13.1594	18.02657	5.950409
2018-04-03	11:31:50	1.783039	2.791366	7.165525	-13.31091	19.46755	6.087402
2018-04-03	11:34:50	1.775788	2.79003	7.165887	-13.37767	18.5599	5.967346
2018-04-03	11:37:50	1.765249	2.789885	7.171458	-13.61132	18.98072	5.771301
2018-04-03	11:40:50	1.767623	2.780303	7.168654	-13.5231	19.93955	5.930176
2018-04-03	11:43:50	1.759157	2.765113	7.172057	-13.64946	27.88483	5.899811
2018-04-03	11:46:50	1.750425	2.760566	7.173365	-13.71622	24.10355	5.841949
2018-04-03	11:49:50	1.746684	2.76155	7.171827	-13.83039	28.12245	5.75943
2018-04-03	11:52:50	1.7433574	2.751529	7.171726	-13.62801	29.31689	5.820648
2018-04-03	11:55:50	1.740271	2.742005	7.168686	-13.53264	29.84713	5.872833
2018-04-03	11:58:50	1.735028	2.734833	7.17178	-13.63764	31.63785	5.859589
2018-04-03	12:01:50	1.727012	2.724679	7.171673	-13.62562	33.47305	5.829346
2018-04-03	12:04:50	1.720545	2.718197	7.172589	-13.67331	32.01828	5.803819
2018-04-03	12:07:50	1.671167	2.652668	7.173787	-13.72814	39.98904	5.627991
2018-04-03	12:10:50	1.671784	2.667094	7.177398	-13.91172	57.73732	5.461304
2018-04-03	12:13:50	1.676377	2.684968	7.174735	-13.7639	61.88488	5.332794
2018-04-03	12:16:50	1.665356	2.691205	7.173791	-13.68993	89.64034	5.042633
2018-04-03	12:19:50	1.666791	2.692347	7.173599	-13.58046	103.2516	4.862335
2018-04-03	12:22:50	1.6633004	2.707244	7.174282	-13.71384	111.8342	4.805206
2018-04-03	12:25:50	1.654037	2.675058	7.172737	-13.64231	104.9954	5.016541

Log Notes

2018-04-03 11:22:50 Started
 2018-04-03 12:26:18 Stopped



1/2

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION											
Project Name: Holland BPW – James DeYoung PP					Date: <u>4-3-18</u>						
Project #: <u>73-160017</u>					Field Personnel: <u>P. HEROUT & C. DAUOT</u>						
Site Location: <u>Holland, MI</u>					Well Const.: <u>Sch 40 PVC</u>						
Well ID: <u>MW-3</u>					Casing Diameter: <u>2.0"</u>						
Sample ID (if different than Well ID): _____					Screened Interval (ft. from TOC): <u>10.0'-15.0- bgs (13.0'-18.0')</u>						
					Top of Casing (ft.): <u>585.30</u>						
PURGING DATA											
Time:	Start:	Finish:									
Purging Volume		Casing Diameter (in)		Casing Vol. (Gal./Ft.)		3 Casing Vol. (Gal./Ft.)					
		1		0.04		0.12					
Total Well Depth (ft. from TOC) = <u>18.23</u>		1.5		0.10		0.30					
Depth to Water (ft. from TOC) = <u>4.60</u>		2		0.16		0.48					
Height of Water in Well (ft.) = <u>13.63</u>		3		0.36		1.08					
One Well Volume (gallons) = <u>2.18</u>		4		0.63		1.89					
Gallons Purged: <u>5.28</u>		Purging and Sampling Device: <u>PERISTALTIC</u>									
Well Volumes Purged: <u>2.5</u>		Purging Rate (g.p.m.) <u>~500 mL/min</u>									
Was Well Purged Dry? Yes ~ <u> </u> No ~ <u> </u>		Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less									
FIELD MONITORING PARAMETERS											
Time/Elapsed time (minutes)	<u>1:31</u>	<u>1:34</u>	<u>1:37</u>	<u>1:40</u>	<u>1:43</u>	<u>1:46</u>	<u>1:49</u>	<u>1:52</u>	<u>1:55</u>		
Accum. Volume Purged (gal)											
Drawdown (ft)											
pH	<u>6.495</u>	<u>6.434</u>	<u>6.403</u>	<u>6.403</u>	<u>6.406</u>	<u>6.405</u>	<u>6.413</u>	<u>6.417</u>	<u>6.425</u>		
Temperature (C)	<u>3.65</u>	<u>4.70</u>	<u>4.88</u>	<u>4.98</u>	<u>5.15</u>	<u>5.02</u>	<u>5.28</u>	<u>5.11</u>	<u>5.06</u>		
Conductivity (mS/cm)	<u>0.000</u>	<u>3.498</u>	<u>3.495</u>	<u>3.491</u>	<u>3.506</u>	<u>3.528</u>	<u>3.541</u>	<u>3.553</u>	<u>3.556</u>		
ORP (mV)											
Dissolved Oxygen (mg/L)											
Turbidity (NTU)	<u>62.968</u>	<u>34.976</u>	<u>19.605</u>	<u>11.515</u>	<u>8.143</u>	<u>6.305</u>	<u>4.120</u>	<u>4.644</u>	<u>3.250</u>		
Odor	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>		
Appearance and/or Color	<u>CLEAR(c)</u>	<u>c</u>	<u>c</u>	<u>c</u>	<u>c</u>	<u>c</u>	<u>c</u>	<u>c</u>	<u>c</u>		
SAMPLING DATA											
Time: Start: <u>2:10P</u> Finish: _____	Pump Rate (g.p.m.): <u>500 mL/min</u>										
Sample Collection Depth (ft. from TOC): <u>~ 15.0</u>											
Weather Conditions: Air Temperature (F): <u>34-35</u>	Wind Speed/Direction: <u>10-20/E</u>								Other: _____		
Samples Collected On chain of Custody No: _____	Analytical Laboratory: _____										

Other Notes:



2/2

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION					
Project Name: Holland BPW – James DeYoung PP	Date: _____				
Project #: 73-160017	Field Personnel: _____				
Site Location: Holland, MI	Well Const.: Sch 40 PVC				
Well ID: MW-3	Casing Diameter: 2.0"				
Sample ID (if different than Well ID): _____	Screened Interval (ft. from TOC): 10.0'-15.0- bgs (13.0'-18.0')				
	Top of Casing (ft.): 585.30				
PURGING DATA					
Time:	Start:	Finish:	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)
Purging Volume			1	0.04	0.12
Total Well Depth (ft. from TOC) =	182		1.5	0.10	0.30
Depth to Water (ft. from TOC) =			2	0.16	0.48
Height of Water in Well (ft.)	66		3	0.36	1.08
One Well Volume (gallons)			4	0.63	1.89
Gallons Purged: _____	Purging and Sampling Device: _____				
Well Volumes Purged: _____	Purging Rate (g.p.m.) _____				
Was Well Purged Dry? Yes ~ No ~	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less				
FIELD MONITORING PARAMETERS					
Time/Elapsed time (minutes)	1:58	2:01	2:04	2:07	2:10
Accum. Volume Purged (gal)					
Drawdown (ft)					
pH	6.478	6.433	6.435	6.445	6.449
Temperature (C)	5.252	5.219	5.388	5.450	5.421
Conductivity (mS/cm)	3.564	3.585	3.596	3.593	3.612
ORP (mV)					
Dissolved Oxygen (mg/L)					
Turbidity (NTU)	3.401	2.836	2.128	1.528	1.361
Odor	—	—	—	—	—
Appearance and/or Color	C	C	C	C	C
SAMPLING DATA					
Time: Start: _____	Finish: _____	Pump Rate (g.p.m.): _____			
Sample Collection Depth (ft. from TOC):	585 10+2				
Weather Conditions: Air Temperature (F):	Wind Speed/Direction: _____ Other: _____				
Samples Collected On chain of Custody No: _____	Analytical Laboratory: _____				

Other Notes:

This file can be opened directly in Microsoft Excel (or you can Export a CSV)

How can I auto-import these files?

Location Properties

Location Name = Mw3

Location ID = d9d53a75-7064-4326-ac90-0f4bcd8104dd

Report Properties

Start Time = 2018-04-03 13:31:33

Duration = 00:39:00

Readings = 14

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 447275

Device Firmware = 1.88

Log Properties

Log Name = Mw3

Log Type = Linear

Log File Number = 4

Log ID = f74c96bb-84ba-a4a8-af68-d086852e9e1f

Interval = 00:03:00

Date	Time	Actual Conductivity (mS/cm) (575965)	Specific Conductivity (mS/cm) (575965)	pH (pH) (551038)	pH mV (mV) (651038)	Turbidity (NTU) (575776)	Temperature (°C) (447275)
2018-04-03	13:31:33	0.0003128714	0.0005283915	6.495141	22.40181	62.96756	3.64505
2018-04-03	13:34:33	2.141239	3.497868	6.434391	25.73013	34.9763	4.694
2018-04-03	13:37:33	2.151708	3.49492	6.403026	27.4229	19.60516	4.877869
2018-04-03	13:40:33	2.156087	3.490911	6.40259	27.45628	11.51537	4.98056
2018-04-03	13:43:33	2.176895	3.50934	6.408029	27.28939	8.142875	5.15274
2018-04-03	13:46:33	2.18178	3.527953	6.405544	27.31232	6.304587	5.022339
2018-04-03	13:49:33	2.207023	3.540735	6.412944	26.93176	4.109606	5.278717
2018-04-03	13:52:33	2.206112	3.557781	6.419415	26.56937	5.108946	4.644345
2018-04-03	13:55:33	2.201807	3.565905	6.425085	26.26181	3.249541	5.062883
2018-04-03	13:58:33	2.219418	3.563552	6.427959	26.12591	3.400859	5.251862
2018-04-03	14:01:33	2.230755	3.565392	6.433027	25.85173	2.836124	5.218781
2018-04-03	14:04:33	2.248711	3.595543	6.435102	25.75636	2.128101	5.388275
2018-04-03	14:07:33	2.251271	3.592907	6.44514	25.22469	1.529325	5.449615
2018-04-03	14:10:33	2.26158	3.612488	6.448699	25.03157	1.360975	5.421204

Log Notes

2018-04-03 13:31:33 Started

2018-04-03 14:12:50 Stopped



07-Sep-2018

Karen Okonta
NTH Consultants, Ltd.
41780 Six Mile Road
Northville, MI 48168

Re: **Holland Board of Public Works**

Work Order: **1807486**

Dear Karen,

ALS Environmental received 7 samples on 10-Jul-2018 05:35 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 38.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Report of Laboratory Analysis

Certificate No: MI: 0022

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1807486

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1807486-01	PZ-1	Groundwater		7/10/2018 10:30	7/10/2018 17:35	<input type="checkbox"/>
1807486-02	MW-1	Groundwater		7/10/2018 17:00	7/10/2018 17:35	<input type="checkbox"/>
1807486-03	MW-2	Groundwater		7/10/2018 13:30	7/10/2018 17:35	<input type="checkbox"/>
1807486-04	MW-3	Groundwater		7/10/2018 15:20	7/10/2018 17:35	<input type="checkbox"/>
1807486-05	Equipment Blank	Groundwater		7/10/2018	7/10/2018 17:35	<input type="checkbox"/>
1807486-06	Field Blank	Groundwater		7/10/2018	7/10/2018 17:35	<input type="checkbox"/>
1807486-07	Field Duplicate	Groundwater		7/10/2018	7/10/2018 17:35	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1807486

Case Narrative

Radium 228/228 analysis performed by ALS Fort Collins laboratory.

Batch 121322, Method ICP_6020_W, Sample 1807486-04A MS: The matrix spike recovery was outside of the control limit for Calcium. However, the matrix spike duplicate recovery and the RPD between the MS and MSD were in control. No qualification is required.

Per 40CFR Part 136 Table II Sample Handling Guidelines:

The holding time associated with the following parameters is defined as not to exceed 15 minutes:

Hydrogen Ion (pH)

Results for analyses conducted in the laboratory, for the above noted parameters, shall be considered non-compliant.

Batch R240190, Method IC_300.0_WW, Samples 1807486-02B, -03B and -04B: The IC reporting limits are elevated due to dilution for high concentrations of non-target analytes.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
WorkOrder: 1807486

**QUALIFIERS,
ACRONYMS, UNITS**

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
as noted	
mg/L	Milligrams per Liter
s.u.	Standard Units

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: PZ-1
Collection Date: 7/10/2018 10:30 AM

Work Order: 1807486
Lab ID: 1807486-01
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 01:47 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:32 PM
Arsenic	0.037		0.0050	mg/L	1	7/16/2018 05:32 PM
Barium	0.063		0.0050	mg/L	1	7/16/2018 05:32 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:32 PM
Boron	0.26		0.020	mg/L	1	7/16/2018 05:32 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:32 PM
Calcium	33		0.50	mg/L	1	7/16/2018 05:32 PM
Chromium	0.0091		0.0050	mg/L	1	7/16/2018 05:32 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:32 PM
Lead	0.078		0.0050	mg/L	1	7/16/2018 05:32 PM
Lithium	ND		0.010	mg/L	1	7/16/2018 05:32 PM
Molybdenum	0.043		0.0050	mg/L	1	7/16/2018 05:32 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:32 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:32 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	120		10	mg/L	10	7/13/2018 12:41 PM
Fluoride	1.5		1.0	mg/L	1	7/13/2018 12:22 PM
Sulfate	5.8		2.0	mg/L	1	7/13/2018 12:22 PM
PH (LABORATORY)						
pH (laboratory)	8.01	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,500		20	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-1
Collection Date: 7/10/2018 05:00 PM

Work Order: 1807486
Lab ID: 1807486-02
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 01:50 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Arsenic	0.031		0.0050	mg/L	1	7/16/2018 05:33 PM
Barium	0.23		0.0050	mg/L	1	7/16/2018 05:33 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:33 PM
Boron	1.2		0.020	mg/L	1	7/16/2018 05:33 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:33 PM
Calcium	96		0.50	mg/L	1	7/16/2018 05:33 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Lithium	0.12		0.010	mg/L	1	7/16/2018 05:33 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:33 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:33 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	180		25	mg/L	25	7/13/2018 01:19 PM
Fluoride	ND		1.0	mg/L	1	7/13/2018 01:00 PM
Sulfate	ND		50	mg/L	25	7/13/2018 01:19 PM
PH (LABORATORY)						
pH (laboratory)	6.93	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	880		20	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-2
Collection Date: 7/10/2018 01:30 PM

Work Order: 1807486
Lab ID: 1807486-03
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 01:59 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Arsenic	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Barium	0.21		0.0050	mg/L	1	7/17/2018 02:44 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:40 PM
Boron	0.67		0.020	mg/L	1	7/17/2018 02:44 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:40 PM
Calcium	80		0.50	mg/L	1	7/17/2018 02:44 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Lithium	ND		0.010	mg/L	1	7/16/2018 05:40 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:40 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:40 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	540		50	mg/L	50	7/13/2018 01:57 PM
Fluoride	ND		5.0	mg/L	5	7/13/2018 01:38 PM
Sulfate	ND		10	mg/L	5	7/13/2018 01:38 PM
PH (LABORATORY)						
pH (laboratory)	6.94	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,400		20	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-3
Collection Date: 7/10/2018 03:20 PM

Work Order: 1807486
Lab ID: 1807486-04
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 02:02 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Arsenic	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Barium	0.040		0.0050	mg/L	1	7/16/2018 02:58 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 02:58 PM
Boron	0.66		0.020	mg/L	1	7/16/2018 02:58 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 02:58 PM
Calcium	300		5.0	mg/L	10	7/16/2018 04:15 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Lithium	0.029		0.010	mg/L	1	7/16/2018 02:58 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 02:58 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 02:58 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	180		10	mg/L	10	7/13/2018 02:17 PM
Fluoride	ND		10	mg/L	10	7/13/2018 02:17 PM
Sulfate	980		200	mg/L	100	7/13/2018 03:14 PM
PH (LABORATORY)						
pH (laboratory)	6.26	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	2,200		20	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Equipment Blank
Collection Date: 7/10/2018

