

2020 Annual Groundwater Report



CCR Surface Impoundment System James DeYoung Power Plant Holland Board of Public Works Holland, Michigan

January 29, 2020

NTH Project No. 73-160017-04

NTH Consultants, Ltd.
41780 Six Mile Road, Suite 200
Northville, MI 48168





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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 that was operated until June 2017. 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 of electricity. On May 20, 2016, BPW discontinued the use of Unit 3; and on June 1, 2017, BPW officially shutdown and retired all remaining 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 §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 (MDEQ), now known as Michigan Department of Environment, Great Lakes, and Energy (EGLE), 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 and 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 historic 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 the location of on-site CCR removal 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 contained in 40 CFR §257.93, a groundwater Sampling and Analysis Plan (SAP) was developed in October 2017 (revised in March 2018) 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 of the CCR units; 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 indicated 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 units; note that 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 quarterly events were used to develop groundwater contour maps. The quarterly maps are consistent from one sampling event to the next, and confirm groundwater flow direction. Figures 3A, 3B and 3C present groundwater contour maps for the available quarterly sampling events conducted in 2019. Note that a groundwater sampling event was not conducted during the second quarter of 2019 due to excessive precipitation that resulted in flooded conditions at the site.



4.0 ACTIONS COMPLETED

Where possible, NTH conducted groundwater monitoring at the facility on a quarterly basis during the months of January, September, and December 2019, in accordance with the procedures established in the facility's SAP. As stated previously, due to flooding conditions at the site, groundwater samples were not collected during the second quarter of 2019. The monitoring conducted for the remaining three quarters 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 water levels of Lake Macatawa and each well 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-3. The water elevation data obtained was used to develop groundwater contour maps for each sampling event (Groundwater Flow Maps – Figures 3A through 3C), 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 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-3.

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, or matrix interference (effervescent matrix), 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**. However, the elevated reporting limits, in general, were below the applicable criteria.

Once an appropriate number of background samples have been collected, generally eight events based on the distribution of the dataset, 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 or additional 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 quarterly samples collected in 2019, 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 was reported above the MCL of 0.01 mg/L in upgradient well PZ-1, and in downgradient monitoring well MW-1; and lead, which was reported above the MCL of 0.015 mg/L in upgradient well PZ-1. We note that groundwater in upgradient well 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, or “Agency-recommended limits of factor”/ Michigan Part 201 criteria.

5.0 PROBLEMS ENCOUNTERED

As discussed previously, flooding at the site caused by excessive precipitation during the second quarter and a significant portion of the third quarter of 2019, precluded the collection of groundwater samples during the second quarter. Consequently, groundwater samples were collected late in the third quarter of 2019 and fourth quarter of 2019 (September and December 2019) and not in July and October 2019 as indicated in the SAP.



6.0 ACTIONS TO RESOLVE THE PROBLEM

The facility will attempt to collect the samples in 2020 as close to the sampling schedule established in the SAP while ensuring that the sampling intervals are appropriate for collecting samples from different groundwater volumes so as to maintain sample independence. Sample independence is a basic assumption in most statistical procedures and it more accurately reflects the true range of natural variability in groundwater.

7.0 KEY ACTIVITIES FOR THE UPCOMING YEAR

During the on-going assessment monitoring period, the facility will continue to collect quarterly groundwater samples from the existing groundwater monitoring well network. To ensure that independent samples are collected from one quarterly event to the next, groundwater samples will be collected as close to the schedule established in the SAP, but significantly apart from the previous sampling events. As such, dependent on weather conditions, samples will be collected in February, May, August, and November of 2020. Note that if appropriate and merited, the facility may opt to install another groundwater monitoring well in the vicinity of the CCR units to better understand groundwater flow and constituent concentrations at the site. The results of the 2020 sampling events will be provided in the update to the annual groundwater report by January 31, 2021.

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, 2020. 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 A

FIGURES



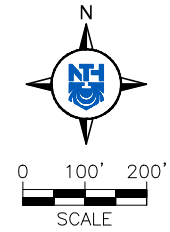
NTH PROJECT No.: 62-160017	CAD FILE NAME: 160017-JDY
DESIGNED BY: SLG	PLOT DATE: 9/28/2016
DRAWN BY: SLG	DRAWING SCALE: 1" = 200'
CHECKED BY: DRL	INCEPTION DATE: 9/7/2016



NTH Consultants, Ltd.
Infrastructure Engineering
and Environmental Services

SITE LOCATION PLAN
JAMES DEYOUNG POWER PLANT HOLLAND, MI

FIGURE:
1

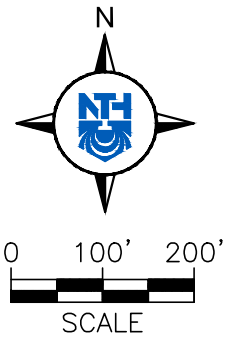
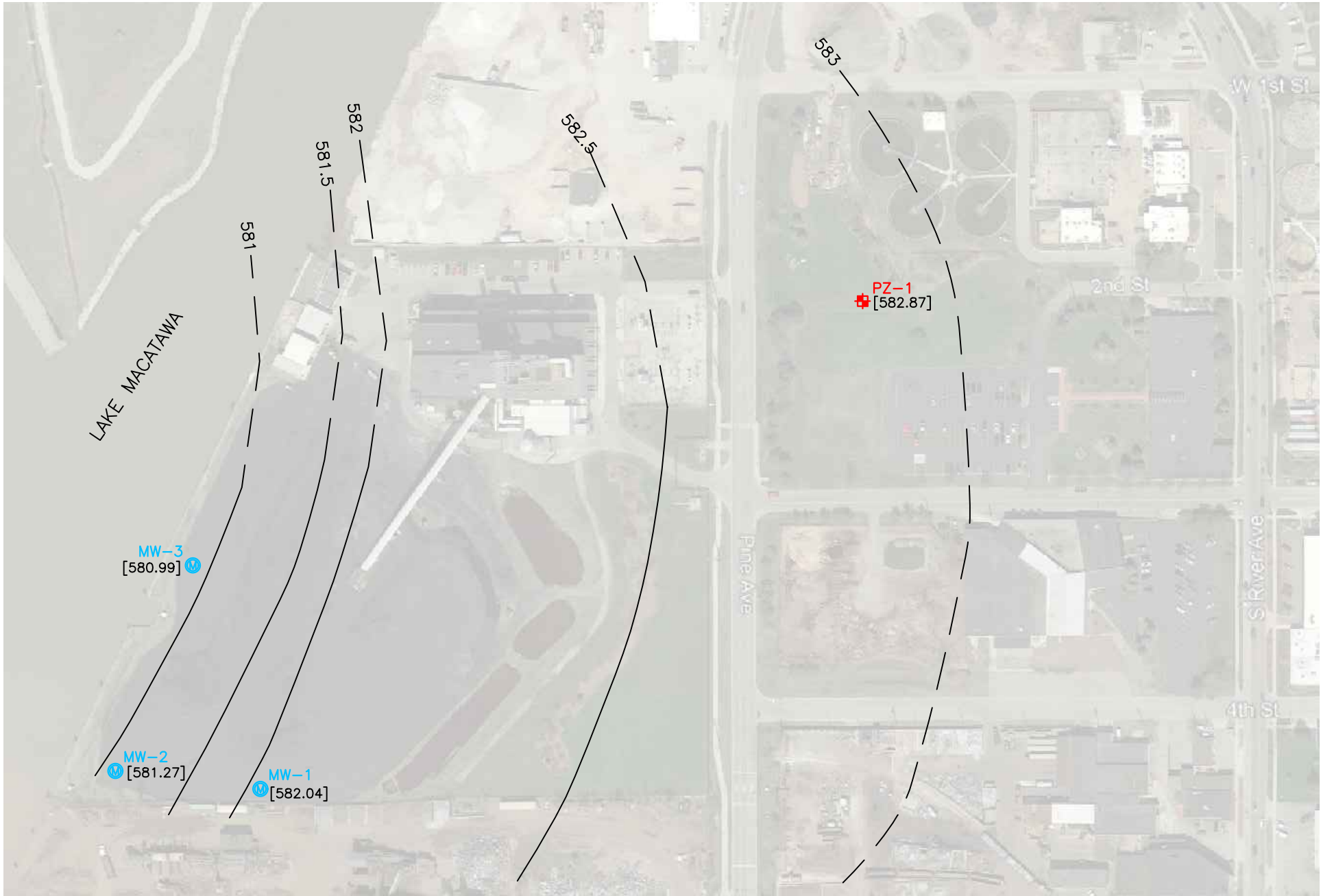


LEGEND



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

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


MONITORING WELL LOCATION MAP		NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	
JAMES DEYOUNG POWER PLANT HOLLAND, MICHIGAN		CAD FILE NAME: 160017-MWLM	INJECTION DATE: 10/13/2017
		DESIGNED BY: KWO	PLANT DATE: 1/23/2018
		DRAWN BY: CRD	DRAWING SCALE: 1" = 200'
		CHECKED BY: KWO	
FIGURE:		2	

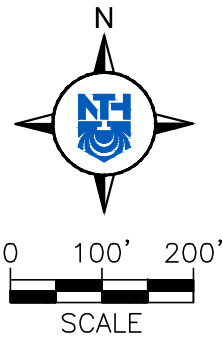


LEGEND

-  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.

 NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	
CAD FILE NAME: 160017-Q119	
PLOT DATE: 01/17/2020	
DRAWING SCALE: 1" = 200'	
INCEPTION DATE: 10/13/2017	
NTH PROJECT No.: 73-160017-04	
DESIGNED BY: WKF	
DRAWN BY: WKF	
CHECKED BY: KWO	
JANUARY 17, 2019 GROUNDWATER LEVELS	
JAMES DEYOUNG POWER PLANT HOLLAND, MICHIGAN	
FIGURE: 3A	

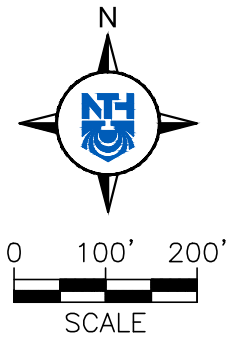


LEGEND

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

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

GROUNDWATER LEVELS SEPTEMBER 16, 2019		NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	
JAMES DEYOUNG POWER PLANT HOLLAND, MICHIGAN		NTH Consultants, Ltd.	
FIGURE:		CAD FILE NAME: 160017-Q319	
3B		PLOT DATE: 01/17/2020	
		DRAWING SCALE: 1" = 200'	
		INCEPTION DATE: 10/13/2017	
		NTH PROJECT No.: 73-160017-04	
		DESIGNED BY: WKF	
		DRAWN BY: WKF	
		CHECKED BY: KWO	



LEGEND

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

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

GROUNDWATER LEVELS DECEMBER 18, 2019		NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	
JAMES DEYOUNG POWER PLANT HOLLAND, MICHIGAN		NTH Consultants, Ltd.	
FIGURE: 3C		CAD FILE NAME: 160017-Q419	
		PLOT DATE: 01/17/2020	
		DRAWING SCALE: 1" = 200'	
		INCEPTION DATE: 10/13/2017	
		DESIGNED BY: WKF	
		DRAWN BY: WKF	
		CHECKED BY: KWO	



APPENDIX B

TABLE

HOLLAND BOARD OF PUBLIC WORKS - JAMES DeYOUNG POWER PLANT

TABLE 1
2019 SUMMARY OF LABORATORY ANALYTICAL RESULTS

PARAMETER		Units	Upgradient Well			Downgradient Wells												Groundwater Protection Standard
			PZ-1 ⁺			MW-1				MW-2				MW-3				Maximum Contaminant Level ^[2]
			1/17/19	9/16/19	12/18/19	1/17/19	9/16/19	09/16/19 ¹	12/18/19	1/17/19	1/17/19 ¹	9/16/19	12/18/19	1/17/19	9/16/19	12/18/19	12/18/2019 ¹	
APPENDIX IV TO CFR PART 257	Antimony	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	NA	<0.005	<0.005	0.006
	Arsenic	mg/L	0.02	0.056	0.032	0.021	0.039	0.038	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	0.01
	Barium	mg/L	0.044	0.074	0.062	0.27	0.29	0.28	0.27	0.2	0.21	0.16	0.2	0.035	NA	0.04	0.04	2
	Beryllium	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	NA	<0.002	<0.002	0.004
	Cadmium	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	NA	<0.002	<0.002	0.005
	Chromium	mg/L	<0.005	<0.005	0.0082	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	0.1
	Cobalt	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	NA	<0.005	<0.005	–
	Fluoride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<5.0	NA	<2.0	<2.0	4
	Lead	mg/L	0.018	0.027	0.018	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	0.015
	Lithium	mg/L	<0.01	<0.01	<0.01	0.12	0.14	0.14	0.12	0.011	0.011	0.012	0.01	0.028	NA	0.03	0.03	–
	Mercury	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	NA	<0.0002	<0.0002	0.002
	Molybdenum	mg/L	0.023	0.021	0.068	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	–
	Selenium	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	NA	<0.005	<0.005	0.05
	Thallium	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	NA	<0.002	<0.002	0.002
APPENDIX III TO CFR PART 257	Radium 226/228 Combined ^[4]	pCi/L	<0.34 / <0.38	<0.34 / <0.38	<0.55 / <0.82	0.32 / 0.92	0.61 / 2.05	0.78 / 2.21	<0.43 / 0.93	0.35 / <0.74	< 0.42 / 0.09	<0.46 / 1.74	0.64 / 1.05	<0.038 / <0.074	NA	<0.21 / <0.76	<0.45 / <0.76	5
	Boron	mg/L	0.29	0.47	0.38	1.10	1.40	1.50	1.20	0.63	0.66	0.75	0.72	0.79	NA	0.77	0.78	–
	Calcium	mg/L	38	53	45	110	110	110	110	80	80	47	83	360	NA	360	340	—
	Chloride	mg/L	<100	40	210	240	180	180	200	550	550	560	580	170	NA	150	150	250 ^[3]
	Fluoride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<5.0	NA	<5.0	<5.0	4
	pH (lab)	s.u.	8.7	7.77	8.85	7.2	6.94	6.96	7.24	7.2	7.2	6.93	7.24	6.9	NA	6.76	6.76	6.5-8.5
	pH (field)	s.u.	8.42	8.08	8.67	6.99	6.96	6.99	7.1	7.08	7.08	7.15	7.14	6.3	NA	6.66	6.72	6.5-8.5
	Sulfate	mg/L	4.4	28	29	39	39	39	26	<4	<4	<4.0	<4.0	1300	NA	950	970	250 ^[3]
	Total Dissolved Solids	mg/L	1000	1200	1500	960	1100	990	900	1200	1200	1400	1300	2200	NA	2000	1900	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.
NA - Not analyzed. Well inaccessible due to flooding.



APPENDIX C

ANALYTICAL REPORTS & FIELD INFORMATION FORMS



19-Feb-2019

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

Re: **Holland Board of Public Works**

Work Order: **1901899**

Dear Karen,

ALS Environmental received 8 samples on 17-Jan-2019 04:30 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 39.

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

Environmental 

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1901899

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
1901899-01	PZ1	Groundwater		1/17/2019 10:10	1/17/2019 16:30	<input type="checkbox"/>
1901899-02	MW 2	Groundwater		1/17/2019 12:30	1/17/2019 16:30	<input type="checkbox"/>
1901899-03	MW 1	Groundwater		1/17/2019 13:50	1/17/2019 16:30	<input type="checkbox"/>
1901899-04	MW 3	Groundwater		1/17/2019 15:10	1/17/2019 16:30	<input type="checkbox"/>
1901899-06	Field Blank	Groundwater		1/17/2019	1/17/2019 16:30	<input type="checkbox"/>
1901899-07	Field Duplicate	Groundwater		1/17/2019	1/17/2019 16:30	<input type="checkbox"/>
1901899-08	Equipment Blank	Groundwater		1/17/2019	1/17/2019 16:30	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 1901899

Case Narrative

Samples for the above noted Work Order were received on 01/17/2019. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Wet Chemistry:

Samples were processed outside of holding time for pH, as the analysis is a field test and holding time is defined as 15 minutes. Results should be considered estimated.

Batch R253692, Method IC_300.0_WW, Samples 1901899-02B and -07B: The reporting limits for Fluoride and Sulfate are elevated due to dilution for high concentrations of non-target analytes.

Batch R253692, Method IC_300.0_WW, Sample 1901899-04B: The reporting limit for Fluoride is elevated due to dilution for high concentrations of non-target analytes.

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

<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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: PZ1

Collection Date: 1/17/2019 10:10 AM

Work Order: 1901899

Lab ID: 1901899-01

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:04 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:01 PM
Arsenic	0.020		0.0050	mg/L	1	1/21/2019 03:01 PM
Barium	0.044		0.0050	mg/L	1	1/21/2019 03:01 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:01 PM
Boron	0.29		0.020	mg/L	1	1/21/2019 03:01 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:01 PM
Calcium	35		0.50	mg/L	1	1/21/2019 03:01 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:01 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:01 PM
Lead	0.018		0.0050	mg/L	1	1/21/2019 03:01 PM
Lithium	ND		0.010	mg/L	1	1/21/2019 03:01 PM
Molybdenum	0.023		0.0050	mg/L	1	1/21/2019 03:01 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:01 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:01 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	66		10	mg/L	10	1/22/2019 03:55 PM
Fluoride	ND		1.0	mg/L	1	1/22/2019 03:38 PM
Sulfate	4.4		2.0	mg/L	1	1/22/2019 03:38 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	8.42	H	0.100	s.u.	1	1/20/2019 01:00 PM
Temperature	21.8	H	0.100	C	1	1/20/2019 01:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	1,000		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: MW 2

Collection Date: 1/17/2019 12:30 PM

Work Order: 1901899

Lab ID: 1901899-02

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:19 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Arsenic	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Barium	0.20		0.0050	mg/L	1	1/21/2019 03:07 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:07 PM
Boron	0.63		0.20	mg/L	10	1/21/2019 04:24 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:07 PM
Calcium	80		0.50	mg/L	1	1/21/2019 03:07 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Lithium	0.011		0.010	mg/L	1	1/21/2019 03:07 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:07 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:07 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	550		50	mg/L	50	1/22/2019 04:29 PM
Fluoride	ND		2.0	mg/L	2	1/22/2019 04:12 PM
Sulfate	ND		4.0	mg/L	2	1/22/2019 04:12 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	7.08	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.8	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	1,200		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: MW 1

Collection Date: 1/17/2019 01:50 PM

Work Order: 1901899

Lab ID: 1901899-03

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:21 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Arsenic	0.021		0.0050	mg/L	1	1/21/2019 03:08 PM
Barium	0.27		0.0050	mg/L	1	1/21/2019 03:08 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:08 PM
Boron	1.1		0.20	mg/L	10	1/21/2019 04:25 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:08 PM
Calcium	110		0.50	mg/L	1	1/21/2019 03:08 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Lithium	0.12		0.010	mg/L	1	1/21/2019 03:08 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:08 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:08 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	240		40	mg/L	40	1/22/2019 05:21 PM
Fluoride	ND		1.0	mg/L	1	1/22/2019 04:47 PM
Sulfate	39		10	mg/L	5	1/22/2019 05:04 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.99	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.8	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	960		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: MW 3

Collection Date: 1/17/2019 03:10 PM

Work Order: 1901899

Lab ID: 1901899-04

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:24 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Arsenic	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Barium	0.035		0.0050	mg/L	1	1/21/2019 03:10 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:10 PM
Boron	0.79		0.20	mg/L	10	1/21/2019 04:27 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:10 PM
Calcium	360		5.0	mg/L	10	1/21/2019 04:27 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Lithium	0.028		0.010	mg/L	1	1/21/2019 03:10 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:10 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:10 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	170		25	mg/L	25	1/22/2019 05:55 PM
Fluoride	ND		5.0	mg/L	5	1/22/2019 05:38 PM
Sulfate	1,300		200	mg/L	100	1/22/2019 06:12 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.30	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.7	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	2,200		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank
Collection Date: 1/17/2019

Work Order: 1901899
Lab ID: 1901899-06
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:29 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Arsenic	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Barium	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:14 PM
Boron	ND		0.020	mg/L	1	1/21/2019 03:14 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:14 PM
Calcium	ND		0.50	mg/L	1	1/21/2019 03:14 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Lithium	ND		0.010	mg/L	1	1/21/2019 03:14 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:14 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:14 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	1/22/2019 07:38 PM
Fluoride	ND		1.0	mg/L	1	1/22/2019 07:38 PM
Sulfate	ND		2.0	mg/L	1	1/22/2019 07:38 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	5.95	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.6	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	ND		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate
Collection Date: 1/17/2019

