WASTE MANAGEMENT

October 13, 2021

Mr. Kurt Fritz, P.G.
Pennsylvania Department of
Environmental Protection
South Central Regional Office
909 Elmerton Avenue
Harrisburg, Pennsylvania 17110

Re: Third Quarter 2021 Environmental Monitoring Report
Waste Management Lancaster Landfill, Facility ID# 101559
Mount Joy Township, Lancaster County, Pennsylvania

Dear Mr. Fritz:

Enclosed is a compact disk containing analytical data and completed Pennsylvania Department of Environmental Protection (PADEP) Forms for the 3rd Quarter 2021 Environmental Monitoring Report for the Lancaster Landfill.

Sampling and analysis was performed by Geochemical Testing, Inc. Civil & Environmental Consultants, Inc. reviewed the data and prepared the Letter Report.

Should you have any questions or require any additional information, please contact me at (215) 269-2251.

Respectively Submitted,

FOR

Jeff Shanks, P.G.
Waste Management
Environmental Protection

Enclosure

LANCASTER LANDFILL
MOUNT JOY TOWNSHIP, LANCASTER COUNTY, PENNSYLVANIA
PADEP I.D. NO. 101559

THIRD QUARTER 2021
ENVIRONMENTAL MONITORING REPORT

Submitted:
October 2021

Prepared by:
Civil & Environmental Consultants, Inc.
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CEC Project 306-896

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B. 3rd Quarter 2021 PADEP EDD and Geochemical Testing Laboratory Reports, Quality Assurance/Quality Control Report, and Field Forms
C. 3rd Quarter 2021 PADEP Form 50 Leachate Laboratory Results
D. 3rd Quarter 2021 Methane Probe Monitoring Results
E. 3rd Quarter 2021 Dust Fall Results

1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 3rd Quarter 2021 groundwater monitoring activities at the Lancaster Landfill in Mount Joy Township, Lancaster County, Pennsylvania. The Lancaster Landfill is operated by Waste Management (WM) under Pennsylvania Department of Environmental Protection (PADEP) Permit No. 101559. This sampling event was performed on August 2-3, 2021 to satisfy requirements of the PADEP.

Lancaster Landfill is located in the northern portion of Lancaster County, Pennsylvania approximately five miles east of the city of Elizabethtown, Pennsylvania (Figure 1). The facility is accessed from Cloverleaf Road.

The Groundwater Monitoring Program at Lancaster Landfill incorporates permanent monitoring elements to provide environmental protection during and after landfill development. All field work, sampling methodologies, data evaluation, data quality assurance and quality control (QA/QC), chemical analysis, and time-series analysis were conducted in accordance with the approved site permit.

1.2 SITE DESCRIPTION AND BACKGROUND

Lancaster Landfill is an active construction and demolition solid waste facility. Permit No. 101559 was originally issued on June 2, 1992 and reissued on March 18, 2011. The facility consists of an approximately 135-acre parcel of land, which approximately 58.81 acres are permitted for waste disposal.

2.0 GEOLOGY AND HYDROGEOLOGY

The information in this section was originally presented in Forms 6 and 7 of the 2007 Major Permit Application for the Phase I & II Landfill Expansion, prepared by Blazosky Associates, Inc. Refer to the complete Permit Application for more details.

2.1 REGIONAL GEOLOGY

Lancaster Landfill is located within the southwestern portion of the narrow neck sub-basin of the Gettysburg-Newark Basin Complex. This sub-basin is a transitional zone between the Newark sub-basin to the northwest and the Gettysburg sub-basin to the southeast. The Gettysburg-Newark Basin Complex lies between the Great Valley and Piedmont Physiographic Providences and contains Triassic and Jurassic un-metamorphosed, sedimentary, and mafic igneous rocks (BAI, 2007a).

2.2 LOCAL GEOLOGY

Lancaster Landfill is underlain by Triassic conglomerate, sandstone, siltstone, and shale of the New Oxford Formation. These units are interpreted to record early syntectonic fluvial deposition in a half-graben basin, distal to the border fault in which surface water drainage was directed to the northwest, towards the border fault. Fluvial dominated stratigraphic successions such as these are typical of initial rift basin deposition and generally transition stratigraphically upward into lacustrine-dominated sedimentary successions. Lacustrine deposits have been reported by numerous works in the upper New Oxford and Gettysburg Formations. The sedimentary units in the vicinity of Lancaster Landfill generally strike east-northeast to west-southwest (approximately N60°E) and dip approximately 50 degrees to the north-northwest (BAI, 2007a).