Work Order: 1807486
Lab ID: 1807486-05
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 02:09 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Arsenic	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Barium	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:42 PM
Boron	ND		0.020	mg/L	1	7/16/2018 05:42 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:42 PM
Calcium	ND		0.50	mg/L	1	7/16/2018 05:42 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Lithium	ND		0.010	mg/L	1	7/16/2018 05:42 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:42 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:42 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		1.0	mg/L	1	7/13/2018 11:43 AM
Fluoride	ND		1.0	mg/L	1	7/13/2018 11:43 AM
Sulfate	ND		2.0	mg/L	1	7/13/2018 11:43 AM
PH (LABORATORY)						
pH (laboratory)	6.90	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		10	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank
Collection Date: 7/10/2018

Work Order: 1807486
Lab ID: 1807486-06
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 02:11 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Arsenic	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Barium	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:43 PM
Boron	ND		0.020	mg/L	1	7/16/2018 05:43 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:43 PM
Calcium	ND		0.50	mg/L	1	7/16/2018 05:43 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Lithium	ND		0.010	mg/L	1	7/16/2018 05:43 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:43 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:43 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		1.0	mg/L	1	7/13/2018 12:02 PM
Fluoride	ND		1.0	mg/L	1	7/13/2018 12:02 PM
Sulfate	ND		2.0	mg/L	1	7/13/2018 12:02 PM
PH (LABORATORY)						
pH (laboratory)	6.41	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	12		10	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate
Collection Date: 7/10/2018

Work Order: 1807486
Lab ID: 1807486-07
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	7/18/2018 02:13 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Arsenic	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Barium	0.20		0.0050	mg/L	1	7/17/2018 02:46 PM
Beryllium	ND		0.0020	mg/L	1	7/16/2018 05:45 PM
Boron	0.67		0.020	mg/L	1	7/17/2018 02:46 PM
Cadmium	ND		0.0020	mg/L	1	7/16/2018 05:45 PM
Calcium	80		0.50	mg/L	1	7/17/2018 02:46 PM
Chromium	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Cobalt	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Lead	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Lithium	ND		0.010	mg/L	1	7/16/2018 05:45 PM
Molybdenum	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Selenium	ND		0.0050	mg/L	1	7/16/2018 05:45 PM
Thallium	ND		0.0020	mg/L	1	7/16/2018 05:45 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	560		50	mg/L	50	7/16/2018 11:12 AM
Fluoride	ND		1.0	mg/L	1	7/13/2018 03:33 PM
Sulfate	ND		2.0	mg/L	1	7/13/2018 03:33 PM
PH (LABORATORY)						
pH (laboratory)	6.98	H	0.100	s.u.	1	7/14/2018 06:00 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,400		20	mg/L	1	7/16/2018 03:30 PM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 8/31/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 07-Sep-18

Client: NTH Consultants, Ltd.

Work Order: 1807486

Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **121494**

Instrument ID **HG1**

Method: **SW7470A**

MBLK			Sample ID: MBLK-121494-121494			Units: mg/L		Analysis Date: 7/18/2018 01:38 PM			
Client ID:		Run ID: HG1_180718A		SeqNo: 5152800		Prep Date: 7/18/2018		DF: 1			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury		ND	0.00020								
LCS			Sample ID: LCS-121494-121494			Units: mg/L		Analysis Date: 7/18/2018 01:40 PM			
Client ID:		Run ID: HG1_180718A		SeqNo: 5152801		Prep Date: 7/18/2018		DF: 1			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury		0.00184	0.00020	0.002	0	92	80-120	0			
MS			Sample ID: 1807486-04AMS			Units: mg/L		Analysis Date: 7/18/2018 02:04 PM			
Client ID: MW-3		Run ID: HG1_180718A		SeqNo: 5152811		Prep Date: 7/18/2018		DF: 1			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury		0.00179	0.00020	0.002	-0.000059	92.4	75-125	0			
MSD			Sample ID: 1807486-04AMSD			Units: mg/L		Analysis Date: 7/18/2018 02:06 PM			
Client ID: MW-3		Run ID: HG1_180718A		SeqNo: 5152812		Prep Date: 7/18/2018		DF: 1			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury		0.00185	0.00020	0.002	-0.000059	95.4	75-125	0.00179	3.3	20	

The following samples were analyzed in this batch:

1807486-01A	1807486-02A	1807486-03A
1807486-04A	1807486-05A	1807486-06A
1807486-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC Page: 1 of 8

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **121322** Instrument ID **ICPMS3** Method: **SW6020A**

MLBK		Sample ID: MLBK-121322-121322			Units: mg/L		Analysis Date: 7/16/2018 02:55 PM			
Client ID:		Run ID: ICPMS3_180716A			SeqNo: 5148302		Prep Date: 7/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	ND	0.0050								
Arsenic	ND	0.0050								
Barium	ND	0.0050								
Beryllium	ND	0.0020								
Boron	0.004155	0.020								J
Cadmium	ND	0.0020								
Calcium	ND	0.50								
Chromium	ND	0.0050								
Cobalt	ND	0.0050								
Lead	ND	0.0050								
Lithium	ND	0.010								
Molybdenum	ND	0.0050								
Selenium	ND	0.0050								
Thallium	ND	0.0050								

LCS		Sample ID: LCS-121322-121322			Units: mg/L		Analysis Date: 7/16/2018 02:57 PM			
Client ID:		Run ID: ICPMS3_180716A			SeqNo: 5148303		Prep Date: 7/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.09577	0.0050	0.1	0	95.8	80-120	0			
Arsenic	0.09452	0.0050	0.1	0	94.5	80-120	0			
Barium	0.09704	0.0050	0.1	0	97	80-120	0			
Beryllium	0.09429	0.0020	0.1	0	94.3	80-120	0			
Boron	0.4618	0.020	0.5	0	92.4	80-120	0			
Cadmium	0.09894	0.0020	0.1	0	98.9	80-120	0			
Calcium	9.697	0.50	10	0	97	80-120	0			
Chromium	0.09849	0.0050	0.1	0	98.5	80-120	0			
Cobalt	0.09674	0.0050	0.1	0	96.7	80-120	0			
Lead	0.09556	0.0050	0.1	0	95.6	80-120	0			
Lithium	0.09616	0.010	0.1	0	96.2	80-120	0			
Molybdenum	0.0968	0.0050	0.1	0	96.8	80-120	0			
Selenium	0.09439	0.0050	0.1	0	94.4	80-120	0			
Thallium	0.09517	0.0050	0.1	0	95.2	80-120	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **121322** Instrument ID **ICPMS3** Method: **SW6020A**

MS	Sample ID: 1807486-04AMS			Units: mg/L		Analysis Date: 7/16/2018 03:00 PM			
Client ID: MW-3	Run ID: ICPMS3_180716A			SeqNo: 5148305		Prep Date: 7/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony	0.09627	0.0050	0.1	0.000039	96.2	75-125	0		
Arsenic	0.09679	0.0050	0.1	0.000396	96.4	75-125	0		
Barium	0.1339	0.0050	0.1	0.04022	93.7	75-125	0		
Beryllium	0.08913	0.0020	0.1	0.00004	89.1	75-125	0		
Boron	1.1	0.020	0.5	0.6587	88.3	75-125	0		
Cadmium	0.09493	0.0020	0.1	0.000039	94.9	75-125	0		
Chromium	0.09376	0.0050	0.1	0.000104	93.7	75-125	0		
Cobalt	0.09251	0.0050	0.1	0.000393	92.1	75-125	0		
Lead	0.0941	0.0050	0.1	0.000037	94.1	75-125	0		
Lithium	0.1224	0.010	0.1	0.02911	93.3	75-125	0		
Molybdenum	0.0989	0.0050	0.1	0.001177	97.7	75-125	0		
Selenium	0.09542	0.0050	0.1	0.000189	95.2	75-125	0		
Thallium	0.09303	0.0050	0.1	0.000066	93	75-125	0		

MS	Sample ID: 1807486-04AMS			Units: mg/L		Analysis Date: 7/16/2018 04:16 PM			
Client ID: MW-3	Run ID: ICPMS3_180716A			SeqNo: 5148483		Prep Date: 7/16/2018		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Calcium	314.8	5.0	10	301.6	131	75-125	0		SO

MSD	Sample ID: 1807486-04AMSD			Units: mg/L		Analysis Date: 7/16/2018 03:02 PM			
Client ID: MW-3	Run ID: ICPMS3_180716A			SeqNo: 5148306		Prep Date: 7/16/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony	0.09717	0.0050	0.1	0.000039	97.1	75-125	0.09627	0.926	20
Arsenic	0.09829	0.0050	0.1	0.000396	97.9	75-125	0.09679	1.54	20
Barium	0.1366	0.0050	0.1	0.04022	96.4	75-125	0.1339	2.01	20
Beryllium	0.09201	0.0020	0.1	0.00004	92	75-125	0.08913	3.18	20
Boron	1.131	0.020	0.5	0.6587	94.5	75-125	1.1	2.8	20
Cadmium	0.09688	0.0020	0.1	0.000039	96.8	75-125	0.09493	2.03	20
Chromium	0.09602	0.0050	0.1	0.000104	95.9	75-125	0.09376	2.38	20
Cobalt	0.09492	0.0050	0.1	0.000393	94.5	75-125	0.09251	2.57	20
Lead	0.09527	0.0050	0.1	0.000037	95.2	75-125	0.0941	1.24	20
Lithium	0.1242	0.010	0.1	0.02911	95.1	75-125	0.1224	1.46	20
Molybdenum	0.101	0.0050	0.1	0.001177	99.8	75-125	0.0989	2.07	20
Selenium	0.09863	0.0050	0.1	0.000189	98.4	75-125	0.09542	3.31	20
Thallium	0.09439	0.0050	0.1	0.000066	94.3	75-125	0.09303	1.45	20

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **121322** Instrument ID **ICPMS3** Method: **SW6020A**

MSD	Sample ID: 1807486-04AMSD			Units: mg/L			Analysis Date: 7/16/2018 04:18 PM			
Client ID: MW-3	Run ID: ICPMS3_180716A			SeqNo: 5148485			Prep Date: 7/16/2018			DF: 10
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Calcium	309.7	5.0	10	301.6	80.5	75-125	314.8	1.63	20	O

The following samples were analyzed in this batch:

1807486-01A	1807486-02A	1807486-03A
1807486-04A	1807486-05A	1807486-06A
1807486-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **121272** Instrument ID **TDS** Method: **A2540 C-11**

MLBK		Sample ID: MLBK-121272-121272			Units: mg/L		Analysis Date: 7/16/2018 03:30 PM		
Client ID:		Run ID: TDS_180716A			SeqNo: 5148369		Prep Date: 7/16/2018		DF: 1
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids		ND		10					

DUP		Sample ID: 1807486-05B DUP			Units: mg/L		Analysis Date: 7/16/2018 03:30 PM		
Client ID: Equipment Blank		Run ID: TDS_180716A			SeqNo: 5148360		Prep Date: 7/16/2018		DF: 1
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids		ND		10	0	0	0-0	2	0 10

DUP		Sample ID: 1807560-01K DUP			Units: mg/L		Analysis Date: 7/16/2018 03:30 PM		
Client ID:		Run ID: TDS_180716A			SeqNo: 5148366		Prep Date: 7/16/2018		DF: 1
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Total Dissolved Solids		263	10	0	0	0	0-0	264	0.38 10

The following samples were analyzed in this batch:

1807486-01B	1807486-02B	1807486-03B
1807486-04B	1807486-05B	1807486-06B
1807486-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R240157** Instrument ID **WETCHEM** Method: **A4500-H B-11**

LCS		Sample ID: LCS-R240157-R240157			Units: s.u.			Analysis Date: 7/14/2018 06:00 PM			
Client ID:		Run ID: WETCHEM_180714G			SeqNo: 5145851			Prep Date: 			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		4.04	0.10	4	0	101	90-110		0		
DUP		Sample ID: 1807486-04B DUP			Units: s.u.			Analysis Date: 7/14/2018 06:00 PM			
Client ID: MW-3		Run ID: WETCHEM_180714G			SeqNo: 5145857			Prep Date: 			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		6.27	0.10	0	0	0	0-0	6.26	0.16	20	H
DUP		Sample ID: 1807557-01A DUP			Units: s.u.			Analysis Date: 7/14/2018 06:00 PM			
Client ID:		Run ID: WETCHEM_180714G			SeqNo: 5145863			Prep Date: 			
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		12.53	0.10	0	0	0	0-0	12.52	0.0798	20	H

The following samples were analyzed in this batch:

1807486-01B	1807486-02B	1807486-03B
1807486-04B	1807486-05B	1807486-06B
1807486-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R240190** Instrument ID **IC4** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R240190			Units: mg/L		Analysis Date: 7/13/2018 10:46 AM			
Client ID:		Run ID: IC4_180713A			SeqNo: 5147176		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	ND	1.0								
Fluoride	ND	0.10								
Sulfate	ND	1.0								

LCS		Sample ID: LCS-R240190			Units: mg/L		Analysis Date: 7/13/2018 11:05 AM			
Client ID:		Run ID: IC4_180713A			SeqNo: 5147177		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.362	1.0	10	0	93.6	90-110		0		
Fluoride	2.076	0.10	2	0	104	90-110		0		
Sulfate	9.784	1.0	10	0	97.8	90-110		0		

MS		Sample ID: 1807486-04B MS			Units: mg/L		Analysis Date: 7/13/2018 04:12 PM			
Client ID: MW-3		Run ID: IC4_180713A			SeqNo: 5147213		Prep Date:		DF: 250	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	2747	250	2500	181	103	80-120		0		
Fluoride	487	25	500	0	97.4	80-120		0		
Sulfate	3711	250	2500	981.6	109	80-120		0		

MSD		Sample ID: 1807486-04B MSD			Units: mg/L		Analysis Date: 7/13/2018 04:31 PM			
Client ID: MW-3		Run ID: IC4_180713A			SeqNo: 5147214		Prep Date:		DF: 250	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	2702	250	2500	181	101	80-120		2747	1.65	20
Fluoride	493.1	25	500	0	98.6	80-120		487	1.24	20
Sulfate	3719	250	2500	981.6	109	80-120		3711	0.194	20

The following samples were analyzed in this batch:

1807486-01B	1807486-02B	1807486-03B
1807486-04B	1807486-05B	1807486-06B
1807486-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1807486
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: R240289 Instrument ID IC4 Method: E300.0

MBLK		Sample ID: CCB/MBLK-R240289			Units: mg/L		Analysis Date: 7/16/2018 10:28 AM			
Client ID:		Run ID: IC4_180716A			SeqNo: 5149697		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	ND		1.0							
LCS		Sample ID: LCS-R240289			Units: mg/L		Analysis Date: 7/16/2018 10:47 AM			
Client ID:		Run ID: IC4_180716A			SeqNo: 5149699		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.391	1.0	10	0	93.9	90-110		0		
MS		Sample ID: 1807486-07B MS			Units: mg/L		Analysis Date: 7/16/2018 12:10 PM			
Client ID: Field Duplicate		Run ID: IC4_180716A			SeqNo: 5149703		Prep Date:		DF: 100	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1570	100	1000	555.5	101	80-120		0		
MSD		Sample ID: 1807486-07B MSD			Units: mg/L		Analysis Date: 7/16/2018 12:29 PM			
Client ID: Field Duplicate		Run ID: IC4_180716A			SeqNo: 5149705		Prep Date:		DF: 100	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1591	100	1000	555.5	104	80-120	1570	1.37	20	