Work Order: 1901899
Lab ID: 1901899-07
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:31 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Arsenic	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Barium	0.20		0.0050	mg/L	1	1/21/2019 03:19 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:19 PM
Boron	0.66		0.20	mg/L	10	1/21/2019 04:29 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:19 PM
Calcium	80		0.50	mg/L	1	1/21/2019 03:19 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Lithium	0.011		0.010	mg/L	1	1/21/2019 03:19 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:19 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:19 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	550		50	mg/L	50	1/22/2019 08:12 PM
Fluoride	ND		2.0	mg/L	2	1/22/2019 07:55 PM
Sulfate	ND		4.0	mg/L	2	1/22/2019 07:55 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	7.08	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.6	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	1,200		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

ALS Group, USA

Date: 19-Feb-19

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Equipment Blank
Collection Date: 1/17/2019

Work Order: 1901899
Lab ID: 1901899-08
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/23/19 11:25	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/23/2019 03:34 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 1/21/19 12:46	Analyst: STP
Antimony	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Arsenic	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Barium	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Beryllium	ND		0.0020	mg/L	1	1/21/2019 03:20 PM
Boron	ND		0.020	mg/L	1	1/21/2019 03:20 PM
Cadmium	ND		0.0020	mg/L	1	1/21/2019 03:20 PM
Calcium	ND		0.50	mg/L	1	1/21/2019 03:20 PM
Chromium	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Cobalt	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Lead	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Lithium	ND		0.010	mg/L	1	1/21/2019 03:20 PM
Molybdenum	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Selenium	ND		0.0050	mg/L	1	1/21/2019 03:20 PM
Thallium	ND		0.0020	mg/L	1	1/21/2019 03:20 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	1/22/2019 08:29 PM
Fluoride	ND		1.0	mg/L	1	1/22/2019 08:29 PM
Sulfate	ND		2.0	mg/L	1	1/22/2019 08:29 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.01	H	0.100	s.u.	1	1/19/2019 04:00 PM
Temperature	22.4	H	0.100	C	1	1/19/2019 04:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 1/23/19 12:08	Analyst: TRP
Total Dissolved Solids	ND		50	mg/L	1	1/24/2019 08:39 AM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	2/15/2019

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **131065** Instrument ID **HG4** Method: **SW7470A**

MBLK		Sample ID: MBLK-131065-131065				Units: mg/L		Analysis Date: 1/23/2019 02:49 PM		
Client ID:		Run ID: HG4_190123A				SeqNo: 5492978		Prep Date: 1/23/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.000036	0.00020								J

LCS		Sample ID: LCS-131065-131065				Units: mg/L		Analysis Date: 1/23/2019 02:52 PM		
Client ID:		Run ID: HG4_190123A				SeqNo: 5492979		Prep Date: 1/23/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.001936	0.00020	0.002	0	96.8	80-120	0			

MS		Sample ID: 1901899-01AMS				Units: mg/L		Analysis Date: 1/23/2019 03:07 PM		
Client ID: PZ1		Run ID: HG4_190123A				SeqNo: 5492985		Prep Date: 1/23/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.001644	0.00020	0.002	0.000045	80	75-125	0			

MSD		Sample ID: 1901899-01AMSD				Units: mg/L		Analysis Date: 1/23/2019 03:17 PM		
Client ID: PZ1		Run ID: HG4_190123A				SeqNo: 5492989		Prep Date: 1/23/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.001758	0.00020	0.002	0.000045	85.6	75-125	0.001644	6.7	20	

The following samples were analyzed in this batch:

1901899-01A	1901899-02A	1901899-03A
1901899-04A	1901899-06A	1901899-07A
1901899-08A		

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **130920** Instrument ID **ICPMS3** Method: **SW6020A**

MBLK		Sample ID: MBLK-130920-130920				Units: mg/L		Analysis Date: 1/21/2019 02:58 PM		
Client ID:		Run ID: ICPMS3_190121A				SeqNo: 5488626		Prep Date: 1/21/2019		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	0.01289	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-130920-130920				Units: mg/L		Analysis Date: 1/21/2019 03:00 PM		
Client ID:		Run ID: ICPMS3_190121A				SeqNo: 5488627		Prep Date: 1/21/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.0951	0.0050	0.1	0	95.1	80-120	0			
Arsenic	0.09833	0.0050	0.1	0	98.3	80-120	0			
Barium	0.09423	0.0050	0.1	0	94.2	80-120	0			
Beryllium	0.09694	0.0020	0.1	0	96.9	80-120	0			
Boron	0.4619	0.020	0.5	0	92.4	80-120	0			
Cadmium	0.09853	0.0020	0.1	0	98.5	80-120	0			
Calcium	9.658	0.50	10	0	96.6	80-120	0			
Chromium	0.09735	0.0050	0.1	0	97.3	80-120	0			
Cobalt	0.09783	0.0050	0.1	0	97.8	80-120	0			
Lead	0.09725	0.0050	0.1	0	97.3	80-120	0			
Lithium	0.09699	0.010	0.1	0	97	80-120	0			
Molybdenum	0.09772	0.0050	0.1	0	97.7	80-120	0			
Selenium	0.09839	0.0050	0.1	0	98.4	80-120	0			
Thallium	0.09435	0.0050	0.1	0	94.3	80-120	0			

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **130920** Instrument ID **ICPMS3** Method: **SW6020A**

MS				Sample ID: 1901899-01AMS			Units: mg/L		Analysis Date: 1/21/2019 03:03 PM		
Client ID: PZ1			Run ID: ICPMS3_190121A			SeqNo: 5488629		Prep Date: 1/21/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.09949	0.0050	0.1	0.00263	96.9	75-125		0			
Arsenic	0.12	0.0050	0.1	0.02005	99.9	75-125		0			
Barium	0.1391	0.0050	0.1	0.04357	95.5	75-125		0			
Beryllium	0.09882	0.0020	0.1	0.000057	98.8	75-125		0			
Boron	0.7514	0.020	0.5	0.2892	92.5	75-125		0			
Cadmium	0.09439	0.0020	0.1	0.000016	94.4	75-125		0			
Calcium	43.96	0.50	10	34.7	92.7	75-125		0			
Chromium	0.1016	0.0050	0.1	0.004589	97	75-125		0			
Cobalt	0.09576	0.0050	0.1	0.000591	95.2	75-125		0			
Lead	0.1168	0.0050	0.1	0.01784	99	75-125		0			
Lithium	0.1015	0.010	0.1	0.004731	96.7	75-125		0			
Molybdenum	0.1211	0.0050	0.1	0.02252	98.6	75-125		0			
Selenium	0.08144	0.0050	0.1	0.001515	79.9	75-125		0			
Thallium	0.09489	0.0050	0.1	0.000042	94.8	75-125		0			

MS				Sample ID: 1901898-01AMS			Units: mg/L		Analysis Date: 1/21/2019 03:03 PM		
Client ID:			Run ID: ICPMS3_190121A			SeqNo: 5488653		Prep Date: 1/21/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.09949	0.0050	0.1	0.00263	96.9	75-125		0			
Arsenic	0.12	0.0050	0.1	0.02005	99.9	75-125		0			
Barium	0.1391	0.0050	0.1	0.04357	95.5	75-125		0			
Beryllium	0.09882	0.0020	0.1	0.000057	98.8	75-125		0			
Boron	0.7514	0.020	0.5	0.2892	92.5	75-125		0			
Cadmium	0.09439	0.0020	0.1	0.000016	94.4	75-125		0			
Calcium	43.96	0.50	10	34.7	92.7	75-125		0			
Chromium	0.1016	0.0050	0.1	0.004589	97	75-125		0			
Cobalt	0.09576	0.0050	0.1	0.000591	95.2	75-125		0			
Lead	0.1168	0.0050	0.1	0.01784	99	75-125		0			
Lithium	0.1015	0.010	0.1	0.004731	96.7	75-125		0			
Molybdenum	0.1211	0.0050	0.1	0.02252	98.6	75-125		0			
Selenium	0.08144	0.0050	0.1	0.001515	79.9	75-125		0			
Thallium	0.09489	0.0050	0.1	0.000042	94.8	75-125		0			

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **130920** Instrument ID **ICPMS3** Method: **SW6020A**

MSD				Sample ID: 1901899-01AMSD			Units: mg/L		Analysis Date: 1/21/2019 03:05 PM		
Client ID: PZ1			Run ID: ICPMS3_190121A			SeqNo: 5488630		Prep Date: 1/21/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.09901	0.0050	0.1	0.00263	96.4	75-125	0.09949	0.487	20		
Arsenic	0.1191	0.0050	0.1	0.02005	99.1	75-125	0.12	0.716	20		
Barium	0.1398	0.0050	0.1	0.04357	96.2	75-125	0.1391	0.48	20		
Beryllium	0.09807	0.0020	0.1	0.000057	98	75-125	0.09882	0.768	20		
Boron	0.748	0.020	0.5	0.2892	91.8	75-125	0.7514	0.46	20		
Cadmium	0.09495	0.0020	0.1	0.000016	94.9	75-125	0.09439	0.588	20		
Calcium	43.98	0.50	10	34.7	92.8	75-125	43.96	0.0345	20		
Chromium	0.1016	0.0050	0.1	0.004589	97.1	75-125	0.1016	0.0846	20		
Cobalt	0.09465	0.0050	0.1	0.000591	94.1	75-125	0.09576	1.17	20		
Lead	0.1172	0.0050	0.1	0.01784	99.3	75-125	0.1168	0.286	20		
Lithium	0.102	0.010	0.1	0.004731	97.3	75-125	0.1015	0.549	20		
Molybdenum	0.1212	0.0050	0.1	0.02252	98.7	75-125	0.1211	0.0974	20		
Selenium	0.08237	0.0050	0.1	0.001515	80.9	75-125	0.08144	1.14	20		
Thallium	0.09485	0.0050	0.1	0.000042	94.8	75-125	0.09489	0.039	20		

MSD				Sample ID: 1901898-01AMSD			Units: mg/L		Analysis Date: 1/21/2019 03:05 PM		
Client ID:			Run ID: ICPMS3_190121A			SeqNo: 5488654		Prep Date: 1/21/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.09901	0.0050	0.1	0.00263	96.4	75-125	0.09949	0.487	20		
Arsenic	0.1191	0.0050	0.1	0.02005	99.1	75-125	0.12	0.716	20		
Barium	0.1398	0.0050	0.1	0.04357	96.2	75-125	0.1391	0.48	20		
Beryllium	0.09807	0.0020	0.1	0.000057	98	75-125	0.09882	0.768	20		
Boron	0.748	0.020	0.5	0.2892	91.8	75-125	0.7514	0.46	20		
Cadmium	0.09495	0.0020	0.1	0.000016	94.9	75-125	0.09439	0.588	20		
Calcium	43.98	0.50	10	34.7	92.8	75-125	43.96	0.0345	20		
Chromium	0.1016	0.0050	0.1	0.004589	97.1	75-125	0.1016	0.0846	20		
Cobalt	0.09465	0.0050	0.1	0.000591	94.1	75-125	0.09576	1.17	20		
Lead	0.1172	0.0050	0.1	0.01784	99.3	75-125	0.1168	0.286	20		
Lithium	0.102	0.010	0.1	0.004731	97.3	75-125	0.1015	0.549	20		
Molybdenum	0.1212	0.0050	0.1	0.02252	98.7	75-125	0.1211	0.0974	20		
Selenium	0.08237	0.0050	0.1	0.001515	80.9	75-125	0.08144	1.14	20		
Thallium	0.09485	0.0050	0.1	0.000042	94.8	75-125	0.09489	0.039	20		

The following samples were analyzed in this batch:

1901899-01A	1901899-02A	1901899-03A
1901899-04A	1901899-06A	1901899-07A
1901899-08A		

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **131048** Instrument ID **TDS** Method: **A2540 C-11**

MBLK		Sample ID: MBLK-131048-131048				Units: mg/L		Analysis Date: 1/24/2019 08:39 AM		
Client ID:		Run ID: TDS_190124A				SeqNo: 5495149		Prep Date: 1/23/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids ND 30

LCS		Sample ID: LCS-131048-131048				Units: mg/L		Analysis Date: 1/24/2019 08:39 AM		
Client ID:		Run ID: TDS_190124A			SeqNo: 5495150		Prep Date: 1/23/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 470 30 495 0 94.9 85-109 0

DUP				Sample ID: 1901899-01B DUP				Units: mg/L			Analysis Date: 1/24/2019 08:39 AM				
Client ID: PZ1				Run ID: TDS_190124A				SeqNo: 5495154			Prep Date: 1/23/2019		DF: 1		
Analyte				Result		PQL		SPK Val		SPK Ref Value		%REC		Control Limit	
												RPD Ref Value		%RPD	
												RPD Limit		Qual	

Total Dissolved Solids 1103 50 0 0 0 0-0 1007 9.16 10

DUP				Sample ID: 1901938-01A DUP				Units: mg/L			Analysis Date: 1/24/2019 08:39 AM			
Client ID:				Run ID: TDS_190124A				SeqNo: 5495165			Prep Date: 1/23/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				

Total Dissolved Solids 3383 50 0 0 0 0-0 3167 6.62 10

The following samples were analyzed in this batch:

1901899-01B	1901899-02B	1901899-03B
1901899-04B	1901899-06B	1901899-07B
1901899-08B		

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R253411** Instrument ID **Titrator 1** Method: **E150.1**

LCS				Sample ID: LCS-R253411-R253411				Units: s.u.			Analysis Date: 1/19/2019 04:00 PM			
Client ID:				Run ID: TITRATOR 1_190119B				SeqNo: 5486966			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	0.10	4	0	100	90-110	0						

DUP				Sample ID: 1901680-02A DUP				Units: s.u.			Analysis Date: 1/19/2019 04:00 PM			
Client ID:				Run ID: TITRATOR 1_190119B				SeqNo: 5486987			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		7.76	0.257	20	H			
Temperature		22.51	0.10	0	0	0		22.35	0.713		H			

DUP				Sample ID: 1901899-01B DUP				Units: s.u.			Analysis Date: 1/19/2019 04:00 PM			
Client ID: PZ1				Run ID: TITRATOR 1_190119B				SeqNo: 5487310			Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
pH (laboratory)	8.28	0.10	0	0	0		0			H				
Temperature	22.83	0.10	0	0	0		0			H				

The following samples were analyzed in this batch:

1901899-01B	1901899-02B	1901899-03B
1901899-04B	1901899-06B	1901899-07B
1901899-08B		

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R253436** Instrument ID **WETCHEM** Method: **A4500-H B-11**

LCS				Sample ID: LCS-R253436-R253436				Units: s.u.			Analysis Date: 1/20/2019 01:00 PM		
Client ID:			Run ID: WETCHEM_190120C				SeqNo: 5487012			Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
pH (laboratory)	3.89	0.10	4	0	97.2	90-110	0						

DUP				Sample ID: 1901749-02A DUP				Units: s.u.			Analysis Date: 1/20/2019 01:00 PM			
Client ID:				Run ID: WETCHEM_190120C				SeqNo: 5487026			Prep Date:		DF: 1	
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual			
pH (laboratory)		8.05	0.10	0	0	0		8.02	0.373	20	H			
Temperature		22.6	0.10	0	0	0		22.6	0		H			

DUP				Sample ID: 1901966-02A DUP				Units: s.u.			Analysis Date: 1/20/2019 01:00 PM			
Client ID:				Run ID: WETCHEM_190120C				SeqNo: 5487027			Prep Date:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual				
pH (laboratory)	6.31	0.10	0	0	0		6.34	0.474	20	H				
Temperature	22.4	0.10	0	0	0		22.6	0.889		H				

The following samples were analyzed in this batch:

1901899-01B

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

Client: NTH Consultants, Ltd.
Work Order: 1901899
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R253692** Instrument ID **IC4** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R253692				Units: mg/L		Analysis Date: 1/22/2019 03:04 PM		
Client ID:		Run ID: IC4_190122A				SeqNo: 5493775		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-R253692				Units: mg/L		Analysis Date: 1/22/2019 03:21 PM		
Client ID:		Run ID: IC4_190122A				SeqNo: 5493776		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.626	1.0	10	0	96.3	90-110	0			
Fluoride	2.103	0.10	2	0	105	90-110	0			
Sulfate	9.903	1.0	10	0	99	90-110	0			

MS		Sample ID: 1901899-01B MS				Units: mg/L		Analysis Date: 1/22/2019 08:47 PM		
Client ID: PZ1		Run ID: IC4_190122A				SeqNo: 5493795		Prep Date:		DF: 20
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	259.4	20	200	66.42	96.5	80-120	0			
Fluoride	43.42	2.0	40	0	109	80-120	0			
Sulfate	200.4	20	200	5.96	97.2	80-120	0			

MSD		Sample ID: 1901899-01B MSD				Units: mg/L		Analysis Date: 1/22/2019 09:04 PM		
Client ID: PZ1		Run ID: IC4_190122A				SeqNo: 5493796		Prep Date:		DF: 20
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	254.6	20	200	66.42	94.1	80-120	259.4	1.87	20	
Fluoride	42.59	2.0	40	0	106	80-120	43.42	1.93	20	
Sulfate	196	20	200	5.96	95	80-120	200.4	2.24	20	

The following samples were analyzed in this batch:

1901899-01B	1901899-02B	1901899-03B
1901899-04B	1901899-06B	1901899-07B
1901899-08B		

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



Cincinnati, OH
+1 513 733 5336

Fort Collins, CO
+1 970 490 1511

Everett, WA
+1 425 356 2600

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page ____ of ____

COC ID: 185452

Houston, TX
+1 281 530 5656

Middletown, PA
+1 717 944 5541

Spring City, PA
+1 610 948 4903

Salt Lake City, UT
+1 801 266 7700

South Charleston, WV
+1 304 356 3168

York, PA
+1 717 505 5280

ALS Project Manager:

ALS Work Order #:

901899

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) 662-2668	Phone	(616) 355-1210	G	
Fax	(248) 324-5305	Fax		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	Hold
1	P21, MS, MSD	1/17/19	10:10	gw		6	X	X	X	X	X						
2	MW 2		12:30				X	X	X	X	X						
3	MW 1		1:30				X	X	X	X	X						
4	MW 3		3:10				X	X	X	X	X						
5	Lake		4:00				X	X	X	X	X						
6	field blank		—				X	X	X	X	X						
7	field duplicate		—				X	X	X	X	X						
8	Equipment blank		—				X	X	X	X	X						
9																	
10																	

Sampler(s) Please Print & Sign C. Deniot		Shipment Method		Required Turnaround Time: (Check Box) <input type="checkbox"/> Std 10 Wk Days <input type="checkbox"/> 5 Wk Days <input type="checkbox"/> Other <input type="checkbox"/> 2 Wk Days <input type="checkbox"/> 24 Hour		Results Due Date:	
Relinquished by: C. Deniot	Date: 1/17/19	Time:	Received by:	Notes:			
Relinquished by:	Date: 1/17/19	Time: 1630	Received by (Laboratory):	Cooler ID SR2	Cooler Temp. 3.2°C	QC Package: (Check One Box Below)	
Logged by (Laboratory): DFS	Date: 1/18/19	Time: 0830	Checked by (Laboratory):			<input type="checkbox"/> Level II Std QC <input type="checkbox"/> TFRP Checklist <input type="checkbox"/> Level III Std QC/Raw Data <input type="checkbox"/> TFRP 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.