2.3 SITE HYDROGEOLOGY

Groundwater is present beneath Lancaster Landfill within the New Oxford Formation. The New Oxford Formation is characterized by a series of interbedded sandstones, siltstones, and shales.

Groundwater movement within this unit is typical of fractured bedrock formations and flows primarily through secondary porosity (BAI, 2007b).

2.3.1 New Oxford Formation Hydrostratigraphic Unit

Based on aquifer pumping tests, the New Oxford Formation hydrostratigraphic unit has an average hydraulic conductivity of 24 to 98 ft/day. The storage coefficient is estimated to be 4.1×10^{-4} to 5.47×10^{-3} (unitless). Effective porosity is estimated to be 25 percent (BAI, 2007b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL WELL INSPECTIONS

During completion of each groundwater sampling event, monitoring wells are visually inspected for integrity, any physical damage and/or changes that may have occurred to the well or surrounding area, or signs of distressed vegetation surrounding the well. Any variation from previous sampling events is noted on the Field Information Form. Well casing stickup length, well casing diameter, and material of construction is recorded on the Field Information Form.

3.2 WELL AND SURFACE WATER MONITORING NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well and Surface Water Monitoring Network

The monitoring network at Lancaster Landfill includes quarterly sampling at wells completed within the New Oxford Formation as well as surface water monitoring locations. The monitoring well network targets the preferential flow path for the facility as described in the approved Groundwater Monitoring Plan [Civil & Environmental Consultants, Inc. (CEC), 2018] and is designed as an early detection monitoring system.

Form 21 Monitoring Points			
Monitored Zone		**Location ID**	
Groundwater	Upgradient Well	MW-101U	
	Downgradient Wells	MW-104D MW-105D MW-106D MW-107DR	MW-108DR MW-109DR MW-110DR MW-111DR
Surface Water		MGSU01 MGSD02 MGSD03 MGSD04	MGSD05 MGSU06 MGSU07
Underdrains		U-C2 U-C5 U-C8A U-C9A U-C9B U-C9C	U-C6A U-C6B U-C10A U-C10B U-C10C U-C-10D

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation [feet above mean sea level (famsl)] were recorded to the nearest hundredth of a foot. The water level measurements are utilized in preparation of groundwater contours to determine groundwater flow direction and gradient at the site. Groundwater elevations for the 3rd Quarter 2021 sampling event are generally comparable to historical groundwater elevation measurements (see Table 2).

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocities were estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

- v = average groundwater velocity;
- K_h = aquifer horizontal conductivity;
- i = average hydraulic gradient; and
- n_e = effective aquifer porosity.

The potentiometric surface map of the New Oxford Formation Hydrostratigraphic Unit indicates that the horizontal gradient is to the northeast at 0.0303ft/ft (Figure 3). Horizontal groundwater velocity in the New Oxford Formation Hydrostratigraphic Unit is 11.9 ft/day (4,344 ft/year), based upon an average hydraulic conductivity of 98 ft/day and an effective porosity of 25 percent (BAI, 2007b).

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the detection monitoring wells for the 3rd Quarter 2021 were conducted on August 2-3, 2021 (Table 1). Monitoring well purging and sampling activities were implemented in accordance with the approved Groundwater Monitoring Plan (CEC, 2018) and site permit. The majority of the wells were sampled with a submersible pump with low-flow purging and sampling techniques. Non-dedicated sampling equipment is decontaminated between locations. MW-110DR is purged conventionally (i.e., three well volumes are removed) using a bailer prior to sampling. MW-107DR cannot support low-flow purging, so a dedicated bailer is used to purge the well dry and then a sample is collected within 24 hours.

3.4.2 Laboratory Analysis and Monitoring Parameters

In accordance with the approved Groundwater Monitoring Plan (CEC, 2018), monitoring wells and surface water at the site are analyzed for Form 21 detection constituents plus an additional 22 inorganic parameters. There is no annual sampling event. Refer to Table 1 of the approved Groundwater Monitoring Plan (CEC, 2018) for complete details.