The following samples were analyzed in this batch:

1807486-07B

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Cincinnati, OH
+1 513 733 5336Everett, WA
+1 425 356 2600Fort Collins, CO
+1 970 490 1511Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 1Houston, TX
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+1 610 948 4903Salt Lake City, UT
+1 801 266 7700South Charleston, WV
+1 304 356 3168York, PA
+1 717 505 5280

COC ID: 184651

ALS Project Manager:

ALS Work Order #: 1807486

Customer Information		Project Information		Parameter/Method Request for Analysis												
Purchase Order		Project Name		A	Metals including Hg											
Work Order		Project Number		B	Chloride, Fluoride, Sulfate											
Company Name	NTH Consultants, Ltd.	Bill To Company	NTH Consultants, Ltd.	C	pH											
Send Report To	Karen Okonta	Invoice Attn	Accounts Payable	D	TDS											
Address	41780 Six Mile Road	Address	41780 Six Mile Road	E	Radium 226 & 228											
City/State/Zip	Northville, MI 48168	City/State/Zip	Northville, MI 48168	F												
Phone	(248) 662-2668	Phone	(248) 662-2668	G												
Fax	(248) 324-5305	Fax	(248) 324-5305	H												
e-Mail Address		e-Mail Address		I												
J																

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Ward
1	R2-1	7/10/18	10:30 am	GW		5	✓	✓	✓	✓	✓						
2	MW-1		5:00PM														
3	MW-2		1:30pm														
4	MW-3		3:20 pm														
5	Equipment blank		—														
6	Field blank		—														
7	Field Duplicate		—														
8	Matrix Spike		—														
9	Matrix Spike Dsp.		—														
10																	

Sampler(s) Please Print & Sign <i>Courtney Serial Cate</i>	Shipment Method	Required Turnaround Time: (Check Box)	Results Due Date:
<input type="checkbox"/> Ship 40 WK Days	<input type="checkbox"/> 5 WK Days	<input type="checkbox"/> Other _____	<input type="checkbox"/> 24 Hour

Relinquished by: <i>Cate Cate</i>	Date: 7/10/18	Time: 11:35	Received by: <i>Ts Arnold</i>	Notes:		
Relinquished by:	Date:	Time:	Received by (Laboratory):	Cooler ID	Cooler Temp.	QC Package: (Check One Box Below)

Logged by (Laboratory): <i>DGS</i>	Date: 7/11/18	Time: 1000	Checked by (Laboratory): <i>C</i>	S22	3.2°C	<input type="checkbox"/> Level II Std QC	<input type="checkbox"/> TRRP Checklist
					3.0°C	<input type="checkbox"/> Level III Std QC/Raw Data	<input type="checkbox"/> TRRP Level IV
						<input type="checkbox"/> Level IV SW846/CLP	
						<input type="checkbox"/> Other	

Preservative Key: 1-HCl 2-HNO ₃ 3-H ₂ SO ₄ 4-NaOH 5-Na ₂ S ₂ O ₃ 6-NaHSO ₄ 7-Other 8-4°C 9-5035
--

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2011 by ALS Environmental.

ALS Group, USA

Sample Receipt Checklist

Client Name: NTH - NORTHLILLE

Date/Time Received: 10-Jul-18 17:35

Work Order: 1807486

Received by: LA

Checklist completed by Diane Shaw

eSignature

11-Jul-18

Date

Reviewed by: Chad Whetton

eSignature

11-Jul-18

Date

Matrices: Groundwater

Carrier name: Client

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample(s) received on ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>3.2/3.2, 3.0/3.0 c</u> SR2		
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	<u>7/11/2018 10:41:44 AM</u>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted by:	-		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:



Friday, August 31, 2018

Chad Whelton
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Re: ALS Workorder: 1807245
Project Name:
Project Number: 1807486

Dear Mr. Whelton:

Seven water samples were received from ALS Environmental, on 7/13/2018. The samples were scheduled for the following analyses:

Radium-226

Radium-228

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff R. Kujawa".

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1807245

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to the current revision of SOP 724.

All acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1807245

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 1807486

Client PO Number: 20-122018544

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
PZ-1	1807245-1		WATER	10-Jul-18	10:30
MW-1	1807245-2		WATER	10-Jul-18	17:00
MW-2	1807245-3		WATER	10-Jul-18	13:30
Equipment Blank	1807245-4		WATER	10-Jul-18	
Field Blank	1807245-5		WATER	10-Jul-18	
Field Duplicate	1807245-6		WATER	10-Jul-18	
MW-3	1807245-7		WATER	10-Jul-18	15:20



Subcontractor:
ALS Environmental, Fort Collins
225 Commerce Dr.
Fort Collins, CO 80524

TEL: (800) 443-1511
FAX:
Acct #:

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Date: 11-Jul-18
COC ID: 9360
Due Date: 25-Jul-18

Salesperson **Brian Root**

Customer Information		Project Information		Parameter/Method Request for Analysis										
Purchase Order		Project Name	1807486	A	Subcontracted Analyses (SUBCONTRACT)									
Work Order		Project Number		B	Radium 226/228									
Company Name	ALS Group USA, Corp	Bill To Company	ALS Group USA, Corp	C										
Send Report To	Chad Whelton	Inv Attn	Accounts Payable	D										
Address	3352 128th Ave	Address	3352 128th Ave	E										
				F										
City/State/Zip	Holland, Michigan 49424	City/State/Zip	Holland, Michigan 49424	G										
Phone	(616) 399-6070	Phone	(616) 399-6070	H										
Fax	(616) 399-6185	Fax	(616) 399-6185	I										
eMail Address	chad.whelton@alsglobal.com	eMail CC		J										
ALS Sample ID	Client Sample ID	Matrix	Collection Date 24hr	Bottle	A	B	C	D	E	F	G	H	I	J
① 1807486-01C	PZ-1	Groundwater	10/Jul/2018 10:30	(3) 1LPHNO3	X									
② 1807486-02C	MW-1	Groundwater	10/Jul/2018 17:00	(3) 1LPHNO3	X									
③ 1807486-03C	MW-2	Groundwater	10/Jul/2018 13:30	(3) 1LPHNO3	X									
④ 1807486-05C	Equipment Blank	Groundwater	10/Jul/2018	(3) 1LPHNO3	X									
⑤ 1807486-06C	Field Blank	Groundwater	10/Jul/2018	(3) 1LPHNO3	X									
⑥ 1807486-07C	Field Duplicate	Groundwater	10/Jul/2018	(3) 1LPHNO3	X									
⑦ 1807486-04C	MW-3	Groundwater	10/Jul/2018 15:20	(9) 1LPHNO3	X									

Comments:

Please analyze these samples per our instructions and indicated turnaround requirements. Please include all QC with data. The samples do not need to be returned and can be disposed after 30 days. *MS/MSD on #4*

Relinquished by:

7-11-18 1530

Date/Time

Received by:

JLK 07/13/18

Date/Time

Cooler IDs

Report/QC Level

Std

Relinquished by:

Date/Time

Received by:

Date/Time



1807245

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Michigan

Workorder No: _____

Project Manager: Jeff

Initials: JLK Date: 07/13/18

1. Are airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (chain-of-custody) present?	YES	NO	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)	YES	NO	
6. Are short-hold samples present?	YES	NO	
7. Are all samples within holding times for the requested analyses?	YES	NO	
8. Were all sample containers received intact? (not broken or leaking)	YES	NO	
9. Is there sufficient sample for the requested analyses?	YES	NO	
10. Are all samples in the proper containers for the requested analyses?	YES	NO	
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	NO
12. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	N/A	YES	NO
14. Were the samples shipped on ice?	YES	NO	
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4	RAD ONLY	YES
Cooler #: <u>1</u> <u>2</u>			
Temperature (°C): <u>Amb</u> <u>Amb</u>			
No. of custody seals on cooler: <u>0</u> <u>0</u>			
DOT Survey Acceptance Information	External µR/hr reading: <u>13</u> <u>13</u>		
	Background µR/hr reading: <u>12</u>		
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)			

Additional Information: Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: JLK 7-13-18

7 of 17

Ref:	Date: 11Jul18	SHIPPING:	102.62
Dep:	Wgt: 43.15 LBS	SPECIAL:	7.16
		HANDLING:	0.00
DV:	0.00	TOTAL:	109.80
297-435 RRDW EXP 09/			
Svcs: PRIORITY OVERNIGHT Master 4325 6703 6560		SHIP DATE: 11JUL18	
TRCK: 4325 6703 6571		ACTWGT: 43.15 LB	
ORIGIN ID:GRRA (616) 399-6070		CAD: 0122071/CAFE3111	
SAMPLE RECEIVING			
ALS ENVIRONMENTAL			
3352 128TH AVENUE			
HOLLAND, MI 494249263		BILL SENDER	
UNITED STATES US			

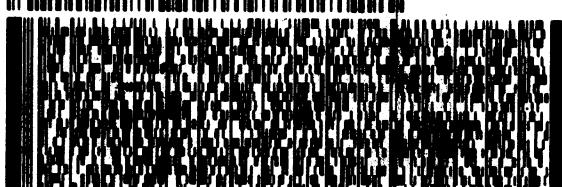
**TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR**

FORT COLLINS CO 80524

(970) 490-1511

DEE •

10



FedEx
Express



1

2 of 2

MPS# 4325 6703 6571

Mstr# 4325 6703 6580

1-800-462-9789

NA FTCA

**THU - 12 JUL 10:30A
PRIORITY OVERNIGHT**

80524
CO-US DEN



Ref:	Date: 11Jul18	SHIPPING:	87.25
Dep:	Wgt: 35.70 LBS	SPECIAL:	6.1 P
	DV: 0.00	HANDLING:	0.00
		TOTAL:	93.36
Svcs: PRIORITY OVERNIGHT	Master 4325 6703 6560		
	TRACK: 4325 6703 6560		
ORIGIN ID:GRRA (616) 399-6070	SHIP DATE: 11JUL18		
SAMPLE RECEIVING	ACTWGT: 35.70 LB		
ALS ENVIRONMENTAL	CAD: 0122071/CAFE3111		
3352 128TH AVENUE			
HOLLAND, MI 494249263	BILL SENDER		
UNITED STATES US			

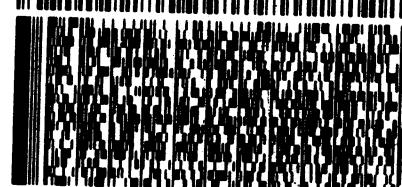
**TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR**

FORT COLLINS CO 80524

(970) 490-1511

REF:

REPT



E
Express

1 of 2
TRK# 0201 4325 6703 6560
MASTER

**THU - 12 JUL 10:30A
PRIORITY OVERNIGHT**

NAFTCA

— 10 —



Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: PZ-1 **Lab ID:** 1807245-1
Legal Location:
Collection Date: 7/10/2018 10:30 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.24)	U	0.36	pCi/l	NA	8/9/2018 11:41
Carr: BARIUM	88.7		40-110	%REC	DL = NA	8/9/2018 11:41
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.44)	U	0.91	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	83.6		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: MW-1 **Lab ID:** 1807245-2
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 17:00 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.25)	U	0.35	pCi/l	NA	8/9/2018 11:41
Carr: BARIUM	92.3		40-110	%REC	DL = NA	8/9/2018 11:41
Radium-228 Analysis by GFPC						
Ra-228	1.1 (+/- 0.54)		0.92	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	83.5		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: MW-2 **Lab ID:** 1807245-3
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 13:30 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.21)	U	0.32	pCi/l	NA	8/9/2018 11:41
Carr: BARIUM	95.9		40-110	%REC	DL = NA	8/9/2018 11:41
Radium-228 Analysis by GFPC						
Ra-228	1.36 (+/- 0.6)		0.98	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	87.3		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: Equipment Blank **Lab ID:** 1807245-4
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.19)	U	0.35	pCi/l	NA	8/9/2018 11:41
Carr: BARIUM	99		40-110	%REC	DL = NA	8/9/2018 11:41
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.42)	U	0.89	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	89.9		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: Field Blank **Lab ID:** 1807245-5
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.29 (+/- 0.23)	LT	0.28	pCi/l	NA	8/9/2018 11:41
Carr: BARIUM	91.2		40-110	%REC	DL = NA	8/9/2018 11:41
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.44)	U	0.91	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	87.9		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: Field Duplicate **Lab ID:** 1807245-6
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.36 (+/- 0.26)	LT	0.34	pCi/l	NA	8/9/2018 12:20
Carr: BARIUM	98.8		40-110	%REC	DL = NA	8/9/2018 12:20
Radium-228 Analysis by GFPC						
Ra-228	1.07 (+/- 0.53)	SOP 724	0.94	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	87.9		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental **Date:** 31-Aug-18
Project: 1807486 **Work Order:** 1807245
Sample ID: MW-3 **Lab ID:** 1807245-7
Legal Location: **Matrix:** WATER
Collection Date: 7/10/2018 15:20 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.41 (+/- 0.27)	LT	0.32	pCi/l	NA	8/9/2018 12:20
Carr: BARIUM	98.6		40-110	%REC	DL = NA	8/9/2018 12:20
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.5)	U	0.91	pCi/l	NA	8/30/2018 12:37
Carr: BARIUM	89.1		40-110	%REC	DL = NA	8/30/2018 12:37

Client: ALS Environmental
Project: 1807486
Sample ID: MW-3
Legal Location:
Collection Date: 7/10/2018 15:20

Date: 31-Aug-18
Work Order: 1807245
Lab ID: 1807245-7
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers**Radiochemistry:**

- "Report Limit" is the MDC
 - U or ND - Result is less than the sample specific MDC.
 - Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
 - Y2 - Chemical Yield outside default limits.
 - W - DER is greater than Warning Limit of 1.42
 - * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
 - # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
 - G - Sample density differs by more than 15% of LCS density.
 - D - DER is greater than Control Limit
 - M - Requested MDC not met.
 - LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 8/31/2018 12:03

Client: ALS Environmental
Work Order: 1807245
Project: 1807486

QC BATCH REPORT

Batch ID: RE180802-1-4			Instrument ID Alpha Scin			Method: Radium-226 by Radon Emanation					
DUP	Sample ID: 1807245-7						Units: pCi/l		Analysis Date: 8/9/2018 12:20		
Client ID: MW-3	Run ID: RE180802-1A						Prep Date: 8/2/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.33						0.41	0.9	2.1	Y1,U
Carr: BARIUM	17670		17310		102	40-110		17070			Y1
LCS	Sample ID: RE180802-1						Units: pCi/l		Analysis Date: 8/9/2018 12:20		
Client ID:	Run ID: RE180802-1A						Prep Date: 8/2/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	53 (+/- 13)	0	47.88		111	67-120					P,Y1
Carr: BARIUM	17430		17270		101	40-110					Y1
MB	Sample ID: RE180802-1						Units: pCi/l		Analysis Date: 8/9/2018 12:20		
Client ID:	Run ID: RE180802-1A						Prep Date: 8/2/2018		DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.37									U
Carr: BARIUM	17100		17270		99	40-110					
The following samples were analyzed in this batch:			1807245-1	1807245-2	1807245-3						
			1807245-4	1807245-5	1807245-6						
			1807245-7								

Client: ALS Environmental
Work Order: 1807245
Project: 1807486

QC BATCH REPORT

Batch ID: RA180817-3-2

Instrument ID LB4100-C

Method: Radium-228 Analysis by GFPC

DUP	Sample ID: 1807245-7			Units: pCi/l		Analysis Date: 8/30/2018 12:37					
Client ID:	MW-3	Run ID: RA180817-3A						Prep Date: 8/17/2018		DF: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		ND	0.9						0.88	0.2	2.1 U
Carr: BARIUM		31190		34690		89.9	40-110		30890		