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Sample Receipt Checklist

Client Name: **NTH - NORTHVILLE**

Date/Time Received: **17-Jan-19 16:30**

Work Order: **1901899**

Received by: **DS**

Checklist completed by Diane Shaw 18-Jan-19
eSignature Date

Reviewed by: Chad Whelton 18-Jan-19
eSignature 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 c</u>		<u>SR2</u>
Cooler(s)/Kit(s):	<u></u>		
Date/Time sample(s) sent to storage:	<u>1/18/2019 9:07:56 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:



Thursday, February 14, 2019

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

Re: ALS Workorder: 1901268
Project Name:
Project Number: 1901899

Dear Mr. Whelton:

Eight water samples were received from ALS Environmental, on 1/21/2019. 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,

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
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
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



1901268

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: 1901268

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 1901899

Client PO Number: 20-122018917

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
MW 2	1901268-1		WATER	17-Jan-19	12:30
MW 1	1901268-2		WATER	17-Jan-19	13:50
MW 3	1901268-3		WATER	17-Jan-19	15:10
Lake	1901268-4		WATER	17-Jan-19	16:00
Field Blank	1901268-5		WATER	17-Jan-19	
Field Duplicate	1901268-6		WATER	17-Jan-19	
Equipment Blank	1901268-7		WATER	17-Jan-19	
PZ1	1901268-8		WATER	17-Jan-19	10:10

**Subcontractor:**ALS Environmental, Fort Collins
225 Commerce Dr.

TEL: (800) 443-1511

FAX:

Acct #:

Fort Collins, CO 80524

CHAIN-OF-CUSTODY RECORD

1901268

Page 1 of 1

Date: 18-Jan-19COC ID: 10368Due Date: 04-Feb-19Salesperson **Brian Root**

Customer Information		Project Information		Parameter/Method Request for Analysis						
Purchase Order		Project Name	1901899	A	Subcontracted Analyses (SUBCONTRACT)					
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 1901899-02C	MW 2	Groundwater	17/Jan/2019 12:30	(3) 1LPHNO3	X									
2 1901899-03C	MW 1	Groundwater	17/Jan/2019 13:50	(3) 1LPHNO3	X									
3 1901899-04C	MW 3	Groundwater	17/Jan/2019 15:10	(3) 1LPHNO3	X									
4 1901899-05C	Lake	Groundwater	17/Jan/2019 16:00	(3) 1LPHNO3	X									
5 1901899-06C	Field Blank	Groundwater	17/Jan/2019	(3) 1LPHNO3	X									
6 1901899-07C	Field Duplicate	Groundwater	17/Jan/2019	(3) 1LPHNO3	X									
7 1901899-08C	Equipment Blank	Groundwater	17/Jan/2019	(3) 1LPHNO3	X									
8 1901899-01C	PZ1	Groundwater	17/Jan/2019 10:10	(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

1-18-18 1000

Received by:

Date/Time

1/21/19 925a

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 Holland

Workorder No: 1901268

Project Manager: JRK

Initials: EE

Date: 1/21/19

1. Are airbills / shipping documents present and/or removable?	DROP OFF	<u>YES</u>	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?		<u>YES</u>	NO
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		<u>YES</u>	NO
6. Are short-hold samples present?		YES	<u>NO</u>
7. Are all samples within holding times for the requested analyses?		<u>YES</u>	NO
8. Were all sample containers received intact? (not broken or leaking)		<u>YES</u>	NO
9. Is there sufficient sample for the requested analyses?		<u>YES</u>	NO
10. Are all samples in the proper containers for the requested analyses?		<u>YES</u>	NO
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	<u>YES</u>	NO
12. Are all aqueous non-preserved samples pH 4-9?	<u>N/A</u>	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)	<u>N/A</u>	YES	NO
14. Were the samples shipped on ice?		YES	<u>NO</u>
15. 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>AMB</u> <u>AMB</u>			
No. of custody seals on cooler: <u>0</u> <u>0</u>			
External µR/hr reading: <u>11</u> <u>9</u>			
Background µR/hr reading: <u>11</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: 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: EE

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

Project Manager Signature / Date: [Signature] 1-21-19

1901268

Ref: Date: 18Jan19 SHIPPING: 0.00
Dep: Wgt: 41.25 LBS SPECIAL: 0.00
DV: 0.00 HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT Master 4325 6707 7799
TRCK: 4325 6707 7799

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

SHIP DATE: 18JAN19
ACTWGT: 41.25 LB
CAD: 0122071/CAFE3211

HOLLAND, MI 494249263
UNITED STATES US

BILL THIRD PARTY

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR

11-0

FORT COLLINS CO 80524

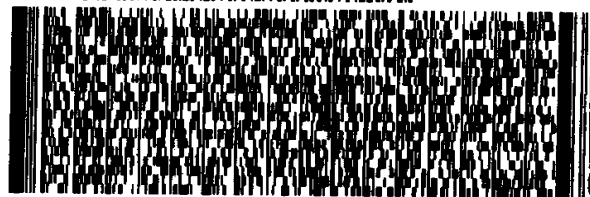
(970) 490-1611

REF:

INU:
PO:

DEPT:

01 0000 0000 0000 01 01 0000 0000 01 01 01 00 00 01 01 0000 0000



FedEx
Express



1 of 2

MON - 21 JAN 10:30A
PRIORITY OVERNIGHT

TRK# 4325 6707 7799
0201

MASTER

TI FTCA AMB

80524
CO-US DEN



Ref:
Dep:Date: 18Jan19
Wgt: 41.70 LBS

DV:

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00Svcs: PRIORITY OVERNIGHT Master 4325 6707 7799
TRCK: 4325 6707 7803ORIGIN ID: GRRR (616) 399-6070
SAMPLE RECEIVING
ALS ENVIRONMENTAL
3352 128TH AVENUEHOLLAND, MI 494249263
UNITED STATES USSHIP DATE: 18JAN19
ACTWGT: 41.70 LB
CAD: 0122071/CAFE3211

BILL THIRD PARTY

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DR

FORT COLLINS CO 80524

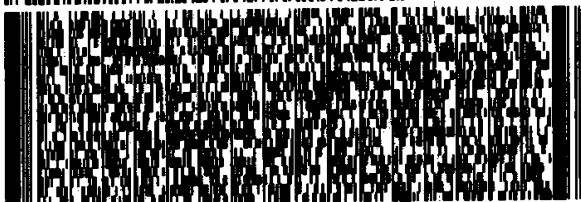
(970) 490-1611
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DEPT:

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Express

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2 of 2

MPS# 4325 6707 7803
0263

Mstr# 4325 6707 7799

0201

TI FTCA

MON - 21 JAN 10:30A
PRIORITY OVERNIGHT80524
CO-US DEN

1901268

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: MW 2

Lab ID: 1901268-1

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019 12:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/22/2019	PrepBy: JXH
Ra-226	0.35 (+/- 0.27)		0.29	pCi/l	NA	1/30/2019 12:12
Carr: BARIUM	95.6		40-110	%REC	DL = NA	1/30/2019 12:12
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/24/2019	PrepBy: MLB
Ra-228	ND (+/- 0.38)	U	0.74	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	94.4		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: MW 1

Lab ID: 1901268-2

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019 13:50

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.32 (+/- 0.26)		SOP 783		Prep Date: 1/22/2019	PrepBy: JXH
<i>Carr: BARIUM</i>	<i>89</i>		0.29	pCi/l	NA	1/30/2019 12:12
			<i>40-110</i>	<i>%REC</i>	DL = NA	1/30/2019 12:12
Radium-228 Analysis by GFPC						
Ra-228	0.92 (+/- 0.47)		SOP 724		Prep Date: 1/24/2019	PrepBy: MLB
<i>Carr: BARIUM</i>	<i>86.6</i>		0.84	pCi/l	NA	1/31/2019 11:11
			<i>40-110</i>	<i>%REC</i>	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: MW 3

Lab ID: 1901268-3

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019 15:10

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/22/2019	PrepBy: JXH
Ra-226	ND (+/- 0.17)	U	0.38	pCi/l	NA	1/30/2019 12:44
Carr: BARIUM	95.7		40-110	%REC	DL = NA	1/30/2019 12:44
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/24/2019	PrepBy: MLB
Ra-228	ND (+/- 0.4)	U	0.74	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	93.9		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: Field Blank

Lab ID: 1901268-5

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/22/2019	PrepBy: JXH
Ra-226	ND (+/- 0.23)	U	0.46	pCi/l	NA	1/30/2019 12:44
Carr: BARIUM	88.9		40-110	%REC	DL = NA	1/30/2019 12:44
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/24/2019	PrepBy: MLB
Ra-228	ND (+/- 0.36)	U	0.78	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	88		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: Field Duplicate

Lab ID: 1901268-6

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 1/22/2019		PrepBy: JXH
Ra-226	ND (+/- 0.25)	U	0.42	pCi/l	NA	1/30/2019 12:44
Carr: BARIUM	93.4		40-110	%REC	DL = NA	1/30/2019 12:44
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 1/24/2019		PrepBy: MLB
Ra-228	0.9 (+/- 0.47)		0.84	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	92.4		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: Equipment Blank

Lab ID: 1901268-7

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 1/22/2019		PrepBy: JXH
Ra-226	ND (+/- 0.15)	U	0.34	pCi/l	NA	1/30/2019 12:44
Carr: BARIUM	96.6		40-110	%REC	DL = NA	1/30/2019 12:44
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 1/24/2019		PrepBy: MLB
Ra-228	ND (+/- 0.3)	U	0.68	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	93.8		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: PZ1

Lab ID: 1901268-8

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019 10:10

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/22/2019	PrepBy: JXH
Ra-226	ND (+/- 0.2)	U	0.24	pCi/l	NA	1/30/2019 12:44
Carr: BARIUM	95.7		40-110	%REC	DL = NA	1/30/2019 12:44
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/24/2019	PrepBy: MLB
Ra-228	ND (+/- 0.32)	U	0.68	pCi/l	NA	1/31/2019 11:11
Carr: BARIUM	94.8		40-110	%REC	DL = NA	1/31/2019 11:11

Client: ALS Environmental

Date: 14-Feb-19

Project: 1901899

Work Order: 1901268

Sample ID: PZ1

Lab ID: 1901268-8

Legal Location:

Matrix: WATER

Collection Date: 1/17/2019 10:10

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.

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: 2/14/2019 9:49:

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1901268

Project: 1901899

Batch ID: RE190122-2-2

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

DUP	Sample ID: 1901268-8			Units: pCi/l			Analysis Date: 1/30/2019 12:44					
Client ID: PZ1	Run ID: RE190122-2A				Prep Date: 1/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	ND	0.4						0.23	0.9	2.1	U	
Carr: BARIUM	15480		16190		95.6	40-110		15500				

LCS	Sample ID: RE190122-2			Units: pCi/l			Analysis Date: 1/30/2019 12:44					
Client ID:	Run ID: RE190122-2A				Prep Date: 1/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	55 (+/- 14)	0	47.87		115	67-120					P	
Carr: BARIUM	14900		16150		92.3	40-110						

MB	Sample ID: RE190122-2			Units: pCi/l			Analysis Date: 1/30/2019 12:44					
Client ID:	Run ID: RE190122-2A				Prep Date: 1/22/2019		DF: NA					
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226	ND	0.38									U	
Carr: BARIUM	15360		16150		95.1	40-110						

The following samples were analyzed in this batch:

1901268-1	1901268-2	1901268-3
1901268-4	1901268-5	1901268-6
1901268-7	1901268-8	

Client: ALS Environmental
Work Order: 1901268
Project: 1901899

QC BATCH REPORT

Batch ID: RA190124-1-2 Instrument ID LB4100-C Method: Radium-228 Analysis by GFPC

DUP	Sample ID: 1901268-8				Units: pCi/l		Analysis Date: 1/31/2019 11:11				
Client ID: PZ1		Run ID: RA190124-1A				Prep Date: 1/24/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.75						0.19	0.6	2.1	U
Carr: BARIUM	29370		31630		92.8	40-110		29990			

LCS	Sample ID: RA190124-1				Units: pCi/l		Analysis Date: 1/31/2019 11:13				
Client ID:	Run ID: RA190124-1A				Prep Date: 1/24/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	8.7 (+/- 2.4)	1.5	8.44		103	70-130					P,M3
Carr: BARIUM	30150		31580		95.5	40-110					

MB	Sample ID: RA190124-1				Units: pCi/l			Analysis Date: 1/31/2019 11:11			
Client ID:	Run ID: RA190124-1A				Prep Date: 1/24/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.7									U
Carr: BARIUM	30790		31700		97.1	40-110					

The following samples were analyzed in this batch:

1901268-1	1901268-2	1901268-3
1901268-4	1901268-5	1901268-6
1901268-7	1901268-8	



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION			
Project Name: <u>Holland BPW – James DeYoung PP</u>		Date: <u>1/17/19</u>	
Project #: <u>73-160017</u>		Field Personnel: <u>CO</u>	
Site Location: <u>Holland, MI</u>		Well Const.: <u>Sch 40 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>9.0'-14.0' (12.0'-17.0')</u>	
		Top of Casing (ft.): <u>588.53</u>	
PURGING DATA			
Time: <u>9:00 am</u> 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>13.48</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>10.04</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: _____		Purging and Sampling Device: <u>Peristaltic</u>	
Well Volumes Purged: _____		Purging Rate (g.p.m.) _____	
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)			
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			
SAMPLING DATA			
Time: _____ Start: _____ Finish: _____		Pump Rate (g.p.m.): _____	
Sample Collection Depth (ft. from TOC): _____			
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 = Holland

Location ID = 4cb0efa1-7517-477f-818c-baf957310dac

Report Properties

Start Time = 2019-01-17 07:26:35

Duration = 01:15:01

Readings = 26

Time Offset = -07:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 613192

Device Firmware = 2.03

Log Properties

Log Name = Pz1

Log Type = Linear

Log File Number = 12

Log ID = 17af223e-76e7-44b7-8f66-dd01e6bebcd4

Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (514259)	Specific Conductivity (mS/cm) (514259)	pH (pH) (574732)	ORP (mV) (574732)	RDO Concentration (mg/L) (6134)
2019-01-17 07:26:35	1.315286	1.629821	8.026401	-40.08151	5.610841
2019-01-17 07:29:35	1.262591	1.728237	8.075583	-172.6995	0.2986336
2019-01-17 07:32:35	1.304392	1.805922	8.182116	-200.5372	0.2727581
2019-01-17 07:35:35	1.27748	1.770468	8.25927	-219.7156	0.2224432
2019-01-17 07:38:35	1.24508	1.72624	8.318521	-232.9359	0.1583926
2019-01-17 07:41:35	1.212969	1.681709	8.386586	-244.0867	0.1254342
2019-01-17 07:44:35	1.185367	1.640905	8.420275	-250.2952	0.1206692
2019-01-17 07:47:35	1.246408	1.725664	8.456868	-252.82	0.1202359
2019-01-17 07:50:35	1.218615	1.685407	8.493444	-260.664	0.09619176
2019-01-17 07:53:35	1.246908	1.725151	8.481239	-261.961	0.1017681
2019-01-17 07:56:35	1.210073	1.67031	8.542547	-268.1194	0.09109085
2019-01-17 07:59:35	1.214688	1.676194	8.541534	-270.9518	0.08499835
2019-01-17 08:02:36	1.207859	1.669984	8.542619	-269.0682	0.09458438
2019-01-17 08:05:36	1.190108	1.643923	8.576078	-273.8891	0.07529208
2019-01-17 08:08:36	1.193239	1.648681	8.584923	-276.2685	0.07130123
2019-01-17 08:11:36	1.203872	1.665735	8.559994	-275.7797	0.07223513
2019-01-17 08:14:36	1.185609	1.637907	8.586613	-277.9732	0.06851099
2019-01-17 08:17:36	1.189665	1.642607	8.594194	-278.9126	0.07148863
2019-01-17 08:20:36	1.199575	1.655992	8.614988	-278.0352	0.07534339
2019-01-17 08:23:36	1.140877	1.571715	8.614353	-278.6527	0.08320161
2019-01-17 08:26:36	1.179621	1.622139	8.652475	-282.4721	0.06696457
2019-01-17 08:29:36	1.191119	1.640992	8.645921	-280.0975	0.07553756
2019-01-17 08:32:36	1.10171	1.516579	8.658098	-281.0369	0.07645576
2019-01-17 08:35:36	1.163665	1.601091	8.657898	-281.404	0.07329725
2019-01-17 08:38:36	1.140229	1.566219	8.683408	-283.9003	0.06182642
2019-01-17 08:41:36	1.058968	1.454978	8.683287	-284.0934	0.06279154

Log Notes

2019-01-17 07:26:35 Started

2019-01-17 08:43:01 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 1/17/19
Project #: 73-160017 Field Personnel: CO
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: <u>12:36pm</u> 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>16.84</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>6.49</u>	2	0.16	0.48
Height of Water in Well (ft.) = <u>10.35</u>	3	0.36	1.08
One Well Volume (gallons) = <u>1.66</u>	4	0.63	1.89

Gallons Purged: _____ Purging and Sampling Device: peristaltic
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)									
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									

SAMPLING DATA

Time: _____ Start: _____ Finish: _____ Pump Rate (g.p.m.): _____
Sample Collection Depth (ft. from TOC): _____
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 can I auto-import these files?](#)

Location Properties

Location Name = Holland

Location ID = 4cb0efa1-7517-477f-818c-baf957310dac

Report Properties

Start Time = 2019-01-17 10:53:52

Duration = 01:03:00

Readings = 22

Time Offset = -07:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 613192

Device Firmware = 2.03

Log Properties

Log Name = Mw1

Log Type = Linear

Log File Number = 14

Log ID = b3bcc9f8-e6f0-4d68-878f-b7784845fd78

Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (514259)	Specific Conductivity (mS/cm) (514259)	pH (pH) (574732)	ORP (mV) (574732)	RDO Concentration (mg/L) (6134
2019-01-17 10:53:52	0.8714126	1.353594	7.345048	-129.622	6.273852
2019-01-17 10:56:52	0.9098028	1.398098	7.270452	-167.2683	0.1810241
2019-01-17 10:59:52	1.052984	1.607127	7.235519	-177.6967	0.10645
2019-01-17 11:02:52	1.137123	1.728643	7.229474	-185.1997	0.07466428
2019-01-17 11:05:52	1.155959	1.756293	7.226521	-189.8966	0.06155317
2019-01-17 11:08:52	1.163236	1.766716	7.226052	-193.8114	0.05347696
2019-01-17 11:11:52	1.167683	1.772212	7.21764	-196.4746	0.04716953
2019-01-17 11:14:52	1.165265	1.767352	7.224954	-198.3342	0.04346351
2019-01-17 11:17:52	1.177571	1.786645	7.211395	-200.0747	0.03947593
2019-01-17 11:20:52	1.174458	1.780617	7.221687	-201.2668	0.0379401
2019-01-17 11:23:52	1.188335	1.802475	7.209691	-202.6162	0.03569902
2019-01-17 11:26:52	1.182876	1.792837	7.210677	-203.5699	0.03359016
2019-01-17 11:29:52	1.179729	1.788159	7.221588	-204.7262	0.03233315
2019-01-17 11:32:52	1.19145	1.80471	7.21075	-205.513	0.03144205
2019-01-17 11:35:52	1.191889	1.80516	7.221655	-206.1472	0.03001758
2019-01-17 11:38:52	1.187088	1.797724	7.208086	-206.5311	0.02970612
2019-01-17 11:41:52	1.194384	1.808161	7.204088	-207.1176	0.02803294
2019-01-17 11:44:52	1.207964	1.827931	7.221582	-207.7971	0.02803568
2019-01-17 11:47:52	1.19742	1.811139	7.207866	-208.0236	0.02758056
2019-01-17 11:50:52	1.192751	1.803796	7.203462	-208.2953	0.02761245
2019-01-17 11:53:52	1.197939	1.812181	7.209658	-208.9749	0.02714199
2019-01-17 11:56:52	1.181354	1.786613	7.20548	-209.4111	0.02622822

Log Notes

2019-01-17 10:53:52 Started

2019-01-17 11:58:11 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 1/17/19
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: <u>11:00 am</u> 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>16.05</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>4.22</u>	2	0.16	0.48
Height of Water in Well (ft.) = <u>11.83</u>	3	0.36	1.08
One Well Volume (gallons) = <u>1.89</u>	4	0.63	1.89
Gallons Purged: _____	Purging and Sampling Device: <u>peristaltic</u>		
Well Volumes Purged: _____	Purging Rate (g.p.m.) _____		
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)									
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									

SAMPLING DATA

Time: _____ Start: _____ Finish: _____ Pump Rate (g.p.m.): _____
Sample Collection Depth (ft. from TOC): _____
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 = Holland

Location ID = 4cb0efa1-7517-477f-818c-baf957310dac

Report Properties

Start Time = 2019-01-17 09:34:00

Duration = 01:06:00

Readings = 23

Time Offset = -07:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 613192

Device Firmware = 2.03

Log Properties

Log Name = Mw2

Log Type = Linear

Log File Number = 13

Log ID = 843648f7-6c4b-4817-9472-11a9b77be77f

Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (514259)	Specific Conductivity (mS/cm) (514259)	pH (pH) (574732)	ORP (mV) (574732)	RDO Concentration (mg/L) (6134)
2019-01-17 09:34:00	1.454452	2.400892	7.799249	-170.4345	9.706652
2019-01-17 09:37:00	1.586824	2.410476	7.183096	-185.4095	0.4628184
2019-01-17 09:40:00	1.582807	2.376003	7.199814	-193.2225	0.2131742
2019-01-17 09:43:00	1.580422	2.360132	7.211332	-194.4909	0.1732591
2019-01-17 09:46:00	1.58514	2.355523	7.222386	-192.369	0.1245317
2019-01-17 09:49:00	1.574603	2.32876	7.228267	-197.216	0.1116866
2019-01-17 09:52:00	1.594972	2.35187	7.233377	-199.6455	0.1059857
2019-01-17 09:55:00	1.569162	2.309302	7.240528	-198.5178	0.0891292
2019-01-17 09:58:00	1.515119	2.227323	7.239075	-199.7767	0.07972211
2019-01-17 10:01:00	1.512953	2.221415	7.245151	-200.933	0.0785424
2019-01-17 10:04:00	1.588857	2.331124	7.246723	-202.2157	0.07335639
2019-01-17 10:07:00	1.553405	2.276984	7.24532	-203.825	0.06838582
2019-01-17 10:10:00	1.564354	2.288698	7.248129	-204.6738	0.06638151
2019-01-17 10:13:00	1.535009	2.249562	7.243214	-204.0134	0.06788829
2019-01-17 10:16:00	1.585347	2.321081	7.24779	-202.7188	0.06171045
2019-01-17 10:19:00	1.564159	2.287647	7.242414	-202.7307	0.0611716
2019-01-17 10:22:00	1.559373	2.282978	7.24359	-204.6738	0.05761772
2019-01-17 10:25:00	1.630706	2.37702	7.240838	-205.8301	0.05294251
2019-01-17 10:28:00	1.608093	2.349859	7.24471	-205.5631	0.05314375
2019-01-17 10:31:00	1.621336	2.36907	7.246807	-205.5798	0.05223969
2019-01-17 10:34:00	1.619855	2.366829	7.242471	-205.7133	0.0514215
2019-01-17 10:37:00	1.609902	2.352661	7.243389	-205.5869	0.05196403
2019-01-17 10:40:00	1.618331	2.35972	7.236971	-206.4715	0.04945258