All water samples collected at the site were delivered to Geochemical Testing, Inc., in Somerset, Pennsylvania for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. The PADEP Form 21s are included in Appendix A. The laboratory reports, laboratory quality control report, and field forms are included in Appendix B. A summary of the analytical results is provided in Table 3.

3.5 ANALYTICAL PROGRAM RESULTS

Nine wells and three underdrain points were sampled during the 3rd Quarter 2021 (underdrains U-C5, U-C6B, U-C9A, U-C9B, and U-C9C were dry). Sample analysis was completed without any difficulties and the results are representative of groundwater at the site. It should be noted that four additional underdrains located to the north of the disposal area (i.e., U-C10A, U-C10B, U-C10C, and U-C10D) were scheduled to be sampled during the 3rd Quarter 2021 at PADEP's request, but the locations are currently unknown. Waste Management is working with ARM Group (who prepared the certification report) and on-site contractors to locate the remaining underdrains.

3.6 GEOCHEMICAL ANALYSIS

The PADEP permit requires Lancaster Landfill to submit quarterly sampling results for Form 21 parameters. Lancaster Landfill is providing a quarterly review of time-series analysis for leachate indicator parameters.

3.6.1 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters [ammonia-nitrogen, alkalinity, total dissolved solids (TDS), chloride, and sodium] were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.1.1 New Oxford Formation

As shown in the time-series graphs for the monitoring wells installed in the New Oxford Formation Hydrostratigraphic Unit (Figure 4), no historically significant upward trends were observed, except for alkalinity at MW-104D, MW-108DR, and MW-110DR. There was a low-level spike in the concentration of ammonia nitrogen in MW-108DR; however, the total concentration remains low (less than 0.5 mg/L). These trends do not appear to be

a result of leachate influence because the remaining indicator parameters are relatively stable over the same period of time. It should also be noted that chloride, sodium, and TDS in MW-106D and MW-107DR appear to fluctuate seasonally; however, detected concentrations are within historic levels.

3.7 SURFACE WATER ANALYSIS

The current surface water Form 21 detection monitoring program consists of seven surface water monitoring points. Those points are MGSU01, MGSD02, MGSD03, MGSD04, MGSD05, MGSU06, and MGSU07.

Surface water was sampled on August 2-3, 2021 for the required analysis pursuant to the permit requirements. All seven surface water locations were sampled during the 3rd Quarter 2021. The concentration of metals and general chemistry constituents in the surface water samples for the 3rd Quarter 2021 sampling event were generally consistent with historical results. Surface water at Lancaster Landfill does not appear to show signs of a leachate influence.

3.8 LEACHATE ANALYSIS

Cells are monitored as part of the leachate collection zone (LCZ) and leachate detection zone (LDZ) monitoring network. During each quarter, a composite leachate collection sample is collected from the storage tank and analyzed for PADEP Form 50 parameters (Appendix C). All samples collected at Lancaster Landfill were delivered to Geochemical Testing for chemical analysis. During the 3rd Quarter 2021, a grab sample from the composite LCZ was collected from the storage tank on August 2, 2021 for Form 50 parameters; additionally, LDZ-3, LDZ-4, LDZ-5, and LDZ-6 were also sampled during the quarter.

Volatile organic compounds (VOCs) were not detected above the established reporting limits in the LCZ sample during the 3rd Quarter 2021. The average daily LCZ flow from the landfill during the quarter was 946.1 gallons per acre per day (g/a/d). This flow is generally comparable with

historic results. Based on recommendations communicated to CEC from the PADEP, the flows were calculated using data collected from the entire calendar quarter.

Analytical data from the LDZs were generally consistent with historic results. The average daily LDZ flows from the landfill were: 0.1 g/a/d from LDZ-1, 0 g/a/d from LDZ-2, 0.1 g/a/d from LDZ-3, 0.9 g/a/d from LDZ-4, 0.6 g/a/d from LDZ-5, 8.4 g/a/d from LDZ-6, 0.8 g/a/d from LDZ-7, and 3.7 g/a/d from LDZ-10. These flows are generally consistent to historical flow measurements.