LCS	Sample ID: RA180817-3			Units: pCi/l		Analysis Date: 8/30/2018 12:26					
Client ID:	Run ID: RA180817-3A						Prep Date: 8/17/2018		DF: NA		
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		8.9 (+/- 2.5)	1.7	8.88		100	70-130				P,M3
Carr: BARIUM		30060		34650		86.7	40-110				

MB	Sample ID: RA180817-3			Units: pCi/l		Analysis Date: 8/30/2018 12:54					
Client ID:	Run ID: RA180817-3A						Prep Date: 8/17/2018		DF: NA		
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		ND	0.88								U
Carr: BARIUM		32150		34660		92.7	40-110				

The following samples were analyzed in this batch:

1807245-1	1807245-2	1807245-3
1807245-4	1807245-5	1807245-6
1807245-7		



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION	
Project Name:	<u>Holland BWP</u>
Project #:	<u>E 73 160017</u>
Site Location:	<u>Holland, MI</u>
Well ID:	<u>D2-1</u>
Sample ID (if different than Well ID):	<u>D2-1</u>
Date: <u>7/10/18</u>	
Field Personnel: <u>Carney Daniel</u>	
Well Const.: <u>SCH 40 PVC</u>	
Casing Diameter: <u>20"</u>	
Screened Interval: _____ (ft. from TOC)	

PURGING DATA				
Time:	Start:	Finish:		
Purging Volume				
	Casing Diameter (in)	Casing Vol. Gal./Ft.		
1	0.04	3 Casing Vol. Gal./Ft.		
Total Well Depth (ft. from TOC) = <u>10.05</u>	1.5	0.10		0.30
Depth to Water (ft. from TOC) = <u>3.49</u>	2	0.16		0.48
Height of Water in Well (ft.) = <u>3.44</u>	3	0.36		1.08
One Well Volume (gallons) = <u>0.55</u>	4	0.63		1.89
Gallons Purged: <u>E 2</u>	Purging and Sampling Device: <u>Peristaltic</u>			
Well Volumes Purged: <u>3+</u>	Purging Rate (g.p.m.) <u>>150 mL/min</u>			
Was Well Purged Dry? Yes ~ <u>No ~</u>	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			

FIELD MONITORING PARAMETERS									
Elapsed time (minutes)	<u>9:48</u>	<u>9:51</u>	<u>9:54</u>	<u>9:51</u>	<u>10</u>	<u>10:03</u>	<u>10:06</u>	<u>10:09</u>	<u>10:12</u>
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH									
Temperature (C)									
Conductivity (mS/cm)									
ORP (mV)									
Dissolved Oxygen (mg/L)									
Turbidity (NTU)									
Odor									
Appearance and/or Color									

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Location Properties

Location Name = Pz1
Location ID = 07d7c657-7ad4-4ceb-9c2d-1fa8239888d8

Report Properties

Start Time = 2018-07-10 07:48:05
Duration = 00:33:00
Readings = 12
Time Offset = -08:00:00

Instrument Properties

Device Model = Aqua TROLL 600
Device SN = 513586
Device Firmware = 1.98

Log Properties

Log Name = Pz1
Log Type = Linear
Log File Number = 1
Log ID = f93ff6f8-14ce-450d-b9c7-12b159c7e2f5
Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (509518)	Specific Conductivity (mS/cm) (509518)	pH (pH) (475556)	Turbidity (NTU) (508930)	Temperature (°C) (613586)
2018-07-10 07:48:05	0.00120937	0.001082701	8.029537	0.6735112	30.59012
2018-07-10 07:51:05	0.001298098	0.001175554	8.102192	0.6821221	30.45776
2018-07-10 07:54:05	0.001374661	0.001240916	8.101263	0.755722	30.64288
2018-07-10 07:57:05	0.001417644	0.001275477	8.029642	0.740581	30.83572
2018-07-10 08:00:05	0.001459848	0.001310908	8.053833	0.7624745	30.94858
2018-07-10 08:03:05	0.001461228	0.001309467	7.979735	0.7590526	31.06781
2018-07-10 08:06:05	0.001412281	0.00126304	8.121285	0.7411997	31.18843
2018-07-10 08:09:05	0.001249316	0.0011114512	8.21674	0.7566686	31.33264
2018-07-10 08:12:05	0.001033343	0.0009198657	8.290894	0.7820894	31.45877
2018-07-10 08:15:06	0.0009276492	0.0008219087	8.013657	0.8004751	31.73587
2018-07-10 08:18:05	0.0008182549	0.0007204522	8.051483	0.8344278	32.10742
2018-07-10 08:21:05	0.0007483488	0.0006537572	8.118839	0.8256578	32.57535

Log Notes

2018-07-10 07:47:45 Started
2018-07-10 08:23:10 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION	
Project Name:	Holland BLP
Project #:	73-160017
Site Location:	Holland, Mi
Well ID:	mw-1
Sample ID (if different than Well ID):	mw-1
	Date: 7/10/18
	Field Personnel: Courtney Doniat
	Well Const.: SCH 40 PVC
	Casing Diameter: 20"
	Screened Interval: 9.0' - 14.0' Bas (ft. from TOC) 12.0' - 17.0'

PURGING DATA				
Time:	Start:	Finish:		
Purging Volume		Casing Diameter (in)	Casing Vol. Gal/Ft.	3 Casing Vol. Gal/Ft.
		1	0.04	0.12
Total Well Depth (ft. from TOC)		1.5	0.10	0.30
Depth to Water (ft. from TOC) =		2	0.16	0.48
Height of Water in Well (ft.) =		3	0.36	1.08
One Well Volume (gallons) =		4	0.63	1.89
Gallons Purged: 88		Purging and Sampling Device: Peristaltic		
Well Volumes Purged: 5		Purging Rate (g.p.m.) 400 mL/min		
Was Well Purged Dry? Yes ~ No ~		Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less		

FIELD MONITORING PARAMETERS									
Elapsed time (minutes)									
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH									
Temperature (C)									
Conductivity (mS/cm)									
ORP (mV)									
Dissolved Oxygen (mg/L)									
Turbidity (NTU)									
Odor									
Appearance and/or Color									

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Location Properties

Location Name = Mw1

Location ID = f306ce88-6911-48b2-acef-2df7ab59237c

Report Properties

Start Time = 2018-07-10 14:14:50

Duration = 00:33:00

Readings = 12

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 513586

Device Firmware = 1.98

Log Properties

Log Name = Mw1

Log Type = Linear

Log File Number = 4

Log ID = 080dc3e5-c842-4b26-9f06-7bf069be66f5

Interval = 00:03:00

Date	Time	Specific Conductivity (mS/cm) (509518)	pH (pH) (475556)	Turbidity (NTU) (508930)	Temperature (°C) (513586)
2018-07-10	14:14:50	0.0004241706	7.189411	0.9172764	33.51746
2018-07-10	14:17:50	0.0004216818	7.042223	0.9143521	33.47653
2018-07-10	14:20:50	0.0004153508	7.006958	0.9414778	33.45593
2018-07-10	14:23:50	0.0003997998	6.993771	0.9207091	33.39322
2018-07-10	14:26:50	0.0003994397	6.968265	0.8972701	33.37921
2018-07-10	14:29:50	0.0003932879	6.933285	0.8674042	33.18027
2018-07-10	14:32:50	0.0003895429	7.122828	0.9225646	32.81674
2018-07-10	14:35:50	0.000397487	7.045087	0.8987502	32.72388
2018-07-10	14:38:50	0.0003890445	7.188431	0.9206616	32.435
2018-07-10	14:41:50	0.0003821887	7.165409	0.8735605	32.25763
2018-07-10	14:44:50	0.0003952555	7.145064	0.9016209	32.04132
2018-07-10	14:47:50	0.0004023911	7.126063	0.8624129	31.87842

Log Notes

2018-07-10 14:14:30 Started

2018-07-10 14:48:20 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BLP
 Project #: 73-160017
 Site Location: Holland, Mi
 Well ID: MW - 2
 Sample ID (if different than Well ID): MW-2

Date: 7/10/18
 Field Personnel: Courtney Deniot
 Well Const.: SCH 40 PVC
 Casing Diameter: 2.0"
 Screened Interval: 8.0' - 13.0' Bas
 (ft. from TOC) (4.0' - 19.0')

PURGING DATA

Time:	Start:	Finish:			
			Casing Diameter (in)	Casing Vol. Gal/Ft.	3 Casing Vol. Gal/Ft.
			1	0.04	0.12
Total Well Depth (ft. from TOC) =	<u>6.17</u>		1.5	0.10	0.30
Depth to Water (ft. from TOC) =	<u>7.07</u>		2	0.16	0.48
Height of Water in Well (ft.) =	<u>12.06</u>		3	0.36	1.08
One Well Volume (gallons) =	<u>1,928</u>		4	0.63	1.89
Gallons Purged: <u>5.1</u>		Purging and Sampling Device: <u>peristaltic</u>			
Well Volumes Purged: <u>3</u>		Purging Rate (g.p.m.) <u>7150 mL/min</u>			
Was Well Purged Dry? Yes ~ <u>No</u>		Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			

FIELD MONITORING PARAMETERS

Elapsed time (minutes)					
Accum. Volume Purged (gal)					
Drawdown (ft)					
pH					
Temperature (C)					
Conductivity (mS/cm)					
ORP (mV)					
Dissolved Oxygen (mg/L)					
Turbidity (NTU)					
Odor					
Appearance and/or Color					

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Location Properties

Location Name = Mw2

Location ID = b7b6f3dd-5df4-4efc-ac1b-44909f0719c4

Report Properties

Start Time = 2018-07-10 10:55:02

Duration = 00:33:00

Readings = 12

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 513586

Device Firmware = 1.98

Log Properties

Log Name = Mw2

Log Type = Linear

Log File Number = 3

Log ID = 71745eaa-8401-4d17-a3ce-1293c3d0ebc4

Interval = 00:03:00

Date Time	Specific Conductivity (mS/cm) (509518)	pH (pH) (475556)	Turbidity (NTU) (508930)	Temperature (°C) (513586)
2018-07-10 10:55:02	0.0002056302	7.515394	1.112181	37.31595
2018-07-10 10:58:02	0.0002006897	7.431551	1.085418	37.33438
2018-07-10 11:01:02	0.0002057141	7.409821	1.062826	37.32202
2018-07-10 11:04:02	0.0002001339	7.360058	1.133364	37.51666
2018-07-10 11:07:02	0.0001977911	7.343407	1.13178	37.4397
2018-07-10 11:10:02	0.0002007505	7.341431	1.098829	37.34381
2018-07-10 11:13:02	0.0002006841	7.293165	2.076762	37.34842
2018-07-10 11:16:02	0.0002009319	7.278155	3.738643	37.62427
2018-07-10 11:19:02	0.0001958281	7.305966	4.530838	37.96625
2018-07-10 11:22:02	0.0001993061	7.261363	4.241145	38.1174
2018-07-10 11:25:02	0.0001979131	7.26766	7.621376	38.34537
2018-07-10 11:28:02	0.0002004904	7.335176	23.58438	38.19772

Log Notes

2018-07-10 10:54:42 Started

2018-07-10 11:30:06 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BLP
Project #: 73-160017
Site Location: Holland, MI
Well ID: MW-3
Sample ID (if different than Well ID): MW-3

Date: 7/10/18
Field Personnel: Courtney Deniot
Well Const.: SCH 40 PVC
Casing Diameter: 20"
Screened Interval: 10.0' - 130' Bas
(ft. from TOC) (13.0' - 18.0')

PURGING DATA

Time:	Start:	Finish:	Casing Diameter (in)	Casing Vol. Gal/Ft.	3 Casing Vol. Gal/Ft.
			1	0.04	0.12
Total Well Depth (ft. from TOC) =	18.25		1.5	0.10	0.30
Depth to Water (ft. from TOC) =	4.14		2	0.16	0.48
Height of Water in Well (ft.) =	14.11		3	0.36	1.08
One Well Volume (gallons) =	2.26		4	0.63	1.89
Gallons Purged:	2.26	Purging and Sampling Device:	Peristaltic pump		
Well Volumes Purged:	3.25	Purging Rate (g.p.m.)	0.05 gpm		
Was Well Purged Dry?	Yes ~ No ~	Note:	Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less		

FIELD MONITORING PARAMETERS

Elapsed time (minutes)						
Accum. Volume Purged (gal)						
Drawdown (ft)						
pH						
Temperature (C)						
Conductivity (mS/cm)						
ORP (mV)						
Dissolved Oxygen (mg/L)						
Turbidity (NTU)						
Odor						
Appearance and/or Color						

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Location Properties

Location Name = Mw3

Location ID = fdfdbc1c-224a-4763-93bc-8590f60838ed

Report Properties

Start Time = 2018-07-10 12:41:01

Duration = 00:28:56

Readings = 10

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 513586

Device Firmware = 1.98

Log Properties

Log Name = Mw3

Log Type = Linear

Log File Number = 2

Log ID = 8dbad821-bb0a-422b-9926-b54e897e5371

Interval = 00:03:00

Date	Time	Specific Conductivity (mS/cm) (509518)	pH (pH) (475556)	Turbidity (NTU) (508930)	Temperature (°C) (513586)
2018-07-10	12:41:01	0.000188876	6.603068	2.501434	43.44205
2018-07-10	12:44:01	0	6.53413	2.132312	39.23999
2018-07-10	12:47:01	0	6.518964	1.899401	36.6196
2018-07-10	12:50:01	0	6.529367	1.773364	35.19424
2018-07-10	12:53:01	0.004553927	6.612149	2.220198	32.88913
2018-07-10	12:59:01	0.003943151	6.596684	2.091048	32.55371
2018-07-10	13:00:57	0.001713933	6.632103	1.54392	31.5864
2018-07-10	13:03:57	0.002152317	6.526846	1.486118	32.49951
2018-07-10	13:06:57	0.002422797	6.536447	1.452042	32.65588
2018-07-10	13:09:57	0.002537772	6.65132	1.469563	32.56238

Log Notes

2018-07-10 12:40:41 Started

2018-07-10 13:00:37 Hardware Reset

2018-07-10 14:10:37 Hardware Reset

2018-07-10 14:12:37 Stopped



15-Nov-2018

Karen Okonta
NTH Consultants, Ltd.
41780 Six Mile Road
Northville, MI 48168

Re: **Holland Board of Public Works**

Work Order: **1810162**

Dear Karen,

ALS Environmental received 7 samples on 02-Oct-2018 05:15 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 40.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Report of Laboratory Analysis

Certificate No: MI: 0022

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1810162

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1810162-01	PZ1	Groundwater		10/2/2018 10:20	10/2/2018 17:15	<input type="checkbox"/>
1810162-02	MW 1	Groundwater		10/2/2018 13:00	10/2/2018 17:15	<input type="checkbox"/>
1810162-03	MW 2	Groundwater		10/2/2018 14:30	10/2/2018 17:15	<input type="checkbox"/>
1810162-04	MW 3	Groundwater		10/2/2018 16:30	10/2/2018 17:15	<input type="checkbox"/>
1810162-05	Equipment Blank	Water		10/2/2018	10/2/2018 17:15	<input type="checkbox"/>
1810162-06	Field Blank	Water		10/2/2018	10/2/2018 17:15	<input type="checkbox"/>
1810162-07	Field Duplicate	Groundwater		10/2/2018	10/2/2018 17:15	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1810162

Case Narrative

Radium 226 & 228 analysis performed by ALS Fort Collins laboratory.