Log Notes

2019-01-17 09:34:00 Started

2019-01-17 10:41:53 Stopped



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 1/17/19
Project #: 73-160017 Field Personnel: CO
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: <u>2:20pm</u> 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>18.22</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>4.31</u>	2	0.16	0.48
Height of Water in Well (ft.) = <u>13.91</u>	3	0.36	1.08
One Well Volume (gallons) = <u>223</u>	4	0.63	1.89

Gallons Purged: _____

Well Volumes Purged: _____

Was Well Purged Dry? Yes ~ ☒ No

Purging and Sampling Device: Peristaltic

Purging Rate (g.p.m.) _____

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)									
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									

SAMPLING DATA

Time: _____ Start: _____ Finish: _____ Pump Rate (g.p.m.): _____
Sample Collection Depth (ft. from TOC): _____
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 = Holland

Location ID = 4cb0efa1-7517-477f-818c-baf957310dac

Report Properties

Start Time = 2019-01-17 12:21:52

Duration = 01:00:00

Readings = 21

Time Offset = -07:00:00

Instrument Properties

Device Model = Aqua TROLL 600

Device SN = 613192

Device Firmware = 2.03

Log Properties

Log Name = Mw3

Log Type = Linear

Log File Number = 15

Log ID = fb8a484f-9ae3-46c4-8684-d422dc29a259

Interval = 00:03:00

Date Time	Actual Conductivity (mS/cm) (514259)	Specific Conductivity (mS/cm) (514259)	pH (pH) (574732)	ORP (mV) (574732)	RDO Concentration (mg/L) (6134
2019-01-17 12:21:52	0.0006963075	0.001142014	7.330477	-51.28241	12.08124
2019-01-17 12:24:52	2.147605	3.199658	6.469272	-59.69859	0.6257157
2019-01-17 12:27:52	2.265138	3.247237	6.431755	-81.14673	0.1205349
2019-01-17 12:30:52	2.210331	3.11997	6.421801	-95.31594	0.08761287
2019-01-17 12:33:52	2.192512	3.082631	6.42036	-105.2485	0.0749193
2019-01-17 12:36:52	2.289778	3.202185	6.412853	-114.449	0.05980064
2019-01-17 12:39:52	2.305679	3.216878	6.416699	-120.4643	0.05594483
2019-01-17 12:42:52	2.30431	3.204369	6.417168	-125.6285	0.04684435
2019-01-17 12:45:52	2.287396	3.187157	6.414121	-131.2313	0.04851895
2019-01-17 12:48:52	2.306314	3.202471	6.404902	-134.8386	0.04528769
2019-01-17 12:51:52	2.306641	3.199067	6.412107	-137.7187	0.04200687
2019-01-17 12:54:52	2.311741	3.196975	6.411324	-139.8788	0.0349768
2019-01-17 12:57:52	2.311354	3.197654	6.415599	-140.9779	0.03571354
2019-01-17 13:00:52	2.306593	3.190238	6.408823	-142.3059	0.03201665
2019-01-17 13:03:52	2.308136	3.189552	6.406035	-143.0283	0.03150226
2019-01-17 13:06:52	2.311664	3.188174	6.424478	-144.9928	0.02740081
2019-01-17 13:09:52	2.18101	3.008644	6.413774	-145.062	0.02908192
2019-01-17 13:12:52	2.179306	3.003108	6.413944	-146.6236	0.0237521
2019-01-17 13:15:52	2.180367	2.999306	6.429059	-148.0422	0.02140461
2019-01-17 13:18:52	2.171118	2.986481	6.427658	-149.5585	0.02366948
2019-01-17 13:21:52	0.001325994	0.001848411	6.933884	-70.04834	10.50629

Log Notes

2019-01-17 12:21:52 Started

2019-01-17 13:24:17 Stopped



28-Jan-2020

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

Re: **Holland Board of Public Works**

Work Order: **19091067**

Dear Karen,

ALS Environmental received 7 samples on 16-Sep-2019 05:10 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 35.

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

Environmental 

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RIGHT SOLUTIONS RIGHT PARTNER

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 19091067

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
19091067-01	PZ-1	Groundwater		9/16/2019 10:30	9/16/2019 17:10	<input type="checkbox"/>
19091067-02	MW-4	Groundwater		9/16/2019 13:30	9/16/2019 17:10	<input type="checkbox"/>
19091067-03	MW-1	Groundwater		9/16/2019 14:05	9/16/2019 17:10	<input type="checkbox"/>
19091067-04	MW-2	Groundwater		9/16/2019 15:30	9/16/2019 17:10	<input type="checkbox"/>
19091067-05	Field Duplicate	Groundwater		9/16/2019	9/16/2019 17:10	<input type="checkbox"/>
19091067-06	EQB	Water		9/16/2019	9/16/2019 17:10	<input type="checkbox"/>
19091067-07	Field Blank	Water		9/16/2019	9/16/2019 17:10	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 19091067

Case Narrative

Samples for the above noted Work Order were received on 09/16/2019. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Metals:

Batch 142726, Method ICP_6020_W, Sample 19091067-02A MS: The MS 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.

Wet Chemistry:

Batch R270910, Method PH_4500_W, Sample LCS-R270910: Sample was processed outside of holding time for pH, as the analysis is a field test and holding time is defined as 15 minutes.

Batch R270992, Method PH_4500_W, Sample LCS-R270992: Sample was processed outside of holding time for pH, as the analysis is a field test and holding time is defined as 15 minutes.

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

<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>
°C	Degrees Celcius
as noted	
mg/L	Milligrams per Liter
s.u.	Standard Units

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: PZ-1

Collection Date: 9/16/2019 10:30 AM

Work Order: 19091067

Lab ID: 19091067-01

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:23 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:32 PM
Arsenic	0.056		0.0050	mg/L	1	9/20/2019 03:32 PM
Barium	0.074		0.0050	mg/L	1	9/20/2019 03:32 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:32 PM
Boron	0.47		0.020	mg/L	1	9/20/2019 03:32 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:32 PM
Calcium	53		0.50	mg/L	1	9/20/2019 03:32 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:32 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:32 PM
Lead	0.027		0.0050	mg/L	1	9/20/2019 03:32 PM
Lithium	ND		0.010	mg/L	1	9/20/2019 03:32 PM
Molybdenum	0.021		0.0050	mg/L	1	9/20/2019 03:32 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:32 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:32 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	40		10	mg/L	10	9/18/2019 03:06 PM
Fluoride	ND		1.0	mg/L	1	9/18/2019 02:49 PM
Sulfate	28		20	mg/L	10	9/18/2019 03:06 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	8.08	H	0.100	s.u.	1	9/19/2019 11:14 AM
Temperature	18.6	H	0.100	°C	1	9/19/2019 11:14 AM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	1,200		50	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-1
Collection Date: 9/16/2019 02:05 PM

Work Order: 19091067
Lab ID: 19091067-03
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:26 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Arsenic	0.039		0.0050	mg/L	1	9/20/2019 03:40 PM
Barium	0.29		0.0050	mg/L	1	9/20/2019 03:40 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:40 PM
Boron	1.4		0.020	mg/L	1	9/20/2019 03:40 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:40 PM
Calcium	110		0.50	mg/L	1	9/20/2019 03:40 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Lead	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Lithium	0.14		0.010	mg/L	1	9/20/2019 03:40 PM
Molybdenum	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:40 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:40 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	180		20	mg/L	20	9/18/2019 05:19 PM
Fluoride	ND		1.0	mg/L	1	9/18/2019 04:02 PM
Sulfate	39		10	mg/L	5	9/18/2019 04:21 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.96	H	0.100	s.u.	1	9/19/2019 11:14 AM
Temperature	18.8	H	0.100	°C	1	9/19/2019 11:14 AM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	1,100		100	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: MW-2

Collection Date: 9/16/2019 03:30 PM

Work Order: 19091067

Lab ID: 19091067-04

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:28 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Arsenic	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Barium	0.16		0.0050	mg/L	1	9/20/2019 03:42 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:42 PM
Boron	0.75		0.020	mg/L	1	9/20/2019 03:42 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:42 PM
Calcium	47		0.50	mg/L	1	9/20/2019 03:42 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Lead	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Lithium	0.012		0.010	mg/L	1	9/20/2019 03:42 PM
Molybdenum	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:42 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:42 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	560		50	mg/L	50	9/18/2019 02:33 PM
Fluoride	ND		2.0	mg/L	2	9/18/2019 02:17 PM
Sulfate	ND		4.0	mg/L	2	9/18/2019 02:17 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	7.15	H	0.100	s.u.	1	9/19/2019 11:14 AM
Temperature	18.9	H	0.100	°C	1	9/19/2019 11:14 AM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	1,400		100	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate
Collection Date: 9/16/2019

Work Order: 19091067
Lab ID: 19091067-05
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:30 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Arsenic	0.038		0.0050	mg/L	1	9/20/2019 03:44 PM
Barium	0.28		0.0050	mg/L	1	9/20/2019 03:44 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:44 PM
Boron	1.5		0.020	mg/L	1	9/20/2019 03:44 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:44 PM
Calcium	110		0.50	mg/L	1	9/20/2019 03:44 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Lead	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Lithium	0.14		0.010	mg/L	1	9/20/2019 03:44 PM
Molybdenum	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:44 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:44 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	180		20	mg/L	20	9/18/2019 06:16 PM
Fluoride	ND		1.0	mg/L	1	9/18/2019 05:38 PM
Sulfate	39		10	mg/L	5	9/18/2019 05:57 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.99	H	0.100	s.u.	1	9/19/2019 11:14 AM
Temperature	19.2	H	0.100	°C	1	9/19/2019 11:14 AM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	990		100	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: EQB
Collection Date: 9/16/2019

Work Order: 19091067
Lab ID: 19091067-06
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:39 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Arsenic	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Barium	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:45 PM
Boron	0.032		0.020	mg/L	1	9/20/2019 03:45 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:45 PM
Calcium	ND		0.50	mg/L	1	9/20/2019 03:45 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Lead	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Lithium	ND		0.010	mg/L	1	9/20/2019 03:45 PM
Molybdenum	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:45 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:45 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	9/18/2019 01:45 PM
Fluoride	ND		1.0	mg/L	1	9/18/2019 01:45 PM
Sulfate	ND		2.0	mg/L	1	9/18/2019 01:45 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DVD
pH (laboratory)	6.76	H	0.100	s.u.	1	9/19/2019 11:14 AM
Temperature	19.5	H	0.100	°C	1	9/19/2019 11:14 AM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	60		50	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank
Collection Date: 9/16/2019

Work Order: 19091067
Lab ID: 19091067-07
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 9/25/19 12:59	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	9/25/2019 03:41 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 9/20/19 09:40	Analyst: STP
Antimony	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Arsenic	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Barium	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Beryllium	ND		0.0020	mg/L	1	9/20/2019 03:54 PM
Boron	ND		0.020	mg/L	1	9/23/2019 04:31 PM
Cadmium	ND		0.0020	mg/L	1	9/20/2019 03:54 PM
Calcium	ND		0.50	mg/L	1	9/20/2019 03:54 PM
Chromium	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Cobalt	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Lead	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Lithium	ND		0.010	mg/L	1	9/20/2019 03:54 PM
Molybdenum	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Selenium	ND		0.0050	mg/L	1	9/20/2019 03:54 PM
Thallium	ND		0.0020	mg/L	1	9/20/2019 03:54 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	9/18/2019 02:01 PM
Fluoride	ND		1.0	mg/L	1	9/18/2019 02:01 PM
Sulfate	ND		2.0	mg/L	1	9/18/2019 02:01 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: DNW
pH (laboratory)	5.79	H	0.100	s.u.	1	9/20/2019 01:00 PM
Temperature	16.1	H	0.100	°C	1	9/20/2019 01:00 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 9/18/19 14:36	Analyst: ERW
Total Dissolved Solids	ND		30	mg/L	1	9/20/2019 01:00 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	10/18/2019

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

Client: NTH Consultants, Ltd.
Work Order: 19091067
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **142993** Instrument ID **HG4** Method: **SW7470A**

MBLK		Sample ID: MBLK-142993-142993				Units: mg/L		Analysis Date: 9/25/2019 02:48 PM		
Client ID:		Run ID: HG4_190925A				SeqNo: 5945335		Prep Date: 9/25/2019		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-142993-142993				Units: mg/L		Analysis Date: 9/25/2019 02:50 PM		
Client ID:		Run ID: HG4_190925A				SeqNo: 5945336		Prep Date: 9/25/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.001953 0.00020 0.002 0 97.6 80-120 0

MS		Sample ID: 19091067-02AMS				Units: mg/L		Analysis Date: 9/25/2019 02:59 PM		
Client ID: MW-4		Run ID: HG4_190925A				SeqNo: 5945340		Prep Date: 9/25/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.001656 0.00020 0.002 0.000051 80.2 75-125 0

MSD		Sample ID: 19091067-02AMSD				Units: mg/L		Analysis Date: 9/25/2019 03:01 PM		
Client ID: MW-4		Run ID: HG4_190925A				SeqNo: 5945341		Prep Date: 9/25/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.00182 0.00020 0.002 0.000051 88.4 75-125 0.001656 9.44 20

The following samples were analyzed in this batch:

19091067-01A	19091067-02A	19091067-03A
19091067-04A	19091067-05A	19091067-06A
19091067-07A		

Client: NTH Consultants, Ltd.
 Work Order: 19091067
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **142726** Instrument ID **ICPMS4** Method: **SW6020A**

MBLK		Sample ID: MBLK-142726-142726				Units: mg/L		Analysis Date: 9/20/2019 02:52 PM		
Client ID:		Run ID: ICPMS4_190920A				SeqNo: 5933139		Prep Date: 9/20/2019		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-142726-142726				Units: mg/L		Analysis Date: 9/20/2019 02:54 PM		
Client ID:		Run ID: ICPMS4_190920A				SeqNo: 5933140		Prep Date: 9/20/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1016	0.0050	0.1	0	102	80-120	0			
Arsenic	0.1062	0.0050	0.1	0	106	80-120	0			
Barium	0.1031	0.0050	0.1	0	103	80-120	0			
Beryllium	0.1036	0.0020	0.1	0	104	80-120	0			
Boron	0.4717	0.020	0.5	0	94.3	80-120	0			
Cadmium	0.1098	0.0020	0.1	0	110	80-120	0			
Calcium	10.72	0.50	10	0	107	80-120	0			
Chromium	0.1051	0.0050	0.1	0	105	80-120	0			
Cobalt	0.1053	0.0050	0.1	0	105	80-120	0			
Lead	0.104	0.0050	0.1	0	104	80-120	0			
Lithium	0.1043	0.010	0.1	0	104	80-120	0			
Molybdenum	0.1058	0.0050	0.1	0	106	80-120	0			
Selenium	0.11	0.0050	0.1	0	110	80-120	0			
Thallium	0.1019	0.0050	0.1	0	102	80-120	0			

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

Client: NTH Consultants, Ltd.
 Work Order: 19091067
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: 142726 Instrument ID ICPMS4 Method: SW6020A

MS				Sample ID: 19091067-02AMS			Units: mg/L		Analysis Date: 9/20/2019 03:36 PM		
Client ID: MW-4			Run ID: ICPMS4_190920A			SeqNo: 5933155		Prep Date: 9/20/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.1023	0.0050	0.1	0.000366	102	75-125	0				
Arsenic	0.1121	0.0050	0.1	0.006353	106	75-125	0				
Barium	0.9803	0.0050	0.1	0.891	89.3	75-125	0			O	
Beryllium	0.1032	0.0020	0.1	0.000011	103	75-125	0				
Boron	1.525	0.020	0.5	1.046	95.8	75-125	0				
Cadmium	0.1026	0.0020	0.1	0.000107	103	75-125	0				
Calcium	165.3	0.50	10	158	73.2	75-125	0			SO	
Chromium	0.1011	0.0050	0.1	0.000513	101	75-125	0				
Cobalt	0.1005	0.0050	0.1	0.00237	98.2	75-125	0				
Lead	0.108	0.0050	0.1	0.002767	105	75-125	0				
Lithium	0.1315	0.010	0.1	0.03039	101	75-125	0				
Molybdenum	0.1129	0.0050	0.1	0.005078	108	75-125	0				
Selenium	0.1091	0.0050	0.1	0.000424	109	75-125	0				
Thallium	0.1028	0.0050	0.1	0.000011	103	75-125	0				

MSD				Sample ID: 19091067-02AMSD			Units: mg/L		Analysis Date: 9/20/2019 03:38 PM		
Client ID: MW-4			Run ID: ICPMS4_190920A			SeqNo: 5933156		Prep Date: 9/20/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.1027	0.0050	0.1	0.000366	102	75-125	0.1023	0.399	20		
Arsenic	0.1115	0.0050	0.1	0.006353	105	75-125	0.1121	0.492	20		
Barium	0.9899	0.0050	0.1	0.891	98.9	75-125	0.9803	0.974	20	O	
Beryllium	0.1018	0.0020	0.1	0.000011	102	75-125	0.1032	1.34	20		
Boron	1.522	0.020	0.5	1.046	95.3	75-125	1.525	0.17	20		
Cadmium	0.1021	0.0020	0.1	0.000107	102	75-125	0.1026	0.557	20		
Calcium	165.6	0.50	10	158	75.9	75-125	165.3	0.165	20	O	
Chromium	0.1019	0.0050	0.1	0.000513	101	75-125	0.1011	0.733	20		
Cobalt	0.1006	0.0050	0.1	0.00237	98.3	75-125	0.1005	0.107	20		
Lead	0.1087	0.0050	0.1	0.002767	106	75-125	0.108	0.666	20		
Lithium	0.1325	0.010	0.1	0.03039	102	75-125	0.1315	0.778	20		
Molybdenum	0.1125	0.0050	0.1	0.005078	107	75-125	0.1129	0.313	20		
Selenium	0.1092	0.0050	0.1	0.000424	109	75-125	0.1091	0.0761	20		
Thallium	0.1027	0.0050	0.1	0.000011	103	75-125	0.1028	0.0759	20		

The following samples were analyzed in this batch:

19091067-01A	19091067-02A	19091067-03A
19091067-04A	19091067-05A	19091067-06A
19091067-07A		

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

Client: NTH Consultants, Ltd.
 Work Order: 19091067
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **142634** Instrument ID **TDS** Method: **A2540 C-11**

MBLK		Sample ID: MBLK-142634-142634				Units: mg/L		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: TDS_190920B				SeqNo: 5932272		Prep Date: 9/18/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids ND 30

LCS		Sample ID: LCS-142634-142634				Units: mg/L		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: TDS_190920B				SeqNo: 5932273		Prep Date: 9/18/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 504 30 495 0 102 85-109 0

DUP		Sample ID: 19091067-02B DUP				Units: mg/L		Analysis Date: 9/20/2019 01:00 PM		
Client ID: MW-4		Run ID: TDS_190920B				SeqNo: 5932276		Prep Date: 9/18/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 1360 150 0 0 0 0-0 1300 4.51 10

DUP		Sample ID: 19091078-08B DUP				Units: mg/L		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: TDS_190920B				SeqNo: 5932286		Prep Date: 9/18/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 1867 50 0 0 0 0-0 1930 3.34 10

The following samples were analyzed in this batch:

19091067-01B	19091067-02B	19091067-03B
19091067-04B	19091067-05B	19091067-06B
19091067-07B		

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

Client: NTH Consultants, Ltd.
 Work Order: 19091067
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R270850** Instrument ID **IC3** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R270850				Units: mg/L		Analysis Date: 9/18/2019 11:52 AM		
Client ID:		Run ID: IC3_190918A				SeqNo: 5927709		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-R270850				Units: mg/L		Analysis Date: 9/18/2019 12:08 PM		
Client ID:		Run ID: IC3_190918A				SeqNo: 5927710		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.135	1.0	10	0	91.3	90-110	0			
Fluoride	1.903	0.10	2	0	95.2	90-110	0			
Sulfate	9.343	1.0	10	0	93.4	90-110	0			

MS		Sample ID: 19091067-02B MS				Units: mg/L		Analysis Date: 9/18/2019 06:36 PM		
Client ID: MW-4		Run ID: IC3_190918A				SeqNo: 5927732		Prep Date:		DF: 100
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1423	100	1000	460.1	96.3	80-120	0			
Fluoride	214.1	10	200	0	107	80-120	0			
Sulfate	966.7	100	1000	6.37	96	80-120	0			