Based on current and historical analytical and flow data from the LDZs as well as the requirements of the PADEP Form 50, the LDZ sampling and analysis schedule is as follows. LDZ-1, LDZ-2, LDZ-3, LDZ-4, LDZ-5, and LDZ-10 do not appear to be influenced by leachate. Therefore, they should be sampled once per year (during the 4th quarter) for the PADEP Form 50 indicator parameters, assuming flows remain less than 10 g/a/d. LDZ-6 and LDZ-7 appear to be influenced by leachate. Therefore, they should be sampled once per year (during the 4th quarter) for the full PADEP Form 50 list of parameters, regardless of flow.

Based on the discussion above, each LDZ is scheduled to be sampled during the 4th Quarter 2021.

3.9 METHANE PROBE MONITORING RESULTS

Field measurements of methane, carbon dioxide, oxygen, and balance were collected from the four on-site gas monitoring probes. Percent methane was then converted to percent lower explosive levels of methane. As shown in Appendix D, no methane was detected at or above the lower explosive limit in any probe during the 3rd Quarter 2021.

3.10 DUST FALL RESULTS

Dust collection analysis is performed monthly through the placement of four dust fall jars around Lancaster Landfill. The jars are collected monthly, and a fresh jar is placed in the holders. It should be noted that analysis method American Society for Testing and Materials (ASTM)

D 1739-98 MOD is a conservative analysis because it includes organic matter that would otherwise be removed for analysis via method ASTM D 1739-82 MOD.

The results of the dust fall analysis contained in Appendix E indicate no sample exceeded the maximum dust fall of 15 g/m^2/month as specified in PA 25 §131.3 and referenced in PA 25 §273.217 during the 3rd Quarter 2021, except for Location B during June, Locations A and D during July, and Locations A and B during August. A review of the laboratory case narrative indicates these exceedances do not appear to be entirely reflective of dust emissions generated from landfill operations due to organic matter (insects, leaves, etc.) present in each of these samples. During the month of June, Location B was noted as containing light brown colored water with dirt, bugs, and seeds. During the month of July, Location A was noted as containing light brown colored water with dirt, bugs, and leaves; and Location D was noted as containing clear water with dirt and bugs. During the month of August, Location A was noted as containing light brown colored water with dirt, bugs, and leaves; and Location B was noted as containing light tan colored water with dirt, bugs, leaves, and bark.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method, except for lab pH, which has a 15-minute hold time. However, field pH readings were collected at the sampling locations in accordance with industry standard practices.

4.2 SAMPLE SURROGATE RECOVERIES

Sample surrogate recovery analyses are performed with each quarterly event. However, if results are not within acceptable ranges, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

4.3 METHOD BLANKS

No laboratory method blanks contained concentrations of any chemicals that would place the sampling event into question.

4.4 LABORATORY CONTROL SPIKES

Laboratory control spikes for all analytical methods are performed with each quarterly event. However, if results are not within advisory limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

4.5 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

Laboratory calibration is performed with each quarterly event. However, if results are not within acceptable limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

5.0 CONCLUSIONS

Samples were collected at Lancaster Landfill according to appropriate sampling procedures and sent to Geochemical Testing. The following observations are noted for the 3rd Quarter 2021 sampling event:

- Lancaster Landfill was sampled for Form 21 groundwater, underdrain, and surface water constituents on August 2-3, 2021.
- Lancaster Landfill was sampled for Form 50 leachate constituents on August 2, 2021.
- The New Oxford Formation Hydrostratigraphic Unit has a horizontal gradient to the north at 0.0303 ft/ft, with a horizontal velocity of 11.9 ft/day (4,344 ft/year) (Figure 3).
- Time-series analysis of select groundwater leachate indicator parameters shows no significant upward trends in these constituents through time, except for alkalinity at MW-104D, MW-108DR, and MW-110DR. However, these trends do not appear to be a result of leachate influence because the remaining indicator parameters are relatively stable over the same period of time.
- During the 3rd Quarter 2021, analytical and flow data from the LDZs were generally consistent with historic results.
- Field measurements of methane, carbon dioxide, oxygen, and balance were collected from the four on-site gas monitoring probes. Percent methane was then converted to percent lower explosive levels of methane. As shown in Appendix D, no methane was detected at or above the lower explosive limit in any probe during the 3rd Quarter 2021.
- The results of the dust fall analysis indicate no sample exceeded the maximum dust fall of 15 g/m^2/month, except for Location B during June, Locations A and D during July, and Locations A and B during August. A review of the laboratory case narrative indicates these exceedances do not appear to be entirely reflective of dust emissions generated from landfill operations due to organic matter (insects, leaves, etc.) present in each of these samples. During the month of June, Location B was noted as containing light brown colored water with dirt, bugs, and seeds. During the month of July, Location A was noted as containing light brown colored water with dirt, bugs, and leaves; and Location D was noted as containing clear water with dirt and bugs. During the month of August, Location