Batch 125841, Method ICP_6020_W, Sample 1810162-01A MSD: The MSD recovery was outside of the control limit for Calcium. However, the MS recovery and the RPD between the MS and MSD was in control. No qualification is required.

Batch R246201, Method IC_300.0_WW, Sample 1810162-03B: The reporting limits for Fluoride and Sulfate are elevated due to dilution for high concentrations of non-target analytes.

Batch R246201, Method IC_300.0_WW, Sample 1810162-04B: The reporting limit for Fluoride is elevated due to dilution for high concentrations of non-target analytes.

Per 40CFR Part 136 Table II Sample Handling Guidelines:

The holding time associated with the following parameters is defined as not to exceed 15 minutes:

Hydrogen Ion (pH)

Results for analyses conducted in the laboratory, for the above noted parameters, shall be considered non-compliant.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
WorkOrder: 1810162

**QUALIFIERS,
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

<u>Units Reported</u>	<u>Description</u>
as noted	
mg/L	Milligrams per Liter
s.u.	Standard Units

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: PZ1
Collection Date: 10/2/2018 10:20 AM

Work Order: 1810162
Lab ID: 1810162-01
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 09:15 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 07:45 PM
Arsenic	0.048		0.0050	mg/L	1	10/8/2018 07:45 PM
Barium	0.066		0.0050	mg/L	1	10/8/2018 07:45 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 07:45 PM
Boron	0.41		0.020	mg/L	1	10/8/2018 07:45 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 07:45 PM
Calcium	45		0.50	mg/L	1	10/8/2018 07:45 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 07:45 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 07:45 PM
Lead	0.086		0.0050	mg/L	1	10/8/2018 07:45 PM
Lithium	ND		0.010	mg/L	1	10/8/2018 07:45 PM
Molybdenum	0.019		0.0050	mg/L	1	10/8/2018 07:45 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 07:45 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 07:45 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	33		5.0	mg/L	5	10/5/2018 12:41 PM
Fluoride	1.1		1.0	mg/L	1	10/4/2018 07:48 PM
Sulfate	7.3		2.0	mg/L	1	10/4/2018 07:48 PM
PH (LABORATORY)						
pH (laboratory)	7.81	H	0.100	s.u.	1	10/5/2018 10:20 AM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,100		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW 1
Collection Date: 10/2/2018 01:00 PM

Work Order: 1810162
Lab ID: 1810162-02
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 08:10 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Arsenic	0.047		0.0050	mg/L	1	10/8/2018 07:51 PM
Barium	0.25		0.0050	mg/L	1	10/8/2018 07:51 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 07:51 PM
Boron	1.5		0.020	mg/L	1	10/8/2018 07:51 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 07:51 PM
Calcium	99		0.50	mg/L	1	10/8/2018 07:51 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Lithium	0.16		0.010	mg/L	1	10/8/2018 07:51 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 07:51 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 07:51 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	170		20	mg/L	20	10/4/2018 08:27 PM
Fluoride	ND		1.0	mg/L	1	10/4/2018 08:07 PM
Sulfate	26		10	mg/L	5	10/5/2018 01:00 PM
PH (LABORATORY)						
pH (laboratory)	7.24	H	0.100	s.u.	1	10/5/2018 10:20 AM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	800		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW 2
Collection Date: 10/2/2018 02:30 PM

Work Order: 1810162
Lab ID: 1810162-03
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 08:12 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Arsenic	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Barium	0.21		0.0050	mg/L	1	10/8/2018 07:57 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 07:57 PM
Boron	0.77		0.020	mg/L	1	10/8/2018 07:57 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 07:57 PM
Calcium	82		0.50	mg/L	1	10/8/2018 07:57 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Lithium	0.012		0.010	mg/L	1	10/8/2018 07:57 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 07:57 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 07:57 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	620		100	mg/L	100	10/4/2018 09:05 PM
Fluoride	ND		2.0	mg/L	2	10/4/2018 08:46 PM
Sulfate	ND		4.0	mg/L	2	10/4/2018 08:46 PM
PH (LABORATORY)						
pH (laboratory)	7.07	H	0.100	s.u.	1	10/5/2018 10:20 AM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	1,300		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW 3
Collection Date: 10/2/2018 04:30 PM

Work Order: 1810162
Lab ID: 1810162-04
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 08:15 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Arsenic	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Barium	0.046		0.0050	mg/L	1	10/8/2018 07:59 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 07:59 PM
Boron	0.76		0.020	mg/L	1	10/8/2018 07:59 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 07:59 PM
Calcium	350		5.0	mg/L	10	10/9/2018 08:44 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Lithium	0.032		0.010	mg/L	1	10/8/2018 07:59 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 07:59 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 07:59 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	200		100	mg/L	100	10/4/2018 09:43 PM
Fluoride	ND		5.0	mg/L	5	10/4/2018 09:24 PM
Sulfate	1,100		200	mg/L	100	10/4/2018 09:43 PM
PH (LABORATORY)						
pH (laboratory)	6.47	H	0.100	s.u.	1	10/5/2018 10:20 AM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	2,300		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Equipment Blank
Collection Date: 10/2/2018

Work Order: 1810162
Lab ID: 1810162-05
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 09:29 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Arsenic	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Barium	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 08:01 PM
Boron	ND		0.020	mg/L	1	10/9/2018 08:45 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 08:01 PM
Calcium	ND		0.50	mg/L	1	10/9/2018 08:45 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Lithium	ND		0.010	mg/L	1	10/8/2018 08:01 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 08:01 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 08:01 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		1.0	mg/L	1	10/4/2018 10:02 PM
Fluoride	ND		1.0	mg/L	1	10/4/2018 10:02 PM
Sulfate	ND		2.0	mg/L	1	10/4/2018 10:02 PM
PH (LABORATORY)						
pH (laboratory)	5.16	H	0.100	s.u.	1	10/9/2018 02:45 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank
Collection Date: 10/2/2018

Work Order: 1810162
Lab ID: 1810162-06
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 09:31 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Arsenic	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Barium	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 08:02 PM
Boron	ND		0.020	mg/L	1	10/9/2018 08:47 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 08:02 PM
Calcium	ND		0.50	mg/L	1	10/9/2018 08:47 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Lithium	ND		0.010	mg/L	1	10/8/2018 08:02 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 08:02 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 08:02 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	ND		1.0	mg/L	1	10/4/2018 10:22 PM
Fluoride	ND		1.0	mg/L	1	10/4/2018 10:22 PM
Sulfate	ND		2.0	mg/L	1	10/4/2018 10:22 PM
PH (LABORATORY)						
pH (laboratory)	5.24	H	0.100	s.u.	1	10/9/2018 02:45 PM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	ND		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached			SUBCONTRACT as noted	1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate
Collection Date: 10/2/2018

Work Order: 1810162
Lab ID: 1810162-07
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
Mercury	ND		0.00020	mg/L	1	10/12/2018 09:34 PM
METALS BY ICP-MS						
Antimony	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Arsenic	0.045		0.0050	mg/L	1	10/8/2018 08:04 PM
Barium	0.25		0.0050	mg/L	1	10/8/2018 08:04 PM
Beryllium	ND		0.0020	mg/L	1	10/8/2018 08:04 PM
Boron	1.5		0.020	mg/L	1	10/8/2018 08:04 PM
Cadmium	ND		0.0020	mg/L	1	10/8/2018 08:04 PM
Calcium	99		0.50	mg/L	1	10/8/2018 08:04 PM
Chromium	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Cobalt	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Lead	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Lithium	0.16		0.010	mg/L	1	10/8/2018 08:04 PM
Molybdenum	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Selenium	ND		0.0050	mg/L	1	10/8/2018 08:04 PM
Thallium	ND		0.0020	mg/L	1	10/8/2018 08:04 PM
ANIONS BY ION CHROMATOGRAPHY						
Chloride	170		20	mg/L	20	10/4/2018 11:38 PM
Fluoride	ND		1.0	mg/L	1	10/4/2018 10:41 PM
Sulfate	29		10	mg/L	5	10/5/2018 01:19 PM
PH (LABORATORY)						
pH (laboratory)	7.07	H	0.100	s.u.	1	10/5/2018 10:20 AM
TOTAL DISSOLVED SOLIDS						
Total Dissolved Solids	810		10	mg/L	1	10/4/2018 07:08 AM
SUBCONTRACTED ANALYSES						
Subcontracted Analyses	See attached		SUBCONTRACT as noted		1	Analyst: ALS 11/14/2018

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: 126193		Instrument ID HG1		Method: SW7470A											
MBLK		Sample ID: MBLK-126193-126193			Units: mg/L		Analysis Date: 10/12/2018 07:03 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322066		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		ND	0.00020												
LCS		Sample ID: LCS-126193-126193			Units: mg/L		Analysis Date: 10/12/2018 07:05 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322067		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00219	0.00020	0.002	0	110	80-120		0						
MS		Sample ID: 18091847-34CMS			Units: mg/L		Analysis Date: 10/12/2018 07:32 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322078		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00246	0.00020	0.002	0.000126	117	75-125		0						
MS		Sample ID: 18091874-01BMS			Units: mg/L		Analysis Date: 10/12/2018 07:46 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322084		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00225	0.00020	0.002	0.000421	91.4	75-125		0						
MSD		Sample ID: 18091847-34CMSD			Units: mg/L		Analysis Date: 10/12/2018 07:34 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322079		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00202	0.00020	0.002	0.000126	94.7	75-125	0.00246	19.6	20					
MSD		Sample ID: 18091874-01BMSD			Units: mg/L		Analysis Date: 10/12/2018 07:56 PM								
Client ID:		Run ID: HG1_181012A			SeqNo: 5322088		Prep Date: 10/12/2018		DF: 1						
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
Mercury		0.00213	0.00020	0.002	0.000421	85.4	75-125	0.00225	5.48	20					

The following samples were analyzed in this batch:

1810162-02A 1810162-03A 1810162-04A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **126195** Instrument ID **HG1** Method: **SW7470A**

MBLK	Sample ID: MBLK-126195-126195			Units: mg/L		Analysis Date: 10/12/2018 08:17 PM		
Client ID:	Run ID: HG1_181012A			SeqNo: 5322099		Prep Date: 10/12/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Mercury	ND	0.00020						

LCS	Sample ID: LCS-126195-126195			Units: mg/L		Analysis Date: 10/12/2018 08:27 PM		
Client ID:	Run ID: HG1_181012A			SeqNo: 5322103		Prep Date: 10/12/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Mercury	0.00203	0.00020	0.002	0	102	80-120	0	

MS	Sample ID: 1810162-01AMS			Units: mg/L		Analysis Date: 10/12/2018 09:17 PM		
Client ID: PZ1	Run ID: HG1_181012A			SeqNo: 5322135		Prep Date: 10/12/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Mercury	0.002	0.00020	0.002	0.000142	92.9	75-125	0	

MSD	Sample ID: 1810162-01AMSD			Units: mg/L		Analysis Date: 10/12/2018 09:19 PM		
Client ID: PZ1	Run ID: HG1_181012A			SeqNo: 5322137		Prep Date: 10/12/2018		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Mercury	0.00197	0.00020	0.002	0.000142	91.4	75-125	0.002	1.51 20

The following samples were analyzed in this batch:

1810162-01A	1810162-05A	1810162-06A
1810162-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **125841** Instrument ID **ICPMS3** Method: **SW6020A**

MLBK	Sample ID: MLBK-125841-125841			Units: mg/L		Analysis Date: 10/8/2018 07:25 PM			
Client ID:	Run ID: ICPMS3_181008A			SeqNo: 5309510		Prep Date: 10/8/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony	ND	0.0050							
Arsenic	ND	0.0050							
Barium	ND	0.0050							
Beryllium	ND	0.0020							
Boron	ND	0.020							
Cadmium	ND	0.0020							
Calcium	0.05083	0.50							J
Chromium	ND	0.0050							
Cobalt	ND	0.0050							
Lead	ND	0.0050							
Lithium	ND	0.010							
Molybdenum	ND	0.0050							
Selenium	ND	0.0050							
Thallium	ND	0.0050							

LCS	Sample ID: LCS-125841-125841			Units: mg/L		Analysis Date: 10/8/2018 07:26 PM			
Client ID:	Run ID: ICPMS3_181008A			SeqNo: 5309511		Prep Date: 10/8/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	Qual
Antimony	0.1013	0.0050	0.1	0	101	80-120	0		
Arsenic	0.106	0.0050	0.1	0	106	80-120	0		
Barium	0.1041	0.0050	0.1	0	104	80-120	0		
Beryllium	0.1048	0.0020	0.1	0	105	80-120	0		
Boron	0.5019	0.020	0.5	0	100	80-120	0		
Cadmium	0.1067	0.0020	0.1	0	107	80-120	0		
Calcium	10.64	0.50	10	0	106	80-120	0		
Chromium	0.1038	0.0050	0.1	0	104	80-120	0		
Cobalt	0.1043	0.0050	0.1	0	104	80-120	0		
Lead	0.1108	0.0050	0.1	0	111	80-120	0		
Lithium	0.1052	0.010	0.1	0	105	80-120	0		
Molybdenum	0.1039	0.0050	0.1	0	104	80-120	0		
Selenium	0.1005	0.0050	0.1	0	101	80-120	0		
Thallium	0.1081	0.0050	0.1	0	108	80-120	0		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **125841** Instrument ID **ICPMS3** Method: **SW6020A**

MS	Sample ID: 1810162-01AMS				Units: mg/L		Analysis Date: 10/8/2018 07:47 PM			
Client ID: PZ1	Run ID: ICPMS3_181008A			SeqNo: 5309523		Prep Date: 10/8/2018		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1051	0.0050	0.1	0.002107	103	75-125		0		
Arsenic	0.1519	0.0050	0.1	0.04844	103	75-125		0		
Barium	0.1674	0.0050	0.1	0.06629	101	75-125		0		
Beryllium	0.1044	0.0020	0.1	0.000097	104	75-125		0		
Boron	0.8957	0.020	0.5	0.4118	96.8	75-125		0		
Cadmium	0.1015	0.0020	0.1	0.000191	101	75-125		0		
Calcium	53.1	0.50	10	45.29	78.1	75-125		0		O
Chromium	0.1056	0.0050	0.1	0.0047	101	75-125		0		
Cobalt	0.1003	0.0050	0.1	0.000914	99.4	75-125		0		
Lead	0.19	0.0050	0.1	0.08619	104	75-125		0		
Lithium	0.1071	0.010	0.1	0.004015	103	75-125		0		
Molybdenum	0.1207	0.0050	0.1	0.01859	102	75-125		0		
Selenium	0.1019	0.0050	0.1	0.000808	101	75-125		0		
Thallium	0.1073	0.0050	0.1	-0.000042	107	75-125		0		

MSD	Sample ID: 1810162-01AMSD				Units: mg/L		Analysis Date: 10/8/2018 07:49 PM			
Client ID: PZ1	Run ID: ICPMS3_181008A			SeqNo: 5309524		Prep Date: 10/8/2018		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1052	0.0050	0.1	0.002107	103	75-125	0.1051	0.0466	20	
Arsenic	0.1528	0.0050	0.1	0.04844	104	75-125	0.1519	0.607	20	
Barium	0.1664	0.0050	0.1	0.06629	100	75-125	0.1674	0.554	20	
Beryllium	0.1043	0.0020	0.1	0.000097	104	75-125	0.1044	0.0565	20	
Boron	0.8976	0.020	0.5	0.4118	97.2	75-125	0.8957	0.221	20	
Cadmium	0.1005	0.0020	0.1	0.000191	100	75-125	0.1015	0.965	20	
Calcium	52.42	0.50	10	45.29	71.3	75-125	53.1	1.29	20	SO
Chromium	0.1058	0.0050	0.1	0.0047	101	75-125	0.1056	0.179	20	
Cobalt	0.0997	0.0050	0.1	0.000914	98.8	75-125	0.1003	0.587	20	
Lead	0.2099	0.0050	0.1	0.08619	124	75-125	0.19	9.96	20	
Lithium	0.1064	0.010	0.1	0.004015	102	75-125	0.1071	0.725	20	
Molybdenum	0.1209	0.0050	0.1	0.01859	102	75-125	0.1207	0.129	20	
Selenium	0.09932	0.0050	0.1	0.000808	98.5	75-125	0.1019	2.52	20	
Thallium	0.1059	0.0050	0.1	-0.000042	106	75-125	0.1073	1.32	20	