MSD		Sample ID: 19091067-02B MSD				Units: mg/L		Analysis Date: 9/18/2019 06:55 PM		
Client ID: MW-4		Run ID: IC3_190918A				SeqNo: 5927733		Prep Date:		DF: 100
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1428	100	1000	460.1	96.8	80-120	1423	0.351	20	
Fluoride	207.8	10	200	0	104	80-120	214.1	3.01	20	
Sulfate	964.9	100	1000	6.37	95.9	80-120	966.7	0.189	20	

The following samples were analyzed in this batch:

19091067-01B	19091067-02B	19091067-03B
19091067-04B	19091067-05B	19091067-06B
19091067-07B		

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

Client: NTH Consultants, Ltd.
 Work Order: 19091067
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R270910** Instrument ID **Titrator 1** Method: **SW9040C**

LCS		Sample ID: LCS-R270910-R270910				Units: s.u.		Analysis Date: 9/19/2019 11:14 AM		
Client ID:		Run ID: TITRATOR 1_190919A				SeqNo: 5929871		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

pH (laboratory) 4.04 0.10 4 0 101 92-108 0

LCS		Sample ID: LCS-R270910-R270910				Units: s.u.		Analysis Date: 9/19/2019 11:14 AM		
Client ID:		Run ID: TITRATOR 1_190919A				SeqNo: 5929909		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

pH (laboratory) 4.04 0.10 4 0 101 92-108 0

DUP		Sample ID: 19091196-01A DUP				Units: s.u.		Analysis Date: 9/19/2019 11:14 AM		
Client ID:		Run ID: TITRATOR 1_190919A				SeqNo: 5929873		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

pH (laboratory) 11.06 0.10 0 0 0 0-0 11.01 0.453 5 HHHH
 Temperature 19.02 0.10 0 0 0 19.28 1.36 HHHH

DUP		Sample ID: 19091067-01B DUP				Units: s.u.		Analysis Date: 9/19/2019 11:14 AM		
Client ID: PZ-1		Run ID: TITRATOR 1_190919A				SeqNo: 5929911		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

pH (laboratory) 8.06 0.10 0 0 0 0-0 8.08 0.248 5 HHHH
 Temperature 19.07 0.10 0 0 0 18.63 2.33 HHHH

DUP		Sample ID: 19091067-02B DUP				Units: s.u.		Analysis Date: 9/19/2019 11:14 AM		
Client ID: MW-4		Run ID: TITRATOR 1_190919A				SeqNo: 5929913		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

pH (laboratory) 7.03 0.10 0 0 0 0-0 6.99 0.571 5 H
 Temperature 18.92 0.10 0 0 0 18.93 0.0528 H

The following samples were analyzed in this batch:

19091067-01B	19091067-02B	19091067-03B
19091067-04B	19091067-05B	19091067-06B

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

Client: NTH Consultants, Ltd.
Work Order: 19091067
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R270992** Instrument ID **WETCHEM** Method: **E150.1**

LCS		Sample ID: LCS-R270992-R270992				Units: s.u.		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: WETCHEM_190920G				SeqNo: 5932369		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.96	0.10	4	0	99	92-108	0			

LCS		Sample ID: LCS-R270992-R270992				Units: s.u.		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: WETCHEM_190920G				SeqNo: 5932379		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.96	0.10	4	0	99	92-108	0			

LCS		Sample ID: LCS-R270992-R270992				Units: s.u.		Analysis Date: 9/20/2019 01:00 PM		
Client ID:		Run ID: WETCHEM_190920G				SeqNo: 5932380		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	3.96	0.10	4	0	99	92-108	0			

The following samples were analyzed in this batch:

19091067-07B

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



Cincinnati, OH
+1 513 733 5336

Fort Collins, CO
+1 970 490 1511

Everett, WA
+1 425 356 2600

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page _____ of _____

COC ID: 191768

Houston, TX
+1 281 530 5656

Middletown, PA
+1 717 944 5541

Spring City, PA
+1 610 948 4903

Salt Lake City, UT
+1 801 266 7700

South Charleston, WV
+1 304 356 3168

York, PA
+1 717 505 5280

Customer Information			Project Information				Parameter/Method Request for Analysis												
Purchase Order		Project Name	73-16 JBY PP Holland BPW		A	Metals including Hg													
Work Order		Project Number	73-160017-04		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													
					F														
City/State/Zip	Northville, MI 48168	City/State/Zip	Holland, MI 49423		G														
Phone	(248) 662-2668	Phone	(616) 355-1210		H														
Fax	(248) 324-5305	Fax			I														
e-Mail Address		e-Mail Address			J														

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	PZ-1	9-16-19	10:30 AM	GW	2	5	✓	✓	✓	✓	✓						
2	MW-4	9-16-19	13:30	GW	2	5	✓	✓	✓	✓	✓						
3	MW-1	9-16-19	14:05	GW	2	5	✓	✓	✓	✓	✓						
4	MW-2	9-16-19	15:30	GW	2	8	✓	✓	✓	✓	✓						
5	MS	9-16-19	—	GW	2	5	✓	✓	✓	✓	✓						
6	MSD	9-16-19	—	GW	2	5	✓	✓	✓	✓	✓						
7	FD Field Duplicate	9-16-19	—	GW	2	5	✓	✓	✓	✓	✓						
8	EQB	9-16-19	—	GW	2	8	✓	✓	✓	✓	✓						
9	Field Blank	9-16-19	—	GW	2	8	✓	✓	✓	✓	✓						
10																	

Sampler(s) Please Print & Sign <i>Chie</i>		Shipment Method		Required Turnaround Time: (Check Box) <input type="checkbox"/> Std 10 WK Days <input type="checkbox"/> 5 WK Days <input type="checkbox"/> Other <input type="checkbox"/> 2 WK Days <input type="checkbox"/> 24 Hour				Results Due Date:	
Relinquished by: <i>Chie Palayo</i>		Date: 9/16/19	Time: 5:10 AM	Received by:		Notes:			
Relinquished by:		Date: 9/16/19	Time: 1710	Received by (Laboratory):		Cooler ID	Cooler Temp.	QC Package: (Check One Box Below)	
Logged by (Laboratory): <i>DFS</i>		Date: 9/17/19	Time: 0930	Checked by (Laboratory):		SR2	3.8°C	<input type="checkbox"/> Level II Std QC	<input type="checkbox"/> TRRP CheckList
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							3.6°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	

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.

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Sample Receipt Checklist

Client Name: **NTH - NORTHVILLE**

Date/Time Received: **16-Sep-19 17:10**

Work Order: **19091067**

Received by: **KRW**

Checklist completed by **Diane Shaw**

18-Sep-19

Reviewed by: **Chad Whelton**

18-Sep-19

eSignature

Date

eSignature

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>3.8/3.8, 3.6/3.6 c</u>		<u>SR2</u>
Cooler(s)/Kit(s):	<u></u>		
Date/Time sample(s) sent to storage:	<u>9/18/2019 11:25:08 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:	<u>-</u>		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:



Thursday, October 17, 2019

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

Re: ALS Workorder: 1909403
Project Name:
Project Number: 19091067

Dear Mr. Whelton:

Seven water samples were received from ALS Environmental, on 9/19/2019. 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,

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
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
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



1909403

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: 1909403

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 19091067

Client PO Number: 20-122019335

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
PZ-1	1909403-1		WATER	16-Sep-19	10:30
MW-1	1909403-2		WATER	16-Sep-19	14:05
Field Duplicate	1909403-3		WATER	16-Sep-19	
MW-2	1909403-4		WATER	16-Sep-19	15:30
EQB	1909403-5		WATER	16-Sep-19	
Field Blank	1909403-6		WATER	16-Sep-19	
MW-4	1909403-7		WATER	16-Sep-19	13:30

**Subcontractor:**

ALS Environmental, Fort Collins

225 Commerce Dr.

TEL: (800) 443-1511

FAX:

Fort Collins, CO 80524

Acct #:

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

1909403

Date: **18-Sep-19**COC ID: **11650**Due Date: **02-Oct-19**Salesperson **Brian Root**

Customer Information		Project Information		Parameter/Method Request for Analysis													
Purchase Order		Project Name	19091067	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 19091067-01C	PZ-1	Groundwater	16/Sep/2019 10:30	(3) 1LPHNO3	X												
2 19091067-03C	MW-1	Groundwater	16/Sep/2019 14:05	(3) 1LPHNO3	X												
3 19091067-05C	Field Duplicate	Groundwater	16/Sep/2019	(3) 1LPHNO3	X												
4 19091067-04C	MW-2	Groundwater	16/Sep/2019 15:30	(6) 500PHNO3	X												
5 19091067-06C	EQB	Water	16/Sep/2019	(6) 500PHNO3	X												
6 19091067-07C	Field Blank	Water	16/Sep/2019	(6) 500PHNO3	X												
7 19091067-02C	MW-4	Groundwater	16/Sep/2019 13:30	(9) 1LPHNO3	X	X											

cc
9/19/19**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

9-18-19 1400

Received by:

EAC

Date/Time

9/19/19 0955

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 Holland

Workorder No: 1909403

Project Manager: JRK

Initials: EE

Date: 9/20/19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
2. Are custody seals on shipping containers intact?		<input checked="" type="checkbox"/> NONE	<input type="checkbox"/> YES	<input type="checkbox"/> NO *
3. Are custody seals on sample containers intact?		<input checked="" type="checkbox"/> NONE	<input type="checkbox"/> YES	<input type="checkbox"/> NO *
4. Is there a COC (chain-of-custody) present?			<input checked="" type="checkbox"/> YES	<input type="checkbox"/> 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	<input type="checkbox"/> NO *
6. Are short-hold samples present?			<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
7. Are all samples within holding times for the requested analyses?			<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO *
8. Were all sample containers received intact? (not broken or leaking)			<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO *
9. Is there sufficient sample for the requested analyses?			<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO *
10. Are all samples in the proper containers for the requested analyses?			<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO *
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO *
12. Are all aqueous non-preserved samples pH 4-9?		<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> YES	<input type="checkbox"/> NO *
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> YES	<input type="checkbox"/> NO
14. Were the samples shipped on ice?			<input 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"/> 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>		
External µR/hr reading:	<u>12</u>	<u>12</u>		
Background µR/hr reading:	<u>13</u>			
<div style="border: 1px solid black; padding: 2px; width: 50px; float: left;">DOT Survey/Acceptance Information</div> 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.)				

* Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

11)... 9403-4 (all bottles) had initial pH ~12, 2ml HNO₃ added; Final pH < 2 | lot #: 197345
 " -5 (all bottles) " " pH ~12, 2ml " " ; " pH < 2 | " " "
 " -6 (all bottles) " " pH ~12, 2ml " " ; " pH < 2 | " " "

All client bottle ID's vs ALS lab ID's double-checked by: EE

If applicable, was the client contacted? ☒ YES / NO / NA Contact: C. Whalton Date/Time: 9-20

Project Manager Signature / Date: [Signature] 9-20-19

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: PZ-1

Lab ID: 1909403-1

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019 10:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 10/9/2019	PrepBy: JXH
Ra-226	ND (+/- 0.34)	U	0.48	pCi/l	NA	10/15/2019 13:13
Carr: BARIUM	88		40-110	%REC	DL = NA	10/15/2019 13:13
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 10/7/2019	PrepBy: RGS
Ra-228	ND (+/- 0.38)	U	0.73	pCi/l	NA	10/14/2019 07:48
Carr: BARIUM	96		40-110	%REC	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: MW-1

Lab ID: 1909403-2

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019 14:05

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.61 (+/- 0.4)		SOP 783		Prep Date: 10/9/2019	PrepBy: JXH
<i>Carr: BARIUM</i>	<i>92.8</i>		0.46	pCi/l	NA	10/15/2019 13:45
			<i>40-110</i>	<i>%REC</i>	DL = NA	10/15/2019 13:45
Radium-228 Analysis by GFPC						
Ra-228	2.05 (+/- 0.65)		SOP 724		Prep Date: 10/7/2019	PrepBy: RGS
<i>Carr: BARIUM</i>	<i>95.7</i>		0.77	pCi/l	NA	10/14/2019 07:48
			<i>40-110</i>	<i>%REC</i>	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: Field Duplicate

Lab ID: 1909403-3

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.78 (+/- 0.48)		SOP 783		Prep Date: 10/9/2019	PrepBy: JXH
<i>Carr: BARIUM</i>	<i>93.1</i>		0.56	pCi/l	NA	10/15/2019 13:45
			<i>40-110</i>	<i>%REC</i>	DL = NA	10/15/2019 13:45
Radium-228 Analysis by GFPC						
Ra-228	2.21 (+/- 0.68)		SOP 724		Prep Date: 10/7/2019	PrepBy: RGS
<i>Carr: BARIUM</i>	<i>96.8</i>		0.77	pCi/l	NA	10/14/2019 07:48
			<i>40-110</i>	<i>%REC</i>	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: MW-2

Lab ID: 1909403-4

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019 15:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.46)	U	0.86	pCi/l	NA	10/15/2019 13:45
Carr: BARIUM	96.4		40-110	%REC	DL = NA	10/15/2019 13:45
Radium-228 Analysis by GFPC						
Ra-228	1.74 (+/- 0.57)		0.72	pCi/l	NA	10/14/2019 07:48
Carr: BARIUM	97.5		40-110	%REC	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: EQB

Lab ID: 1909403-5

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 10/9/2019		PrepBy: JXH
Ra-226	ND (+/- 0.23)	U	0.35	pCi/l	NA	10/15/2019 13:45
Carr: BARIUM	95.8		40-110	%REC	DL = NA	10/15/2019 13:45
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 10/7/2019		PrepBy: RGS
Ra-228	0.96 (+/- 0.44)	Y1	0.73	pCi/l	NA	10/14/2019 07:48
Carr: BARIUM	101	Y1	40-110	%REC	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: Field Blank

Lab ID: 1909403-6

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	ND (+/- 0.23)	U	0.48	pCi/l	NA	10/15/2019 13:45
Carr: BARIUM	95.9		40-110	%REC	DL = NA	10/15/2019 13:45
Radium-228 Analysis by GFPC						
Ra-228	0.83 (+/- 0.41)		0.72	pCi/l	NA	10/14/2019 07:48
Carr: BARIUM	98.5		40-110	%REC	DL = NA	10/14/2019 07:48

Client: ALS Environmental

Date: 17-Oct-19

Project: 19091067

Work Order: 1909403

Sample ID: MW-4

Lab ID: 1909403-7

Legal Location:

Matrix: WATER

Collection Date: 9/16/2019 13:30

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.

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: 10/17/2019 8:39

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1909403

Project: 19091067

Batch ID: RE191009-1-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

DUP	Sample ID: 1909403-7			Units: pCi/l			Analysis Date: 10/15/2019 13:45				
Client ID: MW-4		Run ID: RE191009-1A			Prep Date: 10/9/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.45						0.48	0.2	2.1	U
Carr: BARIUM	16640		18210		91.4	40-110		16230			

LCS	Sample ID: RE191009-1			Units: pCi/l		Analysis Date: 10/15/2019 14:26					
Client ID:	Run ID: RE191009-1A					Prep Date: 10/9/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	55 (+/- 14)	1	46.47		118	67-120					P
Carr: BARIUM	16380		17330		94.5	40-110					

MB	Sample ID: RE191009-1				Units: pCi/l		Analysis Date: 10/15/2019 14:26				
Client ID:	Run ID: RE191009-1A				Prep Date: 10/9/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.54									U
Carr: BARIUM	16980		17330		98	40-110					

The following samples were analyzed in this batch:

1909403-1	1909403-2	1909403-3
1909403-4	1909403-5	1909403-6
1909403-7		

Client: ALS Environmental
Work Order: 1909403
Project: 19091067

QC BATCH REPORT

Batch ID: RA191007-1-2 Instrument ID LB4100-C Method: Radium-228 Analysis by GFPC

DUP	Sample ID: 1909403-7				Units: pCi/l		Analysis Date: 10/14/2019 07:48				
Client ID: MW-4		Run ID: RA191007-1A				Prep Date: 10/7/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	2.18 (+/- 0.67)	0.77						1.78	0.4	2.1	
Carr: BARIUM	30990		33000		93.9	40-110		32030			

LCS	Sample ID: RA191007-1			Units: pCi/l			Analysis Date: 10/14/2019 07:48				
Client ID:		Run ID: RA191007-1A			Prep Date: 10/7/2019			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	15.2 (+/- 3.6)	0.7	13.72		111	70-130					P
Carr: BARIUM	31880		32190		99	40-110					

MB	Sample ID: RA191007-1				Units: pCi/l		Analysis Date: 10/14/2019 07:48				
Client ID:		Run ID: RA191007-1A				Prep Date: 10/7/2019			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.77									U
Carr: BARIUM	31790		32170		98.8	40-110					

The following samples were analyzed in this batch:

1909403-1	1909403-2	1909403-3
1909403-4	1909403-5	1909403-6
1909403-7		

Low-Flow Test Report:

Test Date / Time: 9/16/2019 7:57:26 AM

Project: JDY PP Holland BPW Q3 2019

Operator Name: Chloe Palajac

Location Name: Pz1 Well Diameter: 2 in Initial Depth to Water: 9.25 ft	Estimated Total Volume Pumped: 9000 ml Flow Cell Volume: 130 ml Final Flow Rate: 250 ml/min Final Draw Down: 0.92 ft	Instrument Used: Aqua TROLL 600 Serial Number: 464768
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Test Notes:

Low-Flow Readings:

Date Time (MST)	Elapsed Time	pH	Temperature	Specific Conductivity	Turbidity	Depth To Water	Flow
		+/- 0.1	+/- 0.2	+/- 3	+/- 10		
9/16/2019 7:57 AM	00:00	7.89 pH	23.38 °C	0.00 mS/cm	11.17 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:00 AM	03:00	7.89 pH	22.25 °C	0.00 mS/cm	9.21 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:03 AM	06:00	7.89 pH	21.70 °C	0.00 mS/cm	6.54 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:06 AM	09:00	7.88 pH	21.49 °C	0.00 mS/cm	5.04 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:09 AM	12:00	7.86 pH	21.37 °C	0.00 mS/cm	4.25 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:12 AM	15:00	7.84 pH	21.10 °C	0.00 mS/cm	4.32 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:15 AM	18:00	7.80 pH	20.82 °C	0.00 mS/cm	3.77 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:18 AM	21:00	7.79 pH	20.92 °C	0.00 mS/cm	2.53 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:21 AM	24:00	7.77 pH	20.82 °C	0.00 mS/cm	1.91 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:24 AM	27:00	7.75 pH	20.61 °C	0.00 mS/cm	3.21 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:27 AM	30:00	7.77 pH	20.57 °C	0.00 mS/cm	1.20 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:30 AM	33:00	7.79 pH	21.41 °C	0.00 mS/cm	1.62 NTU	9.25 ft	250.00 ml/min
9/16/2019 8:33 AM	36:00	7.77 pH	22.10 °C	0.00 mS/cm	2.66 NTU	9.25 ft	250.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION									
Project Name: <u>Holland BPW – James DeYoung PP</u>					Date: <u>09/16/2019</u>				
Project #: <u>73-160017</u>					Field Personnel: <u>Phil, Keith, Chloe, Abbie</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>592.91</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) = 9.25		1.5		0.10		0.30			
Depth to Water (ft. from TOC) = 13.54		2		0.16		0.48			
Height of Water in Well (ft.) = 4.29		3		0.36		1.08			
One Well Volume (gallons) = 0.69		4		0.63		1.89			
Gallons Purged: _____				Purging and Sampling Device: <u>Peristaltic</u>					
Well Volumes Purged: _____				Purging Rate (g.p.m.) <u>250 ml/min</u>					
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	10:00	10:03	10:06	10:09	10:15	10:18	10:21		
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH	7.89	7.89	7.88/	7.86	7.8	7.79	7.77		
Temperature (C)	22.25	21.7	21.49	21.37	20.82	20.92	20.82		
Conductivity (mS/cm)									
ORP (mV)									
Dissolved Oxygen (mg/L)									
Turbidity (NTU)	9.21	6.574	5.09	4.25	3.77	2.55	1.91		
Odor									
Appearance and/or Color	Slight yellow								
SAMPLING DATA									
Time:		Start: <u>9.57</u>		Finish: <u>10:30</u>		Pump Rate (g.p.m.): _____			
Sample Collection Device: <u>Peristaltic</u>									
Weather Conditions: Air Temperature (F): _____ Wind Speed/Direction: _____ Other: _____									
Samples Collected On chain of Custody No: _____ Analytical Laboratory: _____									
Other Notes: _____									

Low-Flow Test Report:

Test Date / Time: 9/16/2019 11:40:06 AM
Project: JDY PP Holland BPW Q3 2019 (5)
Operator Name: Chloe Palajac

Location Name: Mw1	Estimated Total Volume Pumped: 6000 ml Flow Cell Volume: 130 ml Final Flow Rate: 250 ml/min	Instrument Used: Aqua TROLL 600 Serial Number: 464768
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Test Notes:

Low-Flow Readings:

Date Time (MST)	Elapsed Time	pH	Temperature	Specific Conductivity	Turbidity	Flow
		+/- 0.1	+/- 0.2	+/- 3	+/- 10	
9/16/2019 11:40 AM	00:00	7.01 pH	21.53 °C	0.00 mS/cm	232.86 NTU	250.00 ml/min
9/16/2019 11:43 AM	03:00	6.98 pH	21.16 °C	0.00 mS/cm	332.99 NTU	250.00 ml/min
9/16/2019 11:46 AM	06:00	6.98 pH	20.90 °C	0.00 mS/cm	369.92 NTU	250.00 ml/min
9/16/2019 11:49 AM	09:00	6.97 pH	20.78 °C	0.00 mS/cm	374.82 NTU	250.00 ml/min
9/16/2019 11:52 AM	12:00	6.97 pH	20.99 °C	0.00 mS/cm	400.85 NTU	250.00 ml/min
9/16/2019 11:55 AM	15:00	6.96 pH	21.39 °C	0.00 mS/cm	397.26 NTU	250.00 ml/min
9/16/2019 11:58 AM	18:00	6.95 pH	21.71 °C	0.00 mS/cm	408.91 NTU	250.00 ml/min
9/16/2019 12:01 PM	21:00	6.94 pH	21.83 °C	0.00 mS/cm	401.78 NTU	250.00 ml/min
9/16/2019 12:04 PM	24:00	6.94 pH	21.90 °C	0.00 mS/cm	421.07 NTU	250.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION									
Project Name: <u>Holland BPW – James DeYoung PP</u>					Date: <u>9/16/19</u>				
Project #: <u>73-160017 -04</u>					Field Personnel: <u>Phil, Keith, Chloe, Abbie</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 (if different than Well ID): _____					Screened Interval (ft. from TOC): <u>9.0'-14.0 (12.0'-17.0')</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) = 5.49		1.5		0.10		0.30			
Depth to Water (ft. from TOC) = 16.9		2		0.16		0.48			
Height of Water in Well (ft.) = 11.41		3		0.36		1.08			
One Well Volume (gallons) = 1.82		4		0.63		1.89			
Gallons Purged: _____				Purging and Sampling Device: <u>Peristaltic</u>					
Well Volumes Purged: _____				Purging Rate (g.p.m.) <u>300 ml/min</u>					
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	1:43	1:46	1:49	1:52	1:55	1:58	2:01	2:04	
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH	6.98	6.98	6.97	6.97	6.96	6.95	6.94	6.94	
Temperature (C)	21.16	20.90	20.78	20.99	21.39	21.71	21.53	21.9	
Conductivity (mS/cm)									
ORP (mV)									
Dissolved Oxygen (mg/L)									
Turbidity (NTU)	332.99	369.92	379.82	400.85	397.26	4018.9 1	401.78	421.07	
Odor									
Appearance and/or Color	Clear								
SAMPLING DATA									
Time:		Start: <u>1:40</u>		Finish: <u>2:04</u>		Pump Rate (g.p.m.): _____			
Sample Collection Device: <u>Peristaltic</u>									
Weather Conditions: Air Temperature (F): _____ Wind Speed/Direction: _____ Other: _____									
Samples Collected On chain of Custody No: _____ Analytical Laboratory: _____									
Other Notes: _____									
<u>Field duplicate</u>									

Low-Flow Test Report:

Test Date / Time: 9/16/2019 1:07:13 PM

Project: JDY PP Holland BPW Q3 2019 (6)

Operator Name: Chloe Palajac

Location Name: Mw2	Estimated Total Volume Pumped: 7200 ml Flow Cell Volume: 130 ml Final Flow Rate: 300 ml/min	Instrument Used: Aqua TROLL 600 Serial Number: 464768
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Test Notes:

Low-Flow Readings:

Date Time (MST)	Elapsed Time	pH	Temperature	Specific Conductivity	Turbidity	Flow
		+/- 0.1	+/- 0.2	+/- 3	+/- 10	
9/16/2019 1:07 PM	00:00	7.04 pH	23.99 °C	0.00 mS/cm	3.87 NTU	300.00 ml/min
9/16/2019 1:10 PM	03:00	7.05 pH	23.13 °C	0.00 mS/cm	11.97 NTU	300.00 ml/min
9/16/2019 1:13 PM	06:00	7.04 pH	22.62 °C	0.00 mS/cm	7.94 NTU	300.00 ml/min
9/16/2019 1:16 PM	09:00	7.03 pH	22.25 °C	0.00 mS/cm	4.00 NTU	300.00 ml/min
9/16/2019 1:19 PM	12:00	7.02 pH	21.95 °C	0.00 mS/cm	13.45 NTU	300.00 ml/min
9/16/2019 1:22 PM	15:00	7.00 pH	21.62 °C	0.00 mS/cm	13.84 NTU	300.00 ml/min
9/16/2019 1:25 PM	18:00	6.98 pH	21.30 °C	0.00 mS/cm	20.62 NTU	300.00 ml/min
9/16/2019 1:28 PM	21:00	6.95 pH	21.26 °C	0.00 mS/cm	24.75 NTU	300.00 ml/min
9/16/2019 1:31 PM	24:00	6.93 pH	21.18 °C	0.00 mS/cm	32.47 NTU	300.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION									
Project Name: <u>Holland BPW – James DeYoung PP</u>					Date: <u>9/16/19</u>				
Project #: <u>73-160017</u>					Field Personnel: <u>Phil, Keith, Chloe, Abbie</u>				
Site Location: <u>Holland, MI</u>					Well Const.: <u>Sch 40 PVC</u>				
Well ID: <u>MW-2</u>					Casing Diameter: <u>2.0"</u>				
Sample ID (if different than Well ID): _____					Screened Interval (ft. from TOC): <u>8.0'-13.0 (14.0'-19.0')</u>				
					Top of Casing (ft.): <u>585.49</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) = 2.87		1.5		0.10		0.30			
Depth to Water (ft. from TOC) = 16.16		2		0.16		0.48			
Height of Water in Well (ft.) = 13.29		3		0.36		1.08			
One Well Volume (gallons) = 2.13		4		0.63		1.89			
Gallons Purged: _____				Purging and Sampling Device: <u>Peristaltic</u>					
Well Volumes Purged: _____				Purging Rate (g.p.m.) <u>300 ml/min</u>					
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	3:07	3:10	3:13	3:16	3:19	3:22	3:25	3:28	3:31
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH	7.04	7.05	7.04	7.03	7.02	7.0	6.98	6.95	6.93
Temperature (C)	23.99	23.13	22.62	22.25	21.95	21.62	21.3	21.26	21.18
Conductivity (mS/cm)									
ORP (mV)									
Dissolved Oxygen (mg/L)									
Turbidity (NTU)	3.87	11.97	7.94	4.0	13.45	13.84	20.62	24.75	32.47
Odor									
Appearance and/or Color	Clear								
SAMPLING DATA									
Time:		Start: <u>3:04</u>		Finish: <u>3:31</u>		Pump Rate (g.p.m.): _____			
Sample Collection Device:		<u>Peristaltic</u>							
Weather Conditions: Air Temperature (F): _____		Wind Speed/Direction: _____		Other: _____					
Samples Collected On chain of Custody No: _____		Analytical Laboratory: _____							

Other Notes: _____



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 09/16/2019
Project #: 73-160017 -04 Field Personnel: Phil, Keith, Chloe, Abbie
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:		
	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: _____	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									
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									

SAMPLING DATA

Time: Start: _____ Finish: _____ Pump Rate (g.p.m.): _____
Sample Collection Device: _____
Weather Conditions: Air Temperature (F): _____ Wind Speed/Direction: _____ Other: _____
Samples Collected On chain of Custody No: _____ Analytical Laboratory: _____

Other Notes: The well was inaccessible due to high water level in the surrounding area: surrounded by over 1 foot of water on all sides.



28-Jan-2020

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

Re: **Holland Board of Public Works**

Work Order: **19121443**

Dear Karen,

ALS Environmental received 8 samples on 19-Dec-2019 08:00 AM 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: MN 026-999-449

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

Environmental 

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 19121443

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
19121443-01	PZ-1	Groundwater		12/18/2019 11:50	12/19/2019 08:00	<input type="checkbox"/>
19121443-02	MW-4	Groundwater		12/18/2019 13:45	12/19/2019 08:00	<input type="checkbox"/>
19121443-03	Field Blank (FB)	Groundwater		12/18/2019 13:45	12/19/2019 08:00	<input type="checkbox"/>
19121443-04	MW-1	Groundwater		12/18/2019 15:40	12/19/2019 08:00	<input type="checkbox"/>
19121443-05	MW-2	Groundwater		12/18/2019 16:06	12/19/2019 08:00	<input type="checkbox"/>
19121443-06	MW-3	Groundwater		12/18/2019 16:45	12/19/2019 08:00	<input type="checkbox"/>
19121443-07	Equipment Blank (EQB)	Water		12/18/2019 17:30	12/19/2019 08:00	<input type="checkbox"/>
19121443-08	Field Duplicate (FD)	Groundwater		12/18/2019	12/19/2019 08:00	<input type="checkbox"/>

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Work Order: 19121443

Case Narrative

Samples for the above noted Work Order were received on 12/19/2019. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Metals:

No other deviations or anomalies were noted.

Wet Chemistry:

Batch R278188, Method PH_4500_W, Sample LCS-R278188: Sample was processed outside of holding time for pH, as the analysis is a field test and holding time is defined as 15 minutes.

Batch R279864, Method IC_300.0_WW, Sample 19121443-05B: The reporting limits for Fluoride and Sulfate are elevated due to dilution for high concentrations of non-target analytes.

Batch R279864, Method IC_300.0_WW, Samples 19121443-06B -08B: The reporting limits for Fluoride are elevated due to dilution for high concentrations of non-target analytes.

Radium analysis performed by ALS Fort Collins laboratory.

<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>
°C	Degrees Celcius
as noted	
mg/L	Milligrams per Liter
s.u.	Standard Units

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: PZ-1

Collection Date: 12/18/2019 11:50 AM

Work Order: 19121443

Lab ID: 19121443-01

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 02:49 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 04:51 PM
Arsenic	0.032		0.0050	mg/L	1	12/31/2019 04:51 PM
Barium	0.062		0.0050	mg/L	1	12/31/2019 04:51 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 04:51 PM
Boron	0.38		0.020	mg/L	1	12/31/2019 04:51 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 04:51 PM
Calcium	45		0.50	mg/L	1	12/31/2019 04:51 PM
Chromium	0.0082		0.0050	mg/L	1	12/31/2019 04:51 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 04:51 PM
Lead	0.018		0.0050	mg/L	1	12/31/2019 04:51 PM
Lithium	ND		0.010	mg/L	1	12/31/2019 04:51 PM
Molybdenum	0.068		0.0050	mg/L	1	12/31/2019 04:51 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 04:51 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 04:51 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	210		20	mg/L	20	12/31/2019 01:10 PM
Fluoride	ND		1.0	mg/L	1	12/31/2019 12:51 PM
Sulfate	29		10	mg/L	5	1/2/2020 01:27 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	8.67	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.3	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 09:37	Analyst: ERW
Total Dissolved Solids	1,500		30	mg/L	1	12/26/2019 01:11 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Blank (FB)
Collection Date: 12/18/2019 01:45 PM

Work Order: 19121443
Lab ID: 19121443-03
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:08 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Arsenic	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Barium	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:01 PM
Boron	ND		0.020	mg/L	1	12/31/2019 05:01 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:01 PM
Calcium	ND		0.50	mg/L	1	12/31/2019 05:01 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Lithium	ND		0.010	mg/L	1	12/31/2019 05:01 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:01 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:01 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	12/31/2019 02:07 PM
Fluoride	ND		1.0	mg/L	1	12/31/2019 02:07 PM
Sulfate	ND		2.0	mg/L	1	12/31/2019 02:07 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	6.80	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.5	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 09:37	Analyst: ERW
Total Dissolved Solids	ND		30	mg/L	1	12/26/2019 01:11 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.

Project: Holland Board of Public Works

Sample ID: MW-1

Collection Date: 12/18/2019 03:40 PM

Work Order: 19121443

Lab ID: 19121443-04

Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:10 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Arsenic	0.026		0.0050	mg/L	1	12/31/2019 05:03 PM
Barium	0.27		0.0050	mg/L	1	12/31/2019 05:03 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:03 PM
Boron	1.2		0.020	mg/L	1	12/31/2019 05:03 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:03 PM
Calcium	110		0.50	mg/L	1	12/31/2019 05:03 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Lithium	0.12		0.010	mg/L	1	12/31/2019 05:03 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:03 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:03 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	200		20	mg/L	20	12/31/2019 03:05 PM
Fluoride	ND		1.0	mg/L	1	12/31/2019 02:27 PM
Sulfate	26		10	mg/L	5	12/31/2019 02:46 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	7.10	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.1	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 10:49	Analyst: ERW
Total Dissolved Solids	900		30	mg/L	1	12/26/2019 01:17 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-2
Collection Date: 12/18/2019 04:06 PM

Work Order: 19121443
Lab ID: 19121443-05
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:13 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Arsenic	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Barium	0.20		0.0050	mg/L	1	12/31/2019 05:05 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:05 PM
Boron	0.72		0.020	mg/L	1	12/31/2019 05:05 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:05 PM
Calcium	83		0.50	mg/L	1	12/31/2019 05:05 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Lithium	0.010		0.010	mg/L	1	12/31/2019 05:05 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:05 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:05 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	580		50	mg/L	50	12/31/2019 03:43 PM
Fluoride	ND		2.0	mg/L	2	12/31/2019 03:24 PM
Sulfate	ND		4.0	mg/L	2	12/31/2019 03:24 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	7.14	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.0	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 10:49	Analyst: ERW
Total Dissolved Solids	1,300		30	mg/L	1	12/26/2019 01:17 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: MW-3
Collection Date: 12/18/2019 04:45 PM

Work Order: 19121443
Lab ID: 19121443-06
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:15 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Arsenic	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Barium	0.040		0.0050	mg/L	1	12/31/2019 05:06 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:06 PM
Boron	0.77		0.020	mg/L	1	12/31/2019 05:06 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:06 PM
Calcium	360		5.0	mg/L	10	1/2/2020 04:22 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Lithium	0.030		0.010	mg/L	1	12/31/2019 05:06 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:06 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:06 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	150		80	mg/L	80	12/31/2019 05:00 PM
Fluoride	ND		5.0	mg/L	5	12/31/2019 04:41 PM
Sulfate	950		160	mg/L	80	12/31/2019 05:00 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	6.66	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	17.8	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 10:49	Analyst: ERW
Total Dissolved Solids	2,000		30	mg/L	1	12/26/2019 01:17 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Equipment Blank (EQB)
Collection Date: 12/18/2019 05:30 PM

Work Order: 19121443
Lab ID: 19121443-07
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:17 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Arsenic	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Barium	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:08 PM
Boron	ND		0.020	mg/L	1	12/31/2019 05:08 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:08 PM
Calcium	ND		0.50	mg/L	1	12/31/2019 05:08 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Lithium	ND		0.010	mg/L	1	12/31/2019 05:08 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:08 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:08 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	ND		1.0	mg/L	1	12/31/2019 05:19 PM
Fluoride	ND		1.0	mg/L	1	12/31/2019 05:19 PM
Sulfate	ND		2.0	mg/L	1	12/31/2019 05:19 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	6.11	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.3	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 10:49	Analyst: ERW
Total Dissolved Solids	30		30	mg/L	1	12/26/2019 01:17 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

ALS Group, USA

Date: 28-Jan-20

Client: NTH Consultants, Ltd.
Project: Holland Board of Public Works
Sample ID: Field Duplicate (FD)
Collection Date: 12/18/2019

Work Order: 19121443
Lab ID: 19121443-08
Matrix: GROUNDWATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA						
			SW7470A		Prep: SW7470 1/2/20 11:01	Analyst: RSH
Mercury	ND		0.00020	mg/L	1	1/2/2020 03:26 PM
METALS BY ICP-MS						
			SW6020A		Prep: SW3005A 12/31/19 09:33	Analyst: DSC
Antimony	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Arsenic	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Barium	0.040		0.0050	mg/L	1	12/31/2019 05:10 PM
Beryllium	ND		0.0020	mg/L	1	12/31/2019 05:10 PM
Boron	0.78		0.020	mg/L	1	12/31/2019 05:10 PM
Cadmium	ND		0.0020	mg/L	1	12/31/2019 05:10 PM
Calcium	340		5.0	mg/L	10	1/2/2020 04:56 PM
Chromium	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Cobalt	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Lead	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Lithium	0.030		0.010	mg/L	1	12/31/2019 05:10 PM
Molybdenum	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Selenium	ND		0.0050	mg/L	1	12/31/2019 05:10 PM
Thallium	ND		0.0020	mg/L	1	12/31/2019 05:10 PM
ANIONS BY ION CHROMATOGRAPHY						
			E300.0			Analyst: JDR
Chloride	150		80	mg/L	80	12/31/2019 05:58 PM
Fluoride	ND		5.0	mg/L	5	12/31/2019 05:38 PM
Sulfate	970		160	mg/L	80	12/31/2019 05:58 PM
PH (LABORATORY)						
			A4500-H B-11			Analyst: QTN
pH (laboratory)	6.72	H	0.100	s.u.	1	12/20/2019 03:28 PM
Temperature	18.7	H	0.100	°C	1	12/20/2019 03:28 PM
TOTAL DISSOLVED SOLIDS						
			A2540 C-11		Prep: FILTER 12/24/19 09:37	Analyst: ERW
Total Dissolved Solids	1,900		50	mg/L	1	12/26/2019 01:11 PM
SUBCONTRACTED ANALYSES						
			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted		1	1/16/2020

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

Client: NTH Consultants, Ltd.
Work Order: 19121443
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **149907** Instrument ID **HG4** Method: **SW7470A**

MBLK		Sample ID: MBLK-149907-149907				Units: mg/L		Analysis Date: 1/2/2020 02:38 PM		
Client ID:		Run ID: HG4_200102A				SeqNo: 6171248		Prep Date: 1/2/2020		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-149907-149907				Units: mg/L		Analysis Date: 1/2/2020 02:41 PM		
Client ID:		Run ID: HG4_200102A				SeqNo: 6171249		Prep Date: 1/2/2020		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.002329 0.00020 0.002 0 116 80-120 0

MS		Sample ID: 19121443-01AMS				Units: mg/L		Analysis Date: 1/2/2020 02:51 PM		
Client ID: PZ-1		Run ID: HG4_200102A				SeqNo: 6171254		Prep Date: 1/2/2020		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.00201 0.00020 0.002 -0.000024 102 75-125 0

MSD		Sample ID: 19121443-01AMSD				Units: mg/L		Analysis Date: 1/2/2020 02:54 PM		
Client ID: PZ-1		Run ID: HG4_200102A				SeqNo: 6171255		Prep Date: 1/2/2020		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Mercury 0.00199 0.00020 0.002 -0.000024 101 75-125 0.00201 1 20

The following samples were analyzed in this batch:

19121443-01A	19121443-02A	19121443-03A
19121443-04A	19121443-05A	19121443-06A
19121443-07A	19121443-08A	

Client: NTH Consultants, Ltd.
 Work Order: 19121443
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **147847** Instrument ID **ICPMS3** Method: **SW6020A**

MBLK		Sample ID: MBLK-147847-147847				Units: mg/L		Analysis Date: 12/31/2019 04:48 PM		
Client ID:		Run ID: ICPMS3_191231A				SeqNo: 6169453		Prep Date: 12/31/2019		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	0.00039	0.0050								J
Selenium	ND	0.0050								
Thallium	0.000197	0.0050								J

LCS					Sample ID: LCS-147847-147847			Units: mg/L		Analysis Date: 12/31/2019 04:49 PM	
Client ID:			Run ID: ICPMS3_191231A			SeqNo: 6169454		Prep Date: 12/31/2019		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual	
Antimony	0.09576	0.0050	0.1	0	95.8	80-120	0				
Arsenic	0.1011	0.0050	0.1	0	101	80-120	0				
Barium	0.1025	0.0050	0.1	0	103	80-120	0				
Beryllium	0.09897	0.0020	0.1	0	99	80-120	0				
Boron	0.484	0.020	0.5	0	96.8	80-120	0				
Cadmium	0.105	0.0020	0.1	0	105	80-120	0				
Calcium	10.06	0.50	10	0	101	80-120	0				
Chromium	0.1002	0.0050	0.1	0	100	80-120	0				
Cobalt	0.1007	0.0050	0.1	0	101	80-120	0				
Lead	0.1026	0.0050	0.1	0	103	80-120	0				
Lithium	0.1018	0.010	0.1	0	102	80-120	0				
Molybdenum	0.1027	0.0050	0.1	0	103	80-120	0				
Selenium	0.1032	0.0050	0.1	0	103	80-120	0				
Thallium	0.09736	0.0050	0.1	0	97.4	80-120	0				

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

Client: NTH Consultants, Ltd.
 Work Order: 19121443
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **147847** Instrument ID **ICPMS3** Method: **SW6020A**