A was noted as containing light brown colored water with dirt, bugs, and leaves; and Location B was noted as containing light tan colored water with dirt, bugs, leaves, and bark.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater or surface water conditions;
2. The groundwater monitoring network is capable of monitoring the hydrostratigraphic unit beneath Lancaster Landfill; and
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

Blazosky Associates, Inc (BAI, 2007a). PADEP Form 6 Geologic Information. Veolia ES Lancaster, LLC; Veolia ES Lancaster Landfill; Phase I & II Landfill Expansion Application for Major Permit Modification. June 2007.

Blazosky Associates, Inc (BAI, 2007b). PADEP Form 7 Hydrogeologic Information. Veolia ES Lancaster, LLC; Veolia ES Lancaster Landfill; Phase I & II Landfill Expansion Application for Major Permit Modification. June 2007.

Civil & Environmental Consultants, Inc., 2018. "Lancaster Landfill Groundwater and Surface Water Sampling and Analysis Plan." Submitted September 2018.

TABLES

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

THIRD QUARTER 2021
FIELD PARAMETERS

AQUIFER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS
										pH	COND (µS/cm)	TEMP (C)	
New Oxford Formation	MW-101U	08/03/21	12:02 PM	16.82	54.00	5.95	17.85	6.0	1.01	5.96	143	17.9	
	MW-104D	08/02/21	12:07 PM	40.11	76.50	5.82	17.47	7.3	1.25	6.34	542	17.7	
	MW-105D	08/02/21	11:12 AM	51.95	80.60	4.58	13.75	8.5	1.85	7.07	386	16.5	
	MW-106D	08/02/21	09:54 AM	35.68	80.90	7.24	21.71	17.3	2.38	6.54	334	14.2	
	MW-107DR	08/02/21	01:50 PM	26.18	50.50	3.89	11.67	4.0	1.03	6.75	318	16.5	
	MW-108DR	08/03/21	01:27 PM	47.75	80.00	5.16	15.48	7.3	1.41	7.45	379	16.4	
	MW-109DR	08/02/21	01:30 PM	56.68	101.70	7.20	21.61	15.0	2.08	5.11	477	18.6	
	MW-110DR	08/03/21	10:15 AM	8.49	32.00	3.76	11.28	11.5	3.06	6.50	551	17.4	
	MW-111DR	08/03/21	11:19 AM	30.30	120.15	14.38	43.13	6.0	0.42	6.45	234	17.0	
Surface Water	MGSU01	08/03/21	08:05 AM							7.20	414	17.6	
	MGSD02	08/03/21	08:15 AM							7.10	311	18.1	
	MGSD03	08/03/21	07:50 AM							7.26	289	17.0	
	MGSD04	08/02/21	10:10 AM							8.03	311	17.9	
	MGSD05	08/02/21	10:20 AM							7.45	286	18.9	
	MGSU06	08/03/21	08:40 AM							6.71	335	18.3	
	MGSU07	08/03/21	08:30 AM							7.14	301	18.3	
Underdrain	U-C2	08/02/21	08:20 AM							8.18	402	18.7	
	U-C5												Dry
	U-C6A	08/03/21	12:30 PM							6.73	387	20.3	
	U-C6B												Dry
	U-C8A	08/03/21	10:25 AM							6.20	689	19.1	
	U-C9A												Dry
	U-C9B												Dry
	U-C9C												Dry
	U-C10A												Location unknown
	U-C10B												Location unknown
	U-C10C												Location unknown
	U-C10D												Location unknown