The following samples were analyzed in this batch:

1810162-01A	1810162-02A	1810162-03A
1810162-04A	1810162-05A	1810162-06A
1810162-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: 125633 Instrument ID TDS Method: A2540 C-11

MLBK		Sample ID: MBLK-125633-125633			Units: mg/L		Analysis Date: 10/4/2018 07:08 AM			
Client ID:		Run ID: TDS_181004A			SeqNo: 5300739		Prep Date: 10/3/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	ND		10							
LCS		Sample ID: LCS-125633-125633			Units: mg/L		Analysis Date: 10/4/2018 07:08 AM			
Client ID:		Run ID: TDS_181004A			SeqNo: 5300740		Prep Date: 10/3/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	476	10	495	0	96.2	80-120		0		
DUP		Sample ID: 1810123-03B DUP			Units: mg/L		Analysis Date: 10/4/2018 07:08 AM			
Client ID:		Run ID: TDS_181004A			SeqNo: 5300742		Prep Date: 10/3/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	519	10	0	0	0	0-0		540	3.97	10
DUP		Sample ID: 1810170-01B DUP			Units: mg/L		Analysis Date: 10/4/2018 07:08 AM			
Client ID:		Run ID: TDS_181004A			SeqNo: 5300752		Prep Date: 10/3/2018		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Dissolved Solids	1826	10	0	0	0	0-0		1770	3.11	10

The following samples were analyzed in this batch:

1810162-01B	1810162-02B	1810162-03B
1810162-04B	1810162-05B	1810162-06B
1810162-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R246201** Instrument ID **IC3** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R246201			Units: mg/L		Analysis Date: 10/4/2018 07:10 PM			
Client ID:		Run ID: IC3_181004B		SeqNo: 5302444		Prep Date:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	ND	1.0								
Fluoride	ND	0.10								
Sulfate	ND	1.0								

LCS		Sample ID: LCS-R246201			Units: mg/L		Analysis Date: 10/4/2018 07:29 PM			
Client ID:		Run ID: IC3_181004B		SeqNo: 5302445		Prep Date:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.362	1.0	10	0	93.6	90-110		0		
Fluoride	1.864	0.10	2	0	93.2	90-110		0		
Sulfate	9.772	1.0	10	0	97.7	90-110		0		

MS		Sample ID: 1810162-01B MS			Units: mg/L		Analysis Date: 10/4/2018 11:57 PM			
Client ID: PZ1		Run ID: IC3_181004B		SeqNo: 5302459		Prep Date:		DF: 2		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	54.18	2.0	20	34.86	96.6	80-120		0		E
Fluoride	5.109	0.20	4	1.099	100	80-120		0		
Sulfate	27.05	2.0	20	7.34	98.5	80-120		0		

MSD		Sample ID: 1810162-01B MSD			Units: mg/L		Analysis Date: 10/5/2018 12:17 AM			
Client ID: PZ1		Run ID: IC3_181004B		SeqNo: 5302460		Prep Date:		DF: 2		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	54.21	2.0	20	34.86	96.8	80-120	54.18	0.0609	20	E
Fluoride	5.093	0.20	4	1.099	99.9	80-120	5.109	0.306	20	
Sulfate	27.12	2.0	20	7.34	98.9	80-120	27.05	0.267	20	

The following samples were analyzed in this batch:

1810162-01B	1810162-02B	1810162-03B
1810162-04B	1810162-05B	1810162-06B
1810162-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R246237** Instrument ID **WETCHEM** Method: **A4500-H B-11**

LCS		Sample ID: LCS-R246237-R246237			Units: s.u.			Analysis Date: 10/5/2018 10:20 AM		
Client ID:		Run ID: WETCHEM_181005G			SeqNo: 5303752		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.97	0.10	4	0	99.2	90-110		0		
DUP		Sample ID: 1810162-01B DUP			Units: s.u.			Analysis Date: 10/5/2018 10:20 AM		
Client ID: PZ1		Run ID: WETCHEM_181005G			SeqNo: 5303754		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	7.84	0.10	0	0	0	0-0	7.81	0.383	20	H
DUP		Sample ID: 1810199-01A DUP			Units: s.u.			Analysis Date: 10/5/2018 10:20 AM		
Client ID:		Run ID: WETCHEM_181005G			SeqNo: 5303760		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	8.86	0.10	0	0	0	0-0	8.86	0	20	H

The following samples were analyzed in this batch:

1810162-01B	1810162-02B	1810162-03B
1810162-04B	1810162-07B	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R246322** Instrument ID **IC3** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R246322			Units: mg/L		Analysis Date: 10/5/2018 10:26 AM			
Client ID:		Run ID: IC3_181005A			SeqNo: 5305284		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	ND	1.0								
Sulfate	ND	1.0								

LCS		Sample ID: LCS-R246322			Units: mg/L		Analysis Date: 10/5/2018 10:45 AM			
Client ID:		Run ID: IC3_181005A			SeqNo: 5305285		Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.226	1.0	10	0	92.3	90-110				0
Sulfate	9.696	1.0	10	0	97	90-110				0

MS		Sample ID: 1810162-01B MS			Units: mg/L		Analysis Date: 10/5/2018 01:38 PM			
Client ID: PZ1		Run ID: IC3_181005A			SeqNo: 5305294		Prep Date:		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	128.2	10	100	32.56	95.6	80-120				0
Sulfate	105.2	10	100	7.99	97.2	80-120				0

MSD		Sample ID: 1810162-01B MSD			Units: mg/L		Analysis Date: 10/5/2018 01:57 PM			
Client ID: PZ1		Run ID: IC3_181005A			SeqNo: 5305295		Prep Date:		DF: 10	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	127.9	10	100	32.56	95.4	80-120	128.2	0.206	20	
Sulfate	104.9	10	100	7.99	96.9	80-120	105.2	0.308	20	

The following samples were analyzed in this batch:

1810162-01B	1810162-02B	1810162-07B
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Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: NTH Consultants, Ltd.
Work Order: 1810162
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R246477** Instrument ID **Titrator 1** Method: **E150.1**

LCS		Sample ID: LCS-R246477-R246477			Units: s.u.			Analysis Date: 10/9/2018 02:45 PM			
Client ID:		Run ID: TITRATOR 1_181009B			SeqNo: 5310482		Prep Date:		DF: 1		
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		4.17	0.10	4.4	0	94.8	90-110	0	0		
LCS		Sample ID: LCS-R246477-R246477			Units: s.u.			Analysis Date: 10/9/2018 02:45 PM			
Client ID:		Run ID: TITRATOR 1_181009B			SeqNo: 5310570		Prep Date:		DF: 1		
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		4.17	0.10	4.4	0	94.8	90-110	0	0		
DUP		Sample ID: 1810162-05B DUP			Units: s.u.			Analysis Date: 10/9/2018 02:45 PM			
Client ID: Equipment Blank		Run ID: TITRATOR 1_181009B			SeqNo: 5310496		Prep Date:		DF: 1		
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		5.28	0.10	0	0	0	0-0	5.16	2.3	20	H
DUP		Sample ID: 1810404-01B DUP			Units: s.u.			Analysis Date: 10/9/2018 02:45 PM			
Client ID:		Run ID: TITRATOR 1_181009B			SeqNo: 5310506		Prep Date:		DF: 1		
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)		8.18	0.10	0	0	0	0-0	8.18	0	20	H

The following samples were analyzed in this batch:

1810162-05B 1810162-06B

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Cincinnati, OH
+1 513 733 5336Everett, WA
+1 425 356 2600Fort Collins, CO
+1 970 490 1511Holland, MI
+1 616 399 6070

Chain of Custody Form

Page _____ of _____

Houston, TX
+1 281 530 5656Middletown, PA
+1 717 944 5541Spring City, PA
+1 610 948 4903Salt Lake City, UT
+1 801 266 7700South Charleston, WV
+1 304 356 3168York, PA
+1 717 505 5280

COC ID: 178479

ALS Work Order #: 1810162

Customer Information		Project Information		Parameter/Method Request for Analysis													
Purchase Order		Project Name		A	Metals including Hg												
Work Order		Project Number		B	Chloride, Fluoride, Sulfate												
Company Name	NTH Consultants, Ltd.	Bill To Company	Holland Board of Public Works	C	pH												
Send Report To	Karen Okonta	Invoice Attn	Accounts Payable	D	TDS												
Address	41780 Six Mile Road	Address	625 Hastings	E	Radium 226 & 228												
City/State/Zip	Northville, MI 48168	City/State/Zip	Holland, MI 49423	F													
Phone	(248) 682-2668	Phone	(616) 355-1210	G													
Fax	(248) 324-5305	Fax		H													
e-Mail Address		e-Mail Address		I													
No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	Pz1, ms, MSD	10-2-18	10:20	GW		15	✗	✗	✗	✗	✗						
2	mw 1		1:00			5											
3	mw 2		2:30			5											
4	mw 3		4:30			5											
5	equipment blank		—			5											
6	field blank		—			5											
7	field duplicate		—			5	↓	↓	↓	↓	↓						
8																	
9																	
10																	

Sampler(s) Please Print & Sign			Shipment Method		Required Turnaround Time: (Check Box)			Results Due Date:			
<i>Courtney Denot</i> → <i>Courtney Denot</i>					<input type="checkbox"/> Std 10 Wk Days	<input type="checkbox"/> 5 Wk Days	<input checked="" type="checkbox"/> Other 2 Wk Days	<input type="checkbox"/> 24 Hour			
Relinquished by:	Date: 10-2-18	Time:	Received by:		Notes:						
<i>Courtney Denot</i>											
Relinquished by:	Date:	Time:	Received by (Laboratory): <i>S. Denot</i> 10-2-18 1715		Cooler ID	Cooler Temp.	QC Package: (Check One Box Below)				
					SP2	3.0° C					
Logged by (Laboratory):	Date: 10/3/18	Time: 0910	Checked by (Laboratory): <i>C. Denot</i> 1		PU13	2.4° C					
						4.2° C					
Preservative Key: 1-HCl 2-HNO ₃ 3-H ₂ SO ₄ 4-NaOH 5-Na ₂ S ₂ O ₃ 6-NaHSO ₄ 7-Other 8-4°C 9-5035						<input type="checkbox"/> Level II Std QC <input type="checkbox"/> TRRP Checklist <input type="checkbox"/> Level III Std QC/Raw Data <input type="checkbox"/> TRRP Level IV <input type="checkbox"/> Level IV SW488/CLP <input type="checkbox"/> Other					

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2011 by ALS Environmental.

Sample Receipt ChecklistClient Name: NTH - NORTHLILLEDate/Time Received: 02-Oct-18 17:15Work Order: 1810162Received by: KRWChecklist completed by Keith Werenza
eSignature

03-Oct-18

Date

Reviewed by: Chad Whetton
eSignature

03-Oct-18

Date

Matrices: WaterCarrier name: Client

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample(s) received on ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>3.0/3.0, 2.4/2.4, 4.2/4.2 C</u> SR2		
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	<u>10/3/2018 9:26:08 AM</u>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	N/A <input type="checkbox"/>
pH adjusted by:	-		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

--

CorrectiveAction:

--



Tuesday, November 13, 2018

Chad Whelton
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Re: ALS Workorder: 1810119
Project Name:
Project Number: 1810162

Dear Mr. Whelton:

Seven water samples were received from ALS Environmental, on 10/4/2018. The samples were scheduled for the following analyses:

Radium-226

Radium-228

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "JJR Kujawa".

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1810119

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to the current revision of SOP 724.

The chemical yield for sample 1810119-7DUP fell below the lower control limit of 40% at 39%. The duplicate error ratio (DER) for samples 1810119-7 and -7DUP is in control. Results are submitted per project manager approval.

All remaining acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1810119

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 1810162

Client PO Number: 20-122018741

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
MW 1	1810119-1		WATER	02-Oct-18	13:00
MW 2	1810119-2		WATER	02-Oct-18	14:30
MW 3	1810119-3		WATER	02-Oct-18	16:30
Equipment Blank	1810119-4		WATER	02-Oct-18	
Field Blank	1810119-5		WATER	02-Oct-18	
Field Duplicate	1810119-6		WATER	02-Oct-18	
PZ1	1810119-7		WATER	02-Oct-18	10:20



Subcontractor:

ALS Environmental, Fort Collins
225 Commerce Dr.
Fort Collins, CO 80524

TEL: (800) 443-1511
FAX:
Acct #:

1810119

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Date: 03-Oct-18
COC ID: 9920
Due Date: 25-Oct-18

Salesperson Brian Root

Customer Information		Project Information		Parameter/Method Request for Analysis										
Purchase Order		Project Name 1810162		A	Subcontracted Analyses (SUBCONTRACT) Radium 226 & 228									
Work Order		Project Number		B	MS/MSD									
Company Name	ALS Group USA, Corp	Bill To Company	ALS Group USA, Corp	C										
Send Report To	Chad Whelton	Inv Attn	Accounts Payable	D										
Address	3352 128th Ave	Address	3352 128th Ave	E										
				F										
City/State/Zip	Holland, Michigan 49424	City/State/Zip	Holland, Michigan 49424	G										
Phone	(616) 399-6070	Phone	(616) 399-6070	H										
Fax	(616) 399-6185	Fax	(616) 399-6185	I										
eMail Address	chad.whelton@alsglobal.com	eMail CC		J										
ALS Sample ID	Client Sample ID	Matrix	Collection Date 24hr	Bottle	A	B	C	D	E	F	G	H	I	J
① 1810162-02C	MW 1	Groundwater	2/Oct/2018 13:00	(3) 1LPHNO3	X									
② 1810162-03C	MW 2	Groundwater	2/Oct/2018 14:30	(3) 1LPHNO3	X									
③ 1810162-04C	MW 3	Groundwater	2/Oct/2018 16:30	(3) 1LPHNO3	X									
④ 1810162-05C	Equipment Blank	Water	2/Oct/2018	(3) 1LPHNO3	X									
⑤ 1810162-06C	Field Blank	Water	2/Oct/2018	(3) 1LPHNO3	X									
⑥ 1810162-07C	Field Duplicate	Groundwater	2/Oct/2018	(3) 1LPHNO3	X									
⑦ 1810162-01C	PZ1	Groundwater	2/Oct/2018 10:20	(9) 1LPHNO3	X	X								

Comments:

Please analyze these samples per our instructions and indicated turnaround requirements. Please include all QC with data. The samples do not need to be returned and can be disposed after 30 days.