MS				Sample ID: 19121443-01AMS			Units: mg/L		Analysis Date: 12/31/2019 04:53 PM	
Client ID: PZ-1				Run ID: ICPMS3_191231A			SeqNo: 6169456		Prep Date: 12/31/2019	
									DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1062	0.0050	0.1	0.003593	103	75-125	0			
Arsenic	0.1383	0.0050	0.1	0.03249	106	75-125	0			
Barium	0.1668	0.0050	0.1	0.06243	104	75-125	0			
Beryllium	0.1026	0.0020	0.1	0.000116	103	75-125	0			
Boron	0.8896	0.020	0.5	0.3803	102	75-125	0			
Cadmium	0.1022	0.0020	0.1	-0.00005	102	75-125	0			
Calcium	54.25	0.50	10	44.59	96.7	75-125	0			O
Chromium	0.1085	0.0050	0.1	0.00818	100	75-125	0			
Cobalt	0.1009	0.0050	0.1	0.001327	99.6	75-125	0			
Lead	0.124	0.0050	0.1	0.01844	106	75-125	0			
Lithium	0.1064	0.010	0.1	0.003371	103	75-125	0			
Molybdenum	0.1794	0.0050	0.1	0.06784	112	75-125	0			
Selenium	0.1097	0.0050	0.1	0.002651	107	75-125	0			
Thallium	0.09947	0.0050	0.1	0.000165	99.3	75-125	0			

MSD				Sample ID: 19121443-01AMSD			Units: mg/L		Analysis Date: 12/31/2019 04:55 PM	
Client ID: PZ-1				Run ID: ICPMS3_191231A			SeqNo: 6169457		Prep Date: 12/31/2019	
									DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Antimony	0.1053	0.0050	0.1	0.003593	102	75-125	0.1062	0.844	20	
Arsenic	0.1391	0.0050	0.1	0.03249	107	75-125	0.1383	0.566	20	
Barium	0.1669	0.0050	0.1	0.06243	104	75-125	0.1668	0.0348	20	
Beryllium	0.1028	0.0020	0.1	0.000116	103	75-125	0.1026	0.135	20	
Boron	0.899	0.020	0.5	0.3803	104	75-125	0.8896	1.05	20	
Cadmium	0.1029	0.0020	0.1	-0.00005	103	75-125	0.1022	0.744	20	
Calcium	54.65	0.50	10	44.59	101	75-125	54.25	0.736	20	O
Chromium	0.1086	0.0050	0.1	0.00818	100	75-125	0.1085	0.0516	20	
Cobalt	0.1011	0.0050	0.1	0.001327	99.7	75-125	0.1009	0.166	20	
Lead	0.1248	0.0050	0.1	0.01844	106	75-125	0.124	0.653	20	
Lithium	0.1065	0.010	0.1	0.003371	103	75-125	0.1064	0.0996	20	
Molybdenum	0.1816	0.0050	0.1	0.06784	114	75-125	0.1794	1.23	20	
Selenium	0.1075	0.0050	0.1	0.002651	105	75-125	0.1097	2.03	20	
Thallium	0.09938	0.0050	0.1	0.000165	99.2	75-125	0.09947	0.0895	20	

The following samples were analyzed in this batch:

19121443-01A	19121443-02A	19121443-03A
19121443-04A	19121443-05A	19121443-06A
19121443-07A	19121443-08A	

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

Client: NTH Consultants, Ltd.
 Work Order: 19121443
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **147613** Instrument ID **TDS** Method: **A2540 C-11**

MBLK		Sample ID: MBLK-147613-147613				Units: mg/L		Analysis Date: 12/26/2019 01:11 PM		
Client ID:		Run ID: TDS_191226B				SeqNo: 6155077		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids ND 30

LCS		Sample ID: LCS-147613-147613				Units: mg/L		Analysis Date: 12/26/2019 01:11 PM		
Client ID:		Run ID: TDS_191226B				SeqNo: 6155076		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 472 30 495 0 95.4 85-109 0

DUP		Sample ID: 19121443-01B DUP				Units: mg/L		Analysis Date: 12/26/2019 01:11 PM		
Client ID: PZ-1		Run ID: TDS_191226B				SeqNo: 6155056		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 1548 30 0 0 0 0-0 1514 2.22 10

DUP		Sample ID: 19121630-02A DUP				Units: mg/L		Analysis Date: 12/26/2019 01:11 PM		
Client ID:		Run ID: TDS_191226B				SeqNo: 6155072		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 472 30 0 0 0 0-0 464 1.71 10

The following samples were analyzed in this batch:

19121443-01B	19121443-02B	19121443-03B
19121443-08B		

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

Client: NTH Consultants, Ltd.
 Work Order: 19121443
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **147616** Instrument ID **TDS** Method: **A2540 C-11**

MBLK		Sample ID: MBLK-147616-147616				Units: mg/L		Analysis Date: 12/26/2019 01:17 PM		
Client ID:		Run ID: TDS_191226C				SeqNo: 6155101		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids ND 30

LCS		Sample ID: LCS-147616-147616				Units: mg/L		Analysis Date: 12/26/2019 01:17 PM		
Client ID:		Run ID: TDS_191226C				SeqNo: 6155100		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 468 30 495 0 94.5 85-109 0

DUP		Sample ID: 19121443-04B DUP				Units: mg/L		Analysis Date: 12/26/2019 01:17 PM		
Client ID: MW-1		Run ID: TDS_191226C				SeqNo: 6155079		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 906 30 0 0 0 0-0 904 0.221 10

DUP		Sample ID: 19121637-01D DUP				Units: mg/L		Analysis Date: 12/26/2019 01:17 PM		
Client ID:		Run ID: TDS_191226C				SeqNo: 6155096		Prep Date: 12/24/2019		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Total Dissolved Solids 1440 30 0 0 0 0-0 1374 4.69 10

The following samples were analyzed in this batch:

19121443-04B	19121443-05B	19121443-06B
19121443-07B		

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

Client: NTH Consultants, Ltd.
 Work Order: 19121443
 Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R278188** Instrument ID **Titrator 1** Method: **A4500-H B-11**

LCS		Sample ID: LCS-R278188-R278188				Units: s.u.		Analysis Date: 12/20/2019 03:28 PM		
Client ID:		Run ID: TITRATOR 1_191220C				SeqNo: 6145574		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	4.01	0.10	4	0	100	92-108	0			

LCS		Sample ID: LCS-R278188-R278188				Units: s.u.		Analysis Date: 12/20/2019 03:28 PM		
Client ID:		Run ID: TITRATOR 1_191220C				SeqNo: 6145591		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	4.01	0.10	4	0	100	92-108	0			

DUP		Sample ID: 19121277-02B DUP				Units: s.u.		Analysis Date: 12/20/2019 03:28 PM		
Client ID:		Run ID: TITRATOR 1_191220C				SeqNo: 6145576		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	7.93	0.10	0	0	0	0-0	7.93	0	5	H
Temperature	18.23	0.10	0	0	0	0-0	18.29	0.329		H

DUP		Sample ID: 19121443-03B DUP				Units: s.u.		Analysis Date: 12/20/2019 03:28 PM		
Client ID: Field Blank (FB)		Run ID: TITRATOR 1_191220C				SeqNo: 6145583		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
pH (laboratory)	6.63	0.10	0	0	0	0-0	6.8	2.53	5	H
Temperature	18.37	0.10	0	0	0	0-0	18.5	0.705		H

The following samples were analyzed in this batch:

19121443-01B	19121443-02B	19121443-03B
19121443-04B	19121443-05B	19121443-06B
19121443-07B	19121443-08B	

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

Client: NTH Consultants, Ltd.
Work Order: 19121443
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R279864** Instrument ID **IC3** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R279864				Units: mg/L		Analysis Date: 12/31/2019 12:12 PM		
Client ID:		Run ID: IC3_191231A				SeqNo: 6170075		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-R279864				Units: mg/L		Analysis Date: 12/31/2019 12:32 PM		
Client ID:		Run ID: IC3_191231A				SeqNo: 6170076		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	9.131	1.0	10	0	91.3	90-110	0			
Fluoride	1.817	0.10	2	0	90.9	90-110	0			
Sulfate	9.217	1.0	10	0	92.2	90-110	0			

MS		Sample ID: 19121443-01B MS				Units: mg/L		Analysis Date: 12/31/2019 06:17 PM		
Client ID: PZ-1		Run ID: IC3_191231A				SeqNo: 6170094		Prep Date:		DF: 40
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	600.2	40	400	213.9	96.6	80-120	0			
Fluoride	78.48	4.0	80	0	98.1	80-120	0			
Sulfate	410	40	400	29.96	95	80-120	0			

MSD		Sample ID: 19121443-01B MSD				Units: mg/L		Analysis Date: 12/31/2019 06:36 PM		
Client ID: PZ-1		Run ID: IC3_191231A				SeqNo: 6170095		Prep Date:		DF: 40
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	599.5	40	400	213.9	96.4	80-120	600.2	0.117	20	
Fluoride	82.58	4.0	80	0	103	80-120	78.48	5.09	20	
Sulfate	409.5	40	400	29.96	94.9	80-120	410	0.126	20	

The following samples were analyzed in this batch:

19121443-01B	19121443-02B	19121443-03B
19121443-04B	19121443-05B	19121443-06B
19121443-07B	19121443-08B	

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

Client: NTH Consultants, Ltd.
Work Order: 19121443
Project: Holland Board of Public Works

QC BATCH REPORT

Batch ID: **R279938** Instrument ID **IC3** Method: **E300.0**

MBLK		Sample ID: CCB/MBLK-R279938				Units: mg/L		Analysis Date: 1/2/2020 10:55 AM		
Client ID:		Run ID: IC3_200102A				SeqNo: 6171942		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate ND 1.0

LCS		Sample ID: LCS-R279938				Units: mg/L		Analysis Date: 1/2/2020 11:14 AM		
Client ID:		Run ID: IC3_200102A				SeqNo: 6171943		Prep Date:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate 9.293 1.0 10 0 92.9 90-110 0

MS		Sample ID: 19121443-01B MS				Units: mg/L		Analysis Date: 1/2/2020 01:46 PM		
Client ID: PZ-1		Run ID: IC3_200102A				SeqNo: 6171945		Prep Date:		DF: 40
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate 404.4 40 400 29.38 93.8 80-120 0

MS		Sample ID: 19121705-03B MS				Units: mg/L		Analysis Date: 1/2/2020 06:08 PM		
Client ID:		Run ID: IC3_200102A				SeqNo: 6171958		Prep Date:		DF: 200
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate 2383 200 2000 529 92.7 80-120 0

MSD		Sample ID: 19121443-01B MSD				Units: mg/L		Analysis Date: 1/2/2020 02:05 PM		
Client ID: PZ-1		Run ID: IC3_200102A				SeqNo: 6171946		Prep Date:		DF: 40
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate 407.8 40 400 29.38 94.6 80-120 404.4 0.83 20

MSD		Sample ID: 19121705-03B MSD				Units: mg/L		Analysis Date: 1/2/2020 06:27 PM		
Client ID:		Run ID: IC3_200102A				SeqNo: 6171959		Prep Date:		DF: 200
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Sulfate 2386 200 2000 529 92.8 80-120 2383 0.14 20

The following samples were analyzed in this batch:

19121443-01B

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



Cincinnati, OH
+1 513 733 5336

Fort Collins, CO
+1 970 490 1511

Everett, WA
+1 425 356 2600

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page ____ of ____

COC ID: 203235

Houston, TX
+1 281 530 5656

Middletown, PA
+1 717 944 5541

Spring City, PA
+1 610 948 4903

Salt Lake City, UT
+1 801 266 7700

South Charleston, WV
+1 304 356 3168

York, PA
+1 717 505 5280

Customer Information		Project Information		ALS Project Manager:																ALS Work Order #: 9121443	
Parameter/Method Request for Analysis																					
Purchase Order		Project Name	Holland BPW	A	Metals including Hg																
Work Order		Project Number	73-160017	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																
				F																	
City/State/Zip	Northville, MI 48168	City/State/Zip	Holland, MI 49423	G																	
Phone	(248) 662-2668	Phone	(616) 355-1210	H																	
Fax	(248) 324-3305	Fax		I																	
e-Mail Address	kokonta@nthconsultants.com	e-Mail Address		J																	
No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold				
1	PZ-1	12-18-19	11:50am.	GW	2	4	✓	✓	✓	✓	✓										
2	Matrix Spike PZ-1	12-18-19	12:00pm																		
3	Matrix Spike Duplicate PZ-1	12-18-19	12:15pm																		
4	MW-4	12-18-19	1:45pm.																		
5	FB Field Blank (FB) MW-4	12-18-19	1:45pm.																		
6	MW-1		15:40																		
7	MW-2		16:06																		
8	MW-3		16:45																		
9	EQUIPMENT BLANK (EQB)		5:30 p.m.																		
10	Field Duplicate (FD)																				
Sampler(s) Please Print & Sign		Shipment Method		Required Turnaround Time: (Check Box)								Results Due Date:									
Abbie Welch 12/18/2019				<input checked="" type="checkbox"/> Std 10 WK Days <input type="checkbox"/> 5 WK Days <input type="checkbox"/> Other <input type="checkbox"/> 2 WK Days <input type="checkbox"/> 24 Hour																	
Relinquished by:	Date:	Time:	Received by:	Notes: Need to convert to 24 hr Time?																	
Relinquished by:	Date: 12/19/19	Time: 0800	Received by (Laboratory):	Cooler ID	Cooler Temp.	QC Package: (Check One Box Below)															
Logged by (Laboratory):	Date: 12/19/19	Time: 1000	Checked by (Laboratory):	SO2	5.8°C	<input type="checkbox"/> Level II Std QC	<input type="checkbox"/> TRRP CheckList														
				pH 8	5.0°C	<input type="checkbox"/> Level III Std QC/Raw Data	<input type="checkbox"/> TRRP Level IV														
					5.0°C	<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 2011 by ALS Environmental.

Sample Receipt Checklist

Client Name: **NTH - NORTHVILLE**

Date/Time Received: **19-Dec-19 08:00**

Work Order: **19121443**

Received by: **DS**

Checklist completed by **Diane Shaw**

19-Dec-19

Reviewed by: **Chad Whelton**

19-Dec-19

eSignature

Date

eSignature

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>5.8/5.8, 5.0/5.0, 5.0/5.0 c</u>		<u>SR2</u>
Cooler(s)/Kit(s):	<u></u>		
Date/Time sample(s) sent to storage:	<u>12/19/2019 10:26:17 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:	<u>-</u>		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:



Monday, January 13, 2020

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

Re: ALS Workorder: 1912404
Project Name:
Project Number: 19121443

Dear Mr. Whelton:

Eight water samples were received from ALS Environmental, on 12/20/2019. 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. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

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

Sincerely,

ALS Environmental

FOR 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
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
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



1912404

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: 1912404

Client Name: ALS Environmental

Client Project Name:

Client Project Number: 19121443

Client PO Number: 20-122019492

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
MW-4	1912404-1		WATER	18-Dec-19	13:45
Field Blank (FB)	1912404-2		WATER	18-Dec-19	13:45
MW-1	1912404-3		WATER	18-Dec-19	15:40
MW-2	1912404-4		WATER	18-Dec-19	16:06
MW-3	1912404-5		WATER	18-Dec-19	16:45
Equipment Blank (EQB)	1912404-6		WATER	18-Dec-19	17:30
Field Duplicate (FD)	1912404-7		WATER	18-Dec-19	
PZ-1	1912404-8		WATER	18-Dec-19	11:50

1912404



Environmental

Subcontractor:

ALS Environmental, Fort Collins

225 Commerce Dr.

TEL: (800) 443-1511

FAX:

Fort Collins, CO 80524

Acct #:

CHAIN-OF-CUSTODY RECORDDate: 19-Dec-19COC ID: 12144Due Date: 09-Jan-20

Page 1 of 1

Salesperson **Brian Root**

Customer Information		Project Information		Parameter/Method Request for Analysis												
Purchase Order		Project Name	19121443	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	MS/MSD											
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 19121443-02C	MW-4	Groundwater	18/Dec/2019 13:45	(2) 1LPHNO3	X											
2 19121443-03C	Field Blank (FB) MW-4	Groundwater	18/Dec/2019 13:45	(2) 1LPHNO3	X											
3 19121443-04C	MW-1	Groundwater	18/Dec/2019 15:40	(2) 1LPHNO3	X											
4 19121443-05C	MW-2	Groundwater	18/Dec/2019 16:06	(2) 1LPHNO3	X											
5 19121443-06C	MW-3	Groundwater	18/Dec/2019 16:45	(2) 1LPHNO3	X											
6 19121443-07C	Equipment Blank (EQB)	Water	18/Dec/2019 17:30	(2) 1LPHNO3	X											
7 19121443-08C	Field Duplicate (FD)	Groundwater	18/Dec/2019	(2) 1LPHNO3	X											
8 19121443-01C	PZ-1	Groundwater	18/Dec/2019 11:50	(6) 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

12-19-19 1400

Received by:

Date/Time

12/20/19 1055

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 Holland

Workorder No: 1912404

Project Manager: JRK

Initials: EE

Date: 12/20/19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	<u>YES</u>	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?			<u>YES</u>	NO *
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			<u>YES</u>	NO *
6. Are short-hold samples present?			YES	<u>NO</u>
7. Are all samples within holding times for the requested analyses?			<u>YES</u>	NO *
8. Were all sample containers received intact? (not broken or leaking)			<u>YES</u>	NO *
9. Is there sufficient sample for the requested analyses?			<u>YES</u>	NO *
10. Are samples in proper containers for requested analyses? (form 250, Sample Handling Guidelines)			<u>YES</u>	NO *
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	<u>YES</u>	NO *
12. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		<u>N/A</u>	YES	NO
13. Were the samples shipped on ice?			YES	<u>NO</u>
14. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #3 #5		<u>RAD ONLY</u>	YES NO
Cooler #:	<u>1</u>			
Temperature (°C):	<u>AMB</u>			
# of custody seals on cooler:	<u>0</u>			
External mR/hr reading:	<u>10</u>			
Background mR/hr reading:	<u>11</u>			
Were external mR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> / NO / NA (If no, see Form 008.)				

* Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

Were unpreserved bottles pH checked? YES NA

All client bottle ID's vs ALS lab ID's double-checked by: EE

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

Date/Time: _____

Project Manager Signature / Date: _____

JRK 12/23/19

Date: 19Dec19
Wgt: 55.95 LBS

SHIPPING:
SPECIAL:
HANDLING:

0.00
0.00
0.00
0.00

DV: 0.00 TOTAL:

Svcs: PRIORITY OVERNIGHT NSR RES
TRCK: 4892 9284 6933

ORIGIN ID:GRRR (616) 399-6070
ALS ENVIRONMENTAL
ALS ENVIRONMENTAL
3352 128TH AVENUE

SHIP DATE: 19DEC19
ACTWGT: 55.95 LB
CAD: 0122071/CAFE3311

HOLLAND, MI 494249263
UNITED STATES US

BILL THIRD PARTY

TO **SAMPLE RECEIVING
ALS LABORATORY GROUP
225 COMMERCE DR.**

10-0

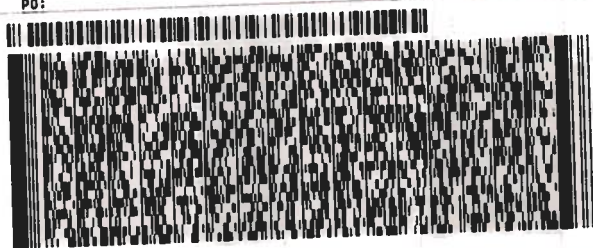
FORT COLLINS CO 80524

945

(800) 443-1511
INV:
PO:

REF :

DEPT:



FedEx
Express



REL#
3785346

TRK# 4892 9284 6933
0201

FRI - 20 DEC 10:30A
PRIORITY OVERNIGHT
NSR RES
80524
CO-US DEN

NA FTCA



1912404

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: Field Blank (FB)

Lab ID: 1912404-2

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 13:45

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 1/6/2020		PrepBy: TRW
Ra-226	ND (+/- 0.24)	Y1,U	0.44	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	102	Y1	40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 1/3/2020		PrepBy: RGS
Ra-228	ND (+/- 0.32)	U	0.7	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	95.8		40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: MW-1

Lab ID: 1912404-3

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 15:40

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 1/6/2020		PrepBy: TRW
Ra-226	ND (+/- 0.28)	U	0.43	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	96.8		40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 1/3/2020		PrepBy: RGS
Ra-228	0.93 (+/- 0.43)		0.73	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	93.7		40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: MW-2

Lab ID: 1912404-4

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 16:06

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
Ra-226	0.64 (+/- 0.38)		SOP 783		Prep Date: 1/6/2020	PrepBy: TRW
<i>Carr: BARIUM</i>	<i>97.2</i>		0.43	pCi/l	NA	1/13/2020 11:51
			<i>40-110</i>	<i>%REC</i>	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
Ra-228	1.05 (+/- 0.47)		SOP 724		Prep Date: 1/3/2020	PrepBy: RGS
<i>Carr: BARIUM</i>	<i>94</i>		0.76	pCi/l	NA	1/10/2020 08:16
			<i>40-110</i>	<i>%REC</i>	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: MW-3

Lab ID: 1912404-5

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 16:45

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/6/2020	PrepBy: TRW
Ra-226	ND (+/- 0.14)	U	0.21	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	98.6		40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/3/2020	PrepBy: RGS
Ra-228	ND (+/- 0.38)	U	0.76	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	96.4		40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: Equipment Blank (EQB)

Lab ID: 1912404-6

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 17:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/6/2020	PrepBy: TRW
Ra-226	ND (+/- 0.21)	U	0.33	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	99.9		40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/3/2020	PrepBy: RGS
Ra-228	ND (+/- 0.29)	Y1,U	0.68	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	100	Y1	40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: Field Duplicate (FD)

Lab ID: 1912404-7

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783	Prep Date: 1/6/2020		PrepBy: TRW
Ra-226	ND (+/- 0.25)	U	0.45	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	98.1		40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724	Prep Date: 1/3/2020		PrepBy: RGS
Ra-228	ND (+/- 0.4)	U	0.76	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	96.9		40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: PZ-1

Lab ID: 1912404-8

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 11:50

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 1/6/2020	PrepBy: TRW
Ra-226	ND (+/- 0.32)	U	0.55	pCi/l	NA	1/13/2020 11:51
Carr: BARIUM	93.7		40-110	%REC	DL = NA	1/13/2020 11:51
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 1/3/2020	PrepBy: RGS
Ra-228	ND (+/- 0.38)	U	0.82	pCi/l	NA	1/10/2020 08:16
Carr: BARIUM	87.1		40-110	%REC	DL = NA	1/10/2020 08:16

Client: ALS Environmental

Date: 13-Jan-20

Project: 19121443

Work Order: 1912404

Sample ID: PZ-1

Lab ID: 1912404-8

Legal Location:

Matrix: WATER

Collection Date: 12/18/2019 11:50

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.