Relinquished by: 	Date/Time 10-3-18 13:30	Received by: 	Date/Time 10-4-18 09:55	Cooler IDs	Report/QC Level Std
Relinquished by:	Date/Time	Received by:	Date/Time		



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS-MI

Workorder No: 1810119

Project Manager: JK

Initials: CDT Date: 10-4-18

1. Are airbills / shipping documents present and/or removable?	DROP OFF	<input checked="" type="checkbox"/> YES	NO
2. Are custody seals on shipping containers intact?	<input checked="" type="checkbox"/> NONE	YES	NO
3. Are custody seals on sample containers intact?	<input checked="" type="checkbox"/> NONE	YES	NO
4. Is there a COC (chain-of-custody) present?	<input checked="" type="checkbox"/> YES	NO	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)	<input checked="" type="checkbox"/> YES	NO	
6. Are short-hold samples present?	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
7. Are all samples within holding times for the requested analyses?	<input checked="" type="checkbox"/> YES	NO	
8. Were all sample containers received intact? (not broken or leaking)	<input checked="" type="checkbox"/> YES	NO	
9. Is there sufficient sample for the requested analyses?	<input checked="" type="checkbox"/> YES	NO	
10. Are all samples in the proper containers for the requested analyses?	<input checked="" type="checkbox"/> YES	NO	
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	<input checked="" type="checkbox"/> YES	NO
12. Are all aqueous non-preserved samples pH 4-9?	<input checked="" type="checkbox"/> N/A	YES	NO
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	<input checked="" type="checkbox"/> N/A	YES	NO
14. Were the samples shipped on ice?	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4	<input checked="" type="checkbox"/> RAD ONLY	YES <input checked="" type="checkbox"/> NO
Cooler #: <u>1</u> <u>2</u>			
Temperature (°C): <u>Amb</u> <u>Amb</u>			
No. of custody seals on cooler: <u>0</u> <u>0</u>			
External µR/hr reading: <u>12</u> <u>10</u>			
Background µR/hr reading: <u>11</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <input checked="" type="checkbox"/> YES / NO / NA (If no, see Form 008.)			

Additional Information: Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:

All client bottle ID's vs ALS lab ID's double-checked by: CDT

If applicable, was the client contacted? YES / NO / Contact: _____ Date/Time: _____

Project Manager Signature / Date:

JH JK 10-5-18

181019

Ref: Date: 03Oct18 SHIPPING: 0.00
Dep: Wgt: 36.05 LBS SPECIAL: 0.00
DV: 0.00 HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT Master 4325 6705 5533
TRCK: 4325 6705 5544

ORIGIN ID:GRRA (616) 399-6070
SAMPLE RECEIVING
ALS ENVIRONMENTAL
3352 128TH AVENUE

HOLLAND, MI 494249263
UNITED STATES US

SHIP DATE: 03OCT18
ACTWT: 36.05 LB
CAD: 0122071/CAFE3111

BILL THIRD PARTY

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR

10-0

FORT COLLINS CO 80524

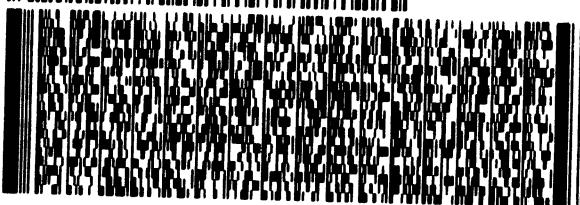
(970) 490-1511

REF:

INU:

PO:

DEPT:



2 of 2
MPS# 4325 6705 5544
0263
Mstr# 4325 6705 5533

THU - 04 OCT 10:30A
PRIORITY OVERNIGHT

NA FTCA

[0201]

80524
CO-US DEN



A
144
24

18/10/15

Ref:	Date: 03Oct18	SHIPPING:	0.00
Dep:	Wgt: 43.30 LBS	SPECIAL:	0.00
		HANDLING:	0.00
DV:	0.00	TOTAL:	0.00

Svcs: PRIORITY OVERNIGHT Master 4325 6705 5533
TRACK: 4325 6705 5533

ORIGIN ID:GRRA (616) 399-6070
SAMPLE RECEIVING
ALS ENVIRONMENTAL
3352 128TH AVENUE
HOLLAND, MI 494249263
UNITED STATES US

SHIP DATE: 03OCT18
ACTWGT: 43.30 LB
CAD: 0122071/CAFE3111

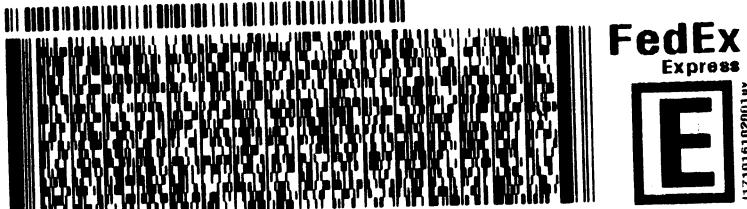
BILL THIRD PARTY

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
225 COMMERCE DR
FORT COLLINS CO 80524
(970) 490-1611 REF:
TRN:
PO:

12-0

Amb

SEARCHED INDEXED SERIALIZED FILED



1 of 2
TRK# 4325 6705 5533
0201 ## MASTER ##

THU - 04 OCT 10:30A
PRIORITY OVERNIGHT

80524
CO-US DEN

NA FTCA



Client: ALS Environmental **Date:** 13-Nov-18
Project: 1810162 **Work Order:** 1810119
Sample ID: MW 1 **Lab ID:** 1810119-1
Legal Location:
Collection Date: 10/2/2018 13:00 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.47 (+/- 0.34)	Y1,LT	0.4	pCi/l	NA	11/12/2018 12:48
Carr: BARIUM	103	Y1	40-110	%REC	DL = NA	11/12/2018 12:48
Radium-228 Analysis by GFPC						
Ra-228	1.47 (+/- 0.54)		0.75	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	87.7		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental
Project: 1810162
Sample ID: MW 2
Legal Location:
Collection Date: 10/2/2018 14:30

Date: 13-Nov-18
Work Order: 1810119
Lab ID: 1810119-2
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.44 (+/- 0.28)	LT	0.25	pCi/l	NA	11/12/2018 12:48
Carr: BARIUM	96.2		40-110	%REC	DL = NA	11/12/2018 12:48
Radium-228 Analysis by GFPC						
Ra-228	1.16 (+/- 0.46)	SOP 724	0.7	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	94.3		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental **Date:** 13-Nov-18
Project: 1810162 **Work Order:** 1810119
Sample ID: MW 3 **Lab ID:** 1810119-3
Legal Location:
Collection Date: 10/2/2018 16:30 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.41 (+/- 0.27)	LT	0.25	pCi/l	NA	11/12/2018 12:48
Carr: BARIUM	96.5		40-110	%REC	DL = NA	11/12/2018 12:48
Radium-228 Analysis by GFPC						
Ra-228	1.38 (+/- 0.5)	SOP 724	0.69	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	94.9		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental **Date:** 13-Nov-18
Project: 1810162 **Work Order:** 1810119
Sample ID: Equipment Blank **Lab ID:** 1810119-4
Legal Location: **Matrix:** WATER
Collection Date: 10/2/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.2)	U	0.29	pCi/l	NA	11/12/2018 12:48
Carr: BARIUM	98.3		40-110	%REC	DL = NA	11/12/2018 12:48
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.35)	U	0.72	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	95.1		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental **Date:** 13-Nov-18
Project: 1810162 **Work Order:** 1810119
Sample ID: Field Blank **Lab ID:** 1810119-5
Legal Location:
Collection Date: 10/2/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.2)	U	0.29	pCi/l	NA	11/12/2018 12:48
Carr: BARIUM	96.5		40-110	%REC	DL = NA	11/12/2018 12:48
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.37)	U	0.76	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	96.4		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental **Date:** 13-Nov-18
Project: 1810162 **Work Order:** 1810119
Sample ID: Field Duplicate **Lab ID:** 1810119-6
Legal Location: **Matrix:** WATER
Collection Date: 10/2/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.57 (+/- 0.34)	LT	0.28	pCi/l	NA	11/12/2018 13:08
Carr: BARIUM	93.4		40-110	%REC	DL = NA	11/12/2018 13:08
Radium-228 Analysis by GFPC						
Ra-228	1.14 (+/- 0.48)	SOP 724	0.77	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	88.7		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental
Project: 1810162
Sample ID: PZ1
Legal Location:
Collection Date: 10/2/2018 10:20

Date: 13-Nov-18
Work Order: 1810119
Lab ID: 1810119-7
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.32)	U	0.5	pCi/l	NA	11/12/2018 13:08
Carr: BARIUM	75.3		40-110	%REC	DL = NA	11/12/2018 13:08
Radium-228 Analysis by GFPC						
Ra-228	ND (+/- 0.73)	U,M	1.51	pCi/l	NA	10/24/2018 10:54
Carr: BARIUM	46.5		40-110	%REC	DL = NA	10/24/2018 10:54

Client: ALS Environmental
Project: 1810162
Sample ID: PZ1
Legal Location:
Collection Date: 10/2/2018 10:20

Date: 13-Nov-18
Work Order: 1810119
Lab ID: 1810119-7
Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers**Radiochemistry:**

- "Report Limit" is the MDC
U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: 11/13/2018 9:37

Client: ALS Environmental
Work Order: 1810119
Project: 1810162

QC BATCH REPORT

Batch ID: RE181106-2-1			Instrument ID Alpha Scin			Method: Radium-226 by Radon Emanation					
DUP	Sample ID: 1810119-7			Run ID: RE181106-2A			Units: pCi/l			Analysis Date: 11/12/2018 13:08	
Client ID: PZ1							Prep Date: 11/6/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.6						0.25	0.3	2.1	U
Carr: BARIUM	7958		17410	45.7	40-110			13100			
LCS	Sample ID: RE181106-2			Run ID: RE181106-2A			Units: pCi/l			Analysis Date: 11/12/2018 13:29	
Client ID:							Prep Date: 11/6/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	50 (+/- 13)	0	47.87	105	67-120						P
Carr: BARIUM	16700		17340	96.3	40-110						
MB	Sample ID: RE181106-2			Run ID: RE181106-2A			Units: pCi/l			Analysis Date: 11/12/2018 13:08	
Client ID:							Prep Date: 11/6/2018			DF: NA	
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.34									U
Carr: BARIUM	15220		17340	87.8	40-110						

The following samples were analyzed in this batch:

1810119-1	1810119-2	1810119-3
1810119-4	1810119-5	1810119-6
1810119-7		

Client: ALS Environmental
Work Order: 1810119
Project: 1810162

QC BATCH REPORT

Batch ID: RA181019-1-2

Instrument ID LB4100-C

Method: Radium-228 Analysis by GFPC

DUP	Sample ID: 1810119-7			Units: pCi/l			Analysis Date: 10/24/2018 10:54				
Client ID:	PZ1	Run ID: RA181019-1A						Prep Date: 10/19/2018		DF: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		1.84 (+/- 0.97)		1.74					0.67	1	2.1 Y2,M3
Carr: BARIUM		13890		35650		39	40-110		16570		Y2

LCS	Sample ID: RA181019-1			Units: pCi/l			Analysis Date: 10/24/2018 10:45				
Client ID:		Run ID: RA181019-1A						Prep Date: 10/19/2018		DF: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		8.2 (+/- 2.3)		1.4	8.721	93.8	70-130				P,M3
Carr: BARIUM		34560		35580		97.1	40-110				

MB	Sample ID: RA181019-1			Units: pCi/l			Analysis Date: 10/24/2018 10:54				
Client ID:		Run ID: RA181019-1A						Prep Date: 10/19/2018		DF: NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER DER	DER Limit Qual
Ra-228		ND		0.73							U
Carr: BARIUM		34950		35580		98.2	40-110				

The following samples were analyzed in this batch:

1810119-1	1810119-2	1810119-3
1810119-4	1810119-5	1810119-6
1810119-7		



MS & msd

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: Holland BPW – James DeYoung PP	Date: 10-2-18			
Project #: 73-160017	Field Personnel: CD			
Site Location: Holland, MI	Well Const.: PVC			
Well ID: PZ-1	Casing Diameter: 2.0"			
Sample ID (if different than Well ID):	Screened Interval (ft. from TOC): NA			
	Top of Casing (ft.): 588.53			
PURGING DATA				
Time: 9:15 Start:	Finish:			
Purging Volume	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)	
	1	0.04	0.12	
Total Well Depth (ft. from TOC) = 13.49	1.5	0.10	0.30	
Depth to Water (ft. from TOC) = 8.38	2	0.16	0.48	
Height of Water in Well (ft.) = 5.11	3	0.36	1.08	
One Well Volume (gallons) = 0.92	4	0.63	1.89	
Gallons Purged:	Purging and Sampling Device:			
Well Volumes Purged: 3	Purging Rate (g.p.m.)			
Was Well Purged Dry? Yes ~ No	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			
FIELD MONITORING PARAMETERS				
Start 9:28am	3	6	9	12
Time/Elapsed time (minutes)	15	18	21	24
Accum. Volume Purged (gal)	18	21	24	27
Drawdown (ft)	9.31	9.39	9.39	9.25
pH	7.9	7.89	7.9	7.92
Temperature (C)	19.3	19.2	19.11	19.02
Conductivity (mS/cm)	1.61	1.63	1.64	1.65
ORP (mV)	1.66	1.67	1.67	1.67
Dissolved Oxygen (mg/L)				
Turbidity (NTU)	16.2	4.3	1.3	0
Odor				
Appearance and/or Color				
SAMPLING DATA				
Time: Start: Finish:	Pump Rate (g.p.m.):			
Sample Collection Depth (ft. from TOC):				
Weather Conditions: Air Temperature (F): 58	Wind Speed/Direction:	Other: cloudy		
Samples Collected On chain of Custody No:	Analytical Laboratory:			

Other Notes: Data cont. on few cell logs.

Location Properties

Location Name = Pz1

Location ID = e6da39e2-f94e-439e-8dac-bdeb095cfcd

Report Properties

Start Time = 2018-10-02 07:35:07

Duration = 01:24:00

Readings = 29

Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 613227

Device Firmware = 2.01

Log Properties

Log Name = Pz1

Log Type = Linear

Log File Number = 1

Log ID = d0855d16-efe4-4b29-a819-32c8b32600e1

Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (602489)	Specific Conductivity (mS/cm) (602489)	pH (pH) (574676)	ORP (mV) (574676)	RDO Concentration (mg/L) (606)
2018-10-02 07:35:07	1.436419	1.612662	7.895215	-172.842	0.2442562
2018-10-02 07:38:07	1.446187	1.625728	7.891542	-184.4816	0.1811316
2018-10-02 07:41:07	1.454471	1.63631	7.897975	-191.4196	0.1431432
2018-10-02 07:44:07	1.46502	1.65071	7.918104	-196.691	0.1186904
2018-10-02 07:47:07	1.469158	1.657	7.94201	-202.5752	0.1026746
2018-10-02 07:50:07	1.472911	1.662827	7.957177	-206.6688	0.08982887
2018-10-02 07:53:07	1.474715	1.668225	7.973471	-209.8255	0.08837966
2018-10-02 07:56:07	1.477279	1.671576	7.982804	-212.2359	0.08723814
2018-10-02 07:59:07	1.475177	1.669216	7.996157	-214.7822	0.08348056
2018-10-02 08:02:07	1.476073	1.670227	8.001438	-216.9471	0.07869018
2018-10-02 08:05:07	1.475248	1.670129	8.017863	-220.0608	0.07296463
2018-10-02 08:08:07	1.479224	1.673977	8.025242	-223.0267	0.06751301
2018-10-02 08:11:07	1.477342	1.671318	8.037953	-225.6088	0.06362515
2018-10-02 08:14:07	1.478708	1.672575	8.043799	-227.4613	0.06218503
2018-10-02 08:17:07	1.479803	1.673394	8.045747	-229.7478	0.06034007
2018-10-02 08:20:07	1.480203	1.673353	8.061881	-233.212	0.05531222
2018-10-02 08:23:07	1.480061	1.674108	8.065853	-235.837	0.0533722
2018-10-02 08:26:07	1.480187	1.673778	8.064246	-238.0781	0.05172927
2018-10-02 08:29:07	1.478361	1.672604	8.080426	-240.9344	0.04976159
2018-10-02 08:32:07	1.475249	1.669391	8.082821	-243.1707	0.04739805
2018-10-02 08:35:07	1.479345	1.672772	8.084265	-245.1734	0.0458573
2018-10-02 08:38:07	1.476183	1.669628	8.09584	-248.3587	0.04510808
2018-10-02 08:41:07	1.476241	1.669418	8.097883	-250.9718	0.04272497
2018-10-02 08:44:07	1.477902	1.672095	8.101763	-253.3202	0.04281811
2018-10-02 08:47:07	1.477289	1.671855	8.113299	-256.186	0.04234267
2018-10-02 08:50:07	1.476244	1.67049	8.111591	-258.4438	0.0405073
2018-10-02 08:53:07	1.477433	1.671525	8.122124	-261.1427	0.03821757
2018-10-02 08:56:07	1.466811	1.659939	8.11904	-262.8712	0.03967029
2018-10-02 08:59:07	1.465604	1.66143	8.121437	-267.2534	0.01090642