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

Client: ALS Environmental

Work Order: 1912404

Project: 19121443

Date: 1/13/2020 3:20:

QC BATCH REPORT

Batch ID: RE200106-3-1

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

DUP	Sample ID: 1912404-8				Units: pCi/l		Analysis Date: 1/13/2020 12:11				
Client ID: PZ-1		Run ID: RE200106-3A				Prep Date: 1/6/2020			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.51						0.19	0.3	2.1	U
Carr: BARIUM	15890		17840		89.1	40-110		16700			

LCS	Sample ID: RE200106-3				Units: pCi/l		Analysis Date: 1/13/2020 12:27				
Client ID:	Run ID: RE200106-3A				Prep Date: 1/6/2020			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	35.8 (+/- 9)	0.5	46.47		77	67-120					P
Carr: BARIUM	17270		17770		97.2	40-110					

MB	Sample ID: RE200106-3				Units: pCi/l			Analysis Date: 1/13/2020 12:11			
Client ID:	Run ID: RE200106-3A				Prep Date: 1/6/2020			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.23									U
Carr: BARIUM	17070		17780		96	40-110					

The following samples were analyzed in this batch:

1912404-1	1912404-2	1912404-3
1912404-4	1912404-5	1912404-6
1912404-7	1912404-8	

Client: ALS Environmental
Work Order: 1912404
Project: 19121443

QC BATCH REPORT

Batch ID: RA200103-1-1 Instrument ID LB4100-C Method: Radium-228 Analysis by GFPC

DUP	Sample ID: 1912404-8				Units: pCi/l		Analysis Date: 1/10/2020 08:16				
Client ID: PZ-1		Run ID: RA200103-1A				Prep Date: 1/3/2020			DF: NA		
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.95						0.15	0.5	2.1	U
Carr: BARIUM	26820		35300		76	40-110		30740			

LCS	Sample ID: RA200103-1				Units: pCi/l		Analysis Date: 1/10/2020 08:16				
Client ID:	Run ID: RA200103-1A				Prep Date: 1/3/2020			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	41 (+/- 9.5)	0.8	41.09		99.8	70-130					P
Carr: BARIUM	34310		35300		97.2	40-110					

MB	Sample ID: RA200103-1				Units: pCi/l			Analysis Date: 1/10/2020 08:16			
Client ID:	Run ID: RA200103-1A				Prep Date: 1/3/2020			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.73									U
Carr: BARIUM	34720		35300		98.3	40-110					

The following samples were analyzed in this batch:

1912404-1	1912404-2	1912404-3
1912404-4	1912404-5	1912404-6
1912404-7	1912404-8	



GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 12/18/19
 Project #: 73-160017 Field Personnel: Phil Herout, Abbie Welch, Keith Farquhar
 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.): 592.91

PURGING DATA

Time: 9 min Start: 11:39 Finish: 11:48

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>13.54</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>9.79</u>	2	<u>0.16</u>	0.48
Height of Water in Well (ft.) = <u>3.75</u>	3	0.36	1.08
One Well Volume (gallons) = <u>0.60</u>	4	0.63	1.89

Gallons Purged: 6.072 Purging and Sampling Device: Peristaltic
 Well Volumes Purged: 10.12 Purging Rate (g.p.m.): 0.066 (250 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	0:00	3:00	6:00	9:00
Accum. Volume Purged (gal)				
Drawdown (ft)				
pH	<u>8.86</u>	<u>8.84</u>	<u>8.85</u>	<u>8.84</u>
Temperature (C)	<u>8.99</u>	<u>9.13</u>	<u>8.99</u>	<u>9.21</u>
Conductivity (mS/cm)	<u>2.35</u>	<u>2.33</u>	<u>2.32</u>	<u>2.32</u>
ORP (mV)	<u>-85.0</u>	<u>-145.2</u>	<u>-164.5</u>	<u>-176.5</u>
Dissolved Oxygen (mg/L)	<u>3.81</u>	<u>0.12</u>	<u>0.07</u>	<u>0.07</u>
Turbidity (NTU)	<u>1.05</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
Odor				
Appearance and/or Color				

SAMPLING DATA

Time: Start: 11:39 Finish: 11:48 Pump Rate (g.p.m.): 0.066 (250 mL/min)
 Sample Collection Device: In-Situ Aqua TROLL 600 16 mph
 Weather Conditions: Air Temperature (F): 18° Wind Speed/Direction: NW Other: Snowy
 Samples Collected On chain of Custody No: PZ-1 Analytical Laboratory: ALS Environmental

* Other Notes: Purged 0.264 gal in the process of establishing a flow-rate (tubing froze, flow rate too slow)
10:20-11:39 Purged 5.214 gal while working on flow cell (not connecting)
11:39-11:48 Purged 0.594 gal while purging with the flow-cell.

Low-Flow Test Report:

Test Date / Time: 12/18/2019 11:39:24 AM

Project: 73-160017

Operator Name: Keith, Phil, Abby

Location Name: PZ-1 Latitude: -55.1263038723041 Longitude: -10.2938732877374 Well Diameter: 2 in Casing Type: PVC Screen Length: 5 ft Top of Screen: 8.54 ft Total Depth: 13.54 ft Initial Depth to Water: 9.79 ft	Pump Type: Peristaltic Tubing Type: PE Pump Intake From TOC: 11 ft Estimated Total Volume Pumped: 2250 ml Flow Cell Volume: 130 ml Final Flow Rate: 250 ml/min Final Draw Down: 10.64 ft	Instrument Used: Aqua TROLL 600 Serial Number: 518546
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Test Notes:

Weather Conditions:

Snowy, 17°F

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 0.2	+/- 3 %	+/- 0.3	+/- 10 %	+/- 10	+/- 0.5	
12/18/2019 11:39 AM	00:00	8.86 pH	8.99 °C	2.35 mS/cm	3.81 mg/L	1.05 NTU	-85.0 mV	9.79 ft	250.00 ml/min
12/18/2019 11:42 AM	03:00	8.84 pH	9.13 °C	2.33 mS/cm	0.12 mg/L	0.00 NTU	-145.2 mV	9.79 ft	250.00 ml/min
12/18/2019 11:45 AM	06:00	8.85 pH	8.99 °C	2.32 mS/cm	0.07 mg/L	0.00 NTU	-164.5 mV	9.79 ft	250.00 ml/min
12/18/2019 11:48 AM	09:00	8.84 pH	9.21 °C	2.32 mS/cm	0.07 mg/L	0.00 NTU	-176.5 mV	9.79 ft	250.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 12/18/19
Project #: 73-160017 Field Personnel: Phil Herout, Abbie Welch, Keith Farguhar
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: 15 min Start: 15:17 Finish: 15:32

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>16.88</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>6.05</u>	2	<u>0.16</u>	0.48
Height of Water in Well (ft.) = <u>10.83</u>	3	0.36	1.08
One Well Volume (gallons) = <u>1.73</u>	4	0.63	1.89

Gallons Purged: 1.68 Purging and Sampling Device: Peristaltic
Well Volumes Purged: 0.971 Purging Rate (g.p.m.): 0.112 (425 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)	0:00	3:00	6:00	9:00	12:00	15:00			
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH	7.36	7.30	7.27	7.25	7.24	7.23			
Temperature (C)	7.68	7.52	7.51	7.29	7.31	7.39			
Conductivity (mS/cm)	1.57	1.54	1.44	1.42	1.40	1.37			
ORP (mV)	-77.7	-104.9	-112.5	-116.4	-119.3	-122.1			
Dissolved Oxygen (mg/L)	1.80	0.26	0.21	0.19	0.17	0.16			
Turbidity (NTU)	0.49	1.77	6.35	7.73	9.40	6.94			
Odor									
Appearance and/or Color									

SAMPLING DATA

Time: Start: 15:17 Finish: 15:32 Pump Rate (g.p.m.): _____
Sample Collection Depth (ft. from TOC): _____
Weather Conditions: Air Temperature (F): 18° Wind Speed/Direction: 16 mph NW Other: Snowing
Samples Collected On chain of Custody No: MW-1 Analytical Laboratory: _____

Other Notes: _____

Low-Flow Test Report:

Test Date / Time: 12/18/2019 3:15:07 PM

Project: 73-160017 (3)

Operator Name: Keith, Phil, Abby

Location Name: MW-1 Well Diameter: 2 in Screen Length: 5 ft Top of Screen: 11.88 ft Total Depth: 16.88 ft Initial Depth to Water: 6.05 ft	Pump Type: Peristaltic Tubing Type: PE Pump Intake From TOC: 11 ft Estimated Total Volume Pumped: 6375 ml Flow Cell Volume: 130 ml Final Flow Rate: 425 ml/min Final Draw Down: 6.2 ft	Instrument Used: Aqua TROLL 600 Serial Number: 518546
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Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 0.2	+/- 3 %	+/- 0.3	+/- 10 %	+/- 10	+/- 0.5	
12/18/2019 3:15 PM	00:00	7.36 pH	7.68 °C	1.57 mS/cm	1.80 mg/L	0.49 NTU	-77.7 mV	6.05 ft	425.00 ml/min
12/18/2019 3:18 PM	03:00	7.30 pH	7.52 °C	1.54 mS/cm	0.26 mg/L	1.77 NTU	-104.9 mV	6.05 ft	425.00 ml/min
12/18/2019 3:21 PM	06:00	7.27 pH	7.51 °C	1.44 mS/cm	0.21 mg/L	6.35 NTU	-112.5 mV	6.05 ft	425.00 ml/min
12/18/2019 3:24 PM	09:00	7.25 pH	7.29 °C	1.42 mS/cm	0.19 mg/L	7.73 NTU	-116.4 mV	6.05 ft	425.00 ml/min
12/18/2019 3:27 PM	12:00	7.24 pH	7.31 °C	1.40 mS/cm	0.17 mg/L	9.40 NTU	-119.3 mV	6.05 ft	425.00 ml/min
12/18/2019 3:30 PM	15:00	7.23 pH	7.39 °C	1.37 mS/cm	0.16 mg/L	6.94 NTU	-122.1 mV	6.05 ft	425.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PP Date: 12/18/19
Project #: 73-160017 Field Personnel: Phil Herout, Abbie Welch, Keith Farquhar
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: 6 min Start: 16:00 Finish: 16:06

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>16.13</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>3.40</u>	2	<u>0.16</u>	0.48
Height of Water in Well (ft.) = <u>12.73</u>	3	0.36	1.08
One Well Volume (gallons) = <u>2.04</u>	4	0.63	1.89

Gallons Purged: 0.672 Purging and Sampling Device: Peristaltic
Well Volumes Purged: 0.329 Purging Rate (g.p.m.) 0.112 (425 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)	0:00	3:00	6:00						
Accum. Volume Purged (gal)									
Drawdown (ft)									
pH	7.25	7.24	7.24						
Temperature (C)	6.97	7.11	6.96						
Conductivity (mS/cm)	2.56	2.57	2.58						
ORP (mV)	-67.0	-80.1	-87.5						
Dissolved Oxygen (mg/L)	0.29	0.21	0.19						
Turbidity (NTU)	3.00	2.14	1.44						
Odor									
Appearance and/or Color									

SAMPLING DATA

Time: Start: 16:00 Finish: 16:06 Pump Rate (g.p.m.): 0.112 (425 mL/min)
Sample Collection Depth (ft. from TOC): _____
Weather Conditions: Air Temperature (F): 18° Wind Speed/Direction: 16 mph NW Other: Snowing
Samples Collected On chain of Custody No: MW-2 Analytical Laboratory: ALS Environmental

Other Notes: _____

Low-Flow Test Report:

Test Date / Time: 12/18/2019 4:00:18 PM

Project: 73-160017 (4)

Operator Name: Keith, Phil, Abby

Location Name: MW-2 Well Diameter: 2 in Casing Type: PVC Screen Length: 5 ft Top of Screen: 11.13 ft Total Depth: 16.13 ft Initial Depth to Water: 3.4 ft	Pump Type: Peristaltic Tubing Type: PE Pump Intake From TOC: 13.63 ft Estimated Total Volume Pumped: 2550 ml Flow Cell Volume: 130 ml Final Flow Rate: 425 ml/min Final Draw Down: 3.5 ft	Instrument Used: Aqua TROLL 600 Serial Number: 518546
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Test Notes:

Weather Conditions:

Snowing, 18°F

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 0.2	+/- 3 %	+/- 0.3	+/- 10 %	+/- 10	+/- 0.5	
12/18/2019 4:00 PM	00:00	7.25 pH	6.97 °C	2.56 mS/cm	0.29 mg/L	3.00 NTU	-67.0 mV	3.40 ft	425.00 ml/min
12/18/2019 4:03 PM	03:00	7.24 pH	7.11 °C	2.57 mS/cm	0.21 mg/L	2.14 NTU	-80.1 mV	3.40 ft	425.00 ml/min
12/18/2019 4:06 PM	06:00	7.24 pH	6.96 °C	2.58 mS/cm	0.19 mg/L	1.44 NTU	-87.5 mV	3.40 ft	425.00 ml/min

Samples

Sample ID:	Description:
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GROUNDWATER SAMPLE COLLECTION LOG

GENERAL INFORMATION

Project Name: Holland BPW – James DeYoung PPDate: 12/18/19Project #: 73-160017Field Personnel: Phil Herout, Abbie Welch,Site Location: Holland, MIWell Const.: Sch 40 PVCWell ID: MW-3Casing 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: 27 min Start: 16:34Finish: 17:01

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>18.22</u>	1.5	0.10	0.30
Depth to Water (ft. from TOC) = <u>3.52</u>	2	<u>0.16</u>	0.48
Height of Water in Well (ft.) = <u>14.70</u>	3	0.36	1.08
One Well Volume (gallons) = <u>2.35</u>	4	0.63	1.89

Gallons Purged: 3.02Purging and Sampling Device: PeristalticWell Volumes Purged: 1.29Purging Rate (g.p.m.) 0.112 (425 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)	<u>0:00</u>	<u>3:00</u>	<u>6:00</u>	<u>9:00</u>	<u>12:00</u>	<u>15:00</u>	<u>18:00</u>	<u>21:00</u>	<u>24:00</u>	<u>27:00</u>
Accum. Volume Purged (gal)										
Drawdown (ft)										
pH	<u>6.72</u>	<u>6.75</u>	<u>6.74</u>	<u>6.74</u>	<u>6.74</u>	<u>6.75</u>	<u>6.76</u>	<u>6.76</u>	<u>6.76</u>	<u>6.76</u>
Temperature (C)	<u>9.25</u>	<u>9.39</u>	<u>9.47</u>	<u>9.71</u>	<u>9.95</u>	<u>9.96</u>	<u>9.71</u>	<u>9.95</u>	<u>9.89</u>	<u>9.75</u>
Conductivity (mS/cm)	<u>2.54</u>	<u>2.68</u>	<u>2.67</u>	<u>2.68</u>	<u>2.70</u>	<u>2.69</u>	<u>2.70</u>	<u>2.72</u>	<u>2.71</u>	<u>2.71</u>
ORP (mV)	<u>-40.5</u>	<u>-43.1</u>	<u>-44.9</u>	<u>-47.0</u>	<u>-49.0</u>	<u>-51.2</u>	<u>-52.9</u>	<u>-54.2</u>	<u>-55.6</u>	<u>-56.4</u>
Dissolved Oxygen (mg/L)	<u>0.31</u>	<u>0.24</u>	<u>0.21</u>	<u>0.19</u>	<u>0.18</u>	<u>0.15</u>	<u>0.14</u>	<u>0.15</u>	<u>0.15</u>	<u>0.15</u>
Turbidity (NTU)	<u>380.51</u>	<u>204.38</u>	<u>128.59</u>	<u>131.17</u>	<u>107.40</u>	<u>83.57</u>	<u>68.79</u>	<u>62.24</u>	<u>56.48</u>	<u>53.78</u>
Odor										
Appearance and/or Color										

SAMPLING DATA

Time: Start: 16:34 Finish: 17:01Pump Rate (g.p.m.): 0.112 (425 mL/min)

Sample Collection Depth (ft. from TOC): _____

Weather Conditions: Air Temperature (F): 18°Wind Speed/Direction: 16 mph NWOther: SnowingSamples Collected On chain of Custody No: MW-3Analytical Laboratory: ALS Environmental

Other Notes: _____

Low-Flow Test Report:

Test Date / Time: 12/18/2019 4:32:45 PM

Project: 73-160017 (5)

Operator Name: Keith, Phil, Abby

Location Name: MW-3 Initial Depth to Water: 3.52 ft	Pump Type: Peristaltic Tubing Type: PE Pump Intake From TOC: 13.63 ft Estimated Total Volume Pumped: 11475 ml Flow Cell Volume: 130 ml Final Flow Rate: 425 ml/min Final Draw Down: 3.65 ft	Instrument Used: Aqua TROLL 600 Serial Number: 518546
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Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 0.2	+/- 3 %	+/- 0.3	+/- 10 %	+/- 10	+/- 0.5	
12/18/2019 4:32 PM	00:00	6.72 pH	9.25 °C	2.54 mS/cm	0.31 mg/L	380.51 NTU	-40.5 mV	3.52 ft	425.00 ml/min
12/18/2019 4:35 PM	03:00	6.75 pH	9.39 °C	2.63 mS/cm	0.24 mg/L	204.38 NTU	-43.1 mV	3.52 ft	425.00 ml/min
12/18/2019 4:38 PM	06:00	6.74 pH	9.47 °C	2.67 mS/cm	0.21 mg/L	128.59 NTU	-44.9 mV	3.52 ft	425.00 ml/min
12/18/2019 4:41 PM	09:00	6.74 pH	9.71 °C	2.68 mS/cm	0.19 mg/L	131.17 NTU	-47.0 mV	3.52 ft	425.00 ml/min
12/18/2019 4:44 PM	12:00	6.74 pH	9.95 °C	2.70 mS/cm	0.18 mg/L	107.40 NTU	-49.0 mV	3.52 ft	425.00 ml/min
12/18/2019 4:47 PM	15:00	6.75 pH	9.96 °C	2.69 mS/cm	0.15 mg/L	83.57 NTU	-51.2 mV	3.52 ft	425.00 ml/min
12/18/2019 4:50 PM	18:00	6.76 pH	9.71 °C	2.70 mS/cm	0.14 mg/L	68.79 NTU	-52.9 mV	3.52 ft	425.00 ml/min
12/18/2019 4:53 PM	21:00	6.76 pH	9.95 °C	2.72 mS/cm	0.15 mg/L	62.24 NTU	-54.2 mV	3.52 ft	425.00 ml/min
12/18/2019 4:56 PM	24:00	6.76 pH	9.89 °C	2.71 mS/cm	0.15 mg/L	56.48 NTU	-55.6 mV	3.52 ft	425.00 ml/min
12/18/2019 4:59 PM	27:00	6.76 pH	9.75 °C	2.71 mS/cm	0.15 mg/L	53.78 NTU	-56.4 mV	3.52 ft	425.00 ml/min

Samples

Sample ID:	Description:
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