Log Notes

2018-10-02 07:35:07 Started

2018-10-02 09:01:06 Stopped

Field ~~Blank~~ Duplicate

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: Holland BPW – James DeYoung PP	Date: 16-2-18			
Project #: 73-160017	Field Personnel: CD			
Site Location: Holland, MI	Well Const.: Sch 40 PVC			
Well ID: MW-1	Casing Diameter: 2.0"			
Sample ID (if different than Well ID):	Screened Interval (ft. from TOC): 9.0'-14.0 (12.0'-17.0')			
	Top of Casing (ft.): 588.53			
PURGING DATA				
Time: 11:40am Start:	Finish:			
Purging Volume	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)	
	1	0.04	0.12	
Total Well Depth (ft. from TOC) = 16.81	1.5	0.10	0.30	
Depth to Water (ft. from TOC) = 5.49	2	0.16	0.48	
Height of Water in Well (ft.) = 11.35	3	0.36	1.08	
One Well Volume (gallons) = 1.816	4	0.63	1.89	
Gallons Purged:	Purging and Sampling Device:			
Well Volumes Purged: 3	Purging Rate (g.p.m.)			
Was Well Purged Dry? Yes ~ No	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			
FIELD MONITORING PARAMETERS				
Start @ 11:40				
Time/Elapsed time (minutes)	3	6	9	12
Accum. Volume Purged (gal)	10	15	18	21
Drawdown (ft)	24	27	29	31
pH	7.07	7.06	7.05	7.06
Temperature (C)	18.46	18.61	18.71	18.81
Conductivity (mS/cm)	1.47	1.48	1.49	1.54
ORP (mV)	586	593	598	603
Dissolved Oxygen (mg/L)	10.0	10.0	10.0	10.0
Turbidity (NTU)	36.48	20.03	19.64	49.92
Odor	0.0	0.0	0.0	0.0
Appearance and/or Color	0.0	0.0	0.0	0.0
SAMPLING DATA				
Time: Start: _____	Finish: _____	Pump Rate (g.p.m.): _____		
Sample Collection Depth (ft. from TOC):				
Weather Conditions: Air Temperature (F): 59	Wind Speed/Direction: _____	Other: cloudy		
Samples Collected On chain of Custody No: _____	Analytical Laboratory: _____			

Other Notes: Slight sheen / slim on water

Data cont. on following logs

Location Properties

Location Name = Mw1
Location ID = 39b06466-b4e9-4214-aa88-09b2a82c0800

Report Properties

Start Time = 2018-10-02 10:03:15
Duration = 01:09:00
Readings = 24
Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600
Device SN = 613227
Device Firmware = 2.01

Log Properties

Log Name = Mw1
Log Type = Linear
Log File Number = 2
Log ID = 6c60e9a6-829e-4026-890f-653b1646f15f
Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (602489)	Specific Conductivity (mS/cm) (602489)	pH (pH) (574676)	ORP (mV) (574676)	RDO Concentration (mg/L) (606)
2018-10-02 10:03:15	1.28676	1.470139	7.07171	-128.4509	0.7406162
2018-10-02 10:06:15	1.298848	1.478563	7.069387	-132.2727	0.2939764
2018-10-02 10:09:15	1.308663	1.487376	7.067233	-139.2226	0.1654976
2018-10-02 10:12:15	1.359868	1.542259	7.058192	-144.7801	0.1304242
2018-10-02 10:15:15	1.378762	1.561077	7.05414	-150.2304	0.105091
2018-10-02 10:18:15	1.375167	1.556672	7.055071	-152.6646	0.09464999
2018-10-02 10:21:15	1.374449	1.554468	7.054862	-154.9773	0.08560818
2018-10-02 10:24:15	1.379731	1.559419	7.055583	-155.9739	0.0816936
2018-10-02 10:27:15	1.380507	1.560266	7.057611	-156.4817	0.07811449
2018-10-02 10:30:15	1.384677	1.563897	7.056346	-157.7358	0.07255534
2018-10-02 10:33:15	1.38614	1.564516	7.058333	-157.4688	0.06726941
2018-10-02 10:36:15	1.383479	1.561638	7.057572	-158.2126	0.06356417
2018-10-02 10:39:15	1.375098	1.55199	7.058671	-160.1486	0.06006518
2018-10-02 10:42:15	1.37836	1.555497	7.060276	-161.1571	0.05807875
2018-10-02 10:45:15	1.381058	1.558216	7.059263	-161.2024	0.05773943
2018-10-02 10:48:15	1.371399	1.548022	7.059473	-162.4613	0.05965171
2018-10-02 10:51:15	1.367961	1.543349	7.060953	-163.229	0.05933401
2018-10-02 10:54:15	1.365525	1.540306	7.058715	-163.3887	0.06359505
2018-10-02 10:57:15	1.364548	1.539833	7.062641	-163.6915	0.06061342
2018-10-02 11:00:15	1.355624	1.530256	7.062767	-164.5832	0.05661953
2018-10-02 11:03:15	1.353451	1.527053	7.065176	-165.2365	0.0561986
2018-10-02 11:06:15	1.352274	1.52558	7.061121	-165.3342	0.05447675
2018-10-02 11:09:15	1.351719	1.524649	7.065472	-165.9136	0.05260656
2018-10-02 11:12:15	1.356721	1.531002	7.0596	-166.214	0.05656696

Log Notes

2018-10-02 10:03:15 Started
2018-10-02 11:15:13 Stopped



Equipment blank

GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: Holland BPW – James DeYoung PP	Date: 10-2-18			
Project #: 73-160017	Field Personnel: CO			
Site Location: Holland, MI	Well Const.: Sch 40 PVC			
Well ID: MW-2	Casing Diameter: 2.0"			
Sample ID (if different than Well ID):	Screened Interval (ft. from TOC): 8.0'-13.0 (14.0'-19.0')			
	Top of Casing (ft.): 585.49			
PURGING DATA				
Time: 1:30 Start:	Finish:			
Purging Volume	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)	
	1	0.04	0.12	
Total Well Depth (ft. from TOC) = 16.09	1.5	0.10	0.30	
Depth to Water (ft. from TOC) = 3.17	2	0.16	0.48	
Height of Water in Well (ft.) = 12.92	3	0.36	1.08	
One Well Volume (gallons) = 8	4	0.63	1.89	
Gallons Purged:	Purging and Sampling Device:			
Well Volumes Purged: 3	Purging Rate (g.p.m.)			
Was Well Purged Dry? Yes ~ No	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			
FIELD MONITORING PARAMETERS				
Start @ 1:30	3	6	9	12
Time/Elapsed time (minutes)	15	18	21	24
Accum. Volume Purged (gal)	18.98	18.91	18.73	18.52
Drawdown (ft)	18.31	18.09	18.24	18.20
pH	7.07	7.08	7.09	7.10
Temperature (C)	18.98	18.91	18.73	18.52
Conductivity (mS/cm)	271	261	265	268
ORP (mV)	271	261	265	268
Dissolved Oxygen (mg/L)	7.10	7.09	7.08	7.07
Turbidity (NTU)	8.15	7.89	43.44	73.81
Odor	8.10	7.89	7.88	7.87
Appearance and/or Color	8.10	7.89	7.88	7.87
SAMPLING DATA				
Time: Start: Finish:	Pump Rate (g.p.m.):			
Sample Collection Depth (ft. from TOC):				
Weather Conditions: Air Temperature (F): 59°	Wind Speed/Direction:	Other: cloudy		
Samples Collected On chain of Custody No:	Analytical Laboratory:			

Other Notes:

Location Properties

Location Name = Mw2
Location ID = 0557140b-31b6-43cf-a28b-9efa2fd88e4c

Report Properties

Start Time = 2018-10-02 11:30:42
Duration = 01:00:00
Readings = 21
Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600
Device SN = 613227
Device Firmware = 2.01

Log Properties

Log Name = Mw2
Log Type = Linear
Log File Number = 3
Log ID = 00d50147-98e3-420e-b0a8-81a54ef5d248
Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (602489)	Specific Conductivity (mS/cm) (602489)	pH (pH) (574676)	ORP (mV) (574676)	RDO Concentration (mg/L) (606)
2018-10-02 11:30:42	2.407839	2.720598	7.073198	-111.4349	0.6859957
2018-10-02 11:33:42	2.404966	2.721596	7.081056	-124.4979	0.2520398
2018-10-02 11:36:42	2.399631	2.726249	7.096786	-135.0169	0.122718
2018-10-02 11:39:42	2.385444	2.722174	7.101538	-141.5615	0.09077219
2018-10-02 11:42:42	2.368409	2.710616	7.104003	-145.2474	0.07765973
2018-10-02 11:45:42	2.33306	2.675788	7.103716	-147.7318	0.06898473
2018-10-02 11:48:42	2.310971	2.65365	7.104399	-149.0145	0.06356205
2018-10-02 11:51:42	2.340401	2.689533	7.105588	-151.01	0.0619971
2018-10-02 11:54:42	2.324684	2.671221	7.105587	-152.0114	0.06090221
2018-10-02 11:57:42	2.313765	2.660114	7.104404	-152.7982	0.05782871
2018-10-02 12:00:42	2.306371	2.651106	7.105674	-153.6088	0.05581921
2018-10-02 12:03:42	2.296677	2.640826	7.106861	-154.274	0.05712276
2018-10-02 12:06:42	2.314918	2.663793	7.106356	-154.355	0.05510364
2018-10-02 12:09:42	2.279349	2.623528	7.106315	-155.6568	0.05254583
2018-10-02 12:12:42	2.267038	2.610027	7.10674	-157.1994	0.05165393
2018-10-02 12:15:42	2.282222	2.628323	7.10814	-158.1125	0.05191187
2018-10-02 12:18:42	2.271859	2.615185	7.10746	-158.8731	0.05057822
2018-10-02 12:21:42	2.26233	2.60472	7.107926	-159.2259	0.05003311
2018-10-02 12:24:42	2.234506	2.571939	7.107967	-159.4596	0.04904577
2018-10-02 12:27:42	2.215841	2.550035	7.108051	-159.6288	0.04796312
2018-10-02 12:30:42	2.280946	2.625178	7.107077	-159.9984	0.04923673

Log Notes

2018-10-02 11:30:42 Started
2018-10-02 12:33:01 Stopped



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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION				
Project Name: Holland BPW – James DeYoung PP	Date: 10-2-18			
Project #: 73-160017	Field Personnel: CD			
Site Location: Holland, MI	Well Const.: Sch 40 PVC			
Well ID: MW-3	Casing Diameter: 2.0"			
Sample ID (if different than Well ID):	Screened Interval (ft. from TOC): 10.0'-15.0- bgs (13.0'-18.0')			
	Top of Casing (ft.): 585.30			
PURGING DATA				
Time: 3:30 Start:	Finish:			
Purging Volume	Casing Diameter (in)	Casing Vol. (Gal./Ft.)	3 Casing Vol. (Gal./Ft.)	
	1	0.04	0.12	
Total Well Depth (ft. from TOC) = 18.16	1.5	0.10	0.30	
Depth to Water (ft. from TOC) = 3.45	2	0.16	0.48	
Height of Water in Well (ft.) = 14.71	3	0.36	1.08	
One Well Volume (gallons) = 2.4	4	0.63	1.89	
Gallons Purged:	Purging and Sampling Device:			
Well Volumes Purged: 3	Purging Rate (g.p.m.)			
Was Well Purged Dry? Yes ~ No	Note: Average low flow rate of 0.13 g.p.m. (500 mL/min) on a 2-inch well typically results in a drawdown of 0.5 ft or less			
FIELD MONITORING PARAMETERS				
Time/Elapsed time (minutes)	3	6	9	12
Accum. Volume Purged (gal)	1	2	3	4
Drawdown (ft)	1	2	3	4
pH	6.66	6.71	6.51	6.50
Temperature (C)	18.39	17.92	17.19	16.94
Conductivity (mS/cm)	262	2.61	2.75	3.07
ORP (mV)	2.61	2.75	3.07	3.3
Dissolved Oxygen (mg/L)	2.3	2.4	2.5	2.6
Turbidity (NTU)	80.1	81.11	81.76	1086
Odor	1	2	3	4
Appearance and/or Color	1	2	3	4
SAMPLING DATA				
Time: Start: Finish:	Pump Rate (g.p.m.):			
Sample Collection Depth (ft. from TOC):				
Weather Conditions: Air Temperature (F): 59	Wind Speed/Direction:	Other: cloudy		
Samples Collected On chain of Custody No:	Analytical Laboratory:			

Other Notes: Date cont. on flow all logs
area around well submerged under water

Location Properties

Location Name = Mw3
Location ID = 10ec0855-d845-4cb1-8eb8-178ec93f4e92

Report Properties

Start Time = 2018-10-02 13:51:15
Duration = 00:39:00
Readings = 14
Time Offset = -06:00:00

Instrument Properties

Device Model = Aqua TROLL 600
Device SN = 613227
Device Firmware = 2.01

Log Properties

Log Name = Mw3
Log Type = Linear
Log File Number = 4
Log ID = dd63ea59-8aab-4c4e-9892-55e1db106d5d
Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (602489)	Specific Conductivity (mS/cm) (602489)	pH (pH) (574676)	ORP (mV) (574676)	RDO Concentration (mg/L) (606)
2018-10-02 13:51:15	2.277647	2.606558	6.655011	-50.93144	0.3494718
2018-10-02 13:54:15	2.378563	2.750149	6.709191	-73.76955	0.3176303
2018-10-02 13:57:15	2.782967	3.270323	6.511067	-66.27845	0.3263933
2018-10-02 14:00:15	2.792402	3.30078	6.497838	-66.64323	0.3013171
2018-10-02 14:03:15	2.785647	3.29737	6.496013	-68.52912	0.2848889
2018-10-02 14:06:15	2.767733	3.281189	6.497367	-69.96201	0.3079336
2018-10-02 14:09:15	2.769372	3.282712	6.495335	-71.50459	0.2839885
2018-10-02 14:12:15	2.761383	3.274474	6.497856	-73.0853	0.2634082
2018-10-02 14:15:15	2.750137	3.263278	6.500266	-74.85436	0.2430075
2018-10-02 14:18:15	2.746748	3.260115	6.502031	-76.47084	0.2134734
2018-10-02 14:21:15	2.751183	3.264878	6.500555	-78.04679	0.1799518
2018-10-02 14:24:15	2.743354	3.258182	6.501719	-80.35944	0.1193204
2018-10-02 14:27:15	2.748327	3.26379	6.50177	-82.9439	0.07237551
2018-10-02 14:30:15	2.748566	3.265726	6.50296	-84.69151	0.0655935

Log Notes

2018-10-02 13:51:15 Started
2018-10-02 14:33:07 Stopped