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

THIRD QUARTER 2021
FIELD PARAMETERS

AQUIFER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS
										pH	COND (µS/cm)	TEMP (C)	
Leachate	Leachate Storage Tank	08/02/21	02:25 PM							8.28	6,330	22.5	
	LDZ-1												Sampled annually
	LDZ-2												Sampled annually
	LDZ-3	08/03/21	02:15 PM							6.88	3,100	23.5	Sampled annually
	LDZ-4	08/03/21	01:45 PM							6.53	2,500	25.2	Sampled annually
	LDZ-5	08/03/21	01:55 PM							6.37	1,253	26.4	Sampled annually
	LDZ-6	08/03/21	02:05 PM							6.75	4,590	25.1	Sampled annually
	LDZ-7												Sampled annually
	LDZ-10												Sampled annually

Notes:
[1] Measured from top of inner casing.
[2] Calculated using 0.16 gallons per foot of water for 2-inch wells.
Calculated using 0.65 gallons per foot of water for 4-inch wells.
Calculated using 1.47 gallons per foot of water for 6-inch wells.

C = Degrees Centigrade.
µS/cm = microSiemens/centimeter.
gpm = gallons per minute.
ft = feet
NA = not applicable

TABLE 2
LANCASTER LANDFILL
PADEP ID NO. 101559

THIRD QUARTER 2021
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
New Oxford Formation	MW-101U	8/3/2021	495.93	16.82	479.11
	MW-104D	8/2/2021	418.32	40.11	378.21
	MW-105D	8/2/2021	439.55	51.95	387.60
	MW-106D	8/2/2021	426.52	35.68	390.84
	MW-107DR	8/2/2021	466.85	26.18	440.67
	MW-108DR	8/3/2021	471.40	47.75	423.65
	MW-109DR	8/2/2021	435.00	56.68	378.32
	MW-110DR	8/3/2021	428.00	8.49	419.51
	MW-111DR	8/3/2021	486.65	30.30	456.35

Notes:
[1] Elevation for the top of the PVC from field forms.
[2] Measured from the top of the PVC riser pipe.
ft amsl = feet above mean sea level.
NA = not applicable.

TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

THIRD QUARTER 2021
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER								
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-101U**	**MW-104D**	**MW-105D**	**MW-106D**	**MW-107DR**	**MW-108DR**	**MW-109DR**	**MW-110DR**	**MW-111DR**
Inorganics												
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloride	mg/L	EPA 300.0	250*	5.9	9.0	17.2	24.9	113	7.2	25.2	9.9	11.8
Iron	mg/L	EPA 200.7	0.3*	0.11	0.42	0.24	0.90	0.53	0.18	0.48	0.72	1.11
Iron, dissolved	mg/L	EPA 200.7	0.3*	< 0.05	< 0.05	< 0.05	0.15	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
pH (Field)	su	Field	NA	5.96	6.34	7.07	6.54	6.75	7.45	5.11	6.50	6.45
Lab pH	su	SM 4500-H+ B	NA	6.40 H	7.06 H	7.37 H	7.48 H	7.08 H	7.74 H	5.83 H	7.04 H	6.85 H
Sodium	mg/L	EPA 200.7	NA	5.2	13.5	10.8	25.0	13.2	9.1	17.6	7.5	16.3
Sodium, dissolved	mg/L	EPA 200.7	NA	5.1	13.4	10.6	25.6	12.9	8.9	17.1	7.9	16.0
Specific Conductance (Field)	µmhos/cm	Field	NA	143	542	386	334	818	379	477	551	234
Specific Conductance	µmhos/cm	EPA 120.1	NA	148	549	391	335	837	383	490	563	242
Sulfate	mg/L	EPA 300.0	250*	15.5	67.3	65.3	11.5	22.6	32.0	153	39.1	46.0
Total Organic Carbon	mg/L	SM 5310 C	NA	1.2	< 1.0	< 1.0	< 1.0	< 1.0	3.1	1.8	2.7	< 1.0
Total Organic Halogen	µg/L	EPA 9020	NA	< 50	< 50	< 50	< 50	< 50	< 50	123	< 50	< 50

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or PADEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist).
* These values represent secondary MCLs.
Dry Points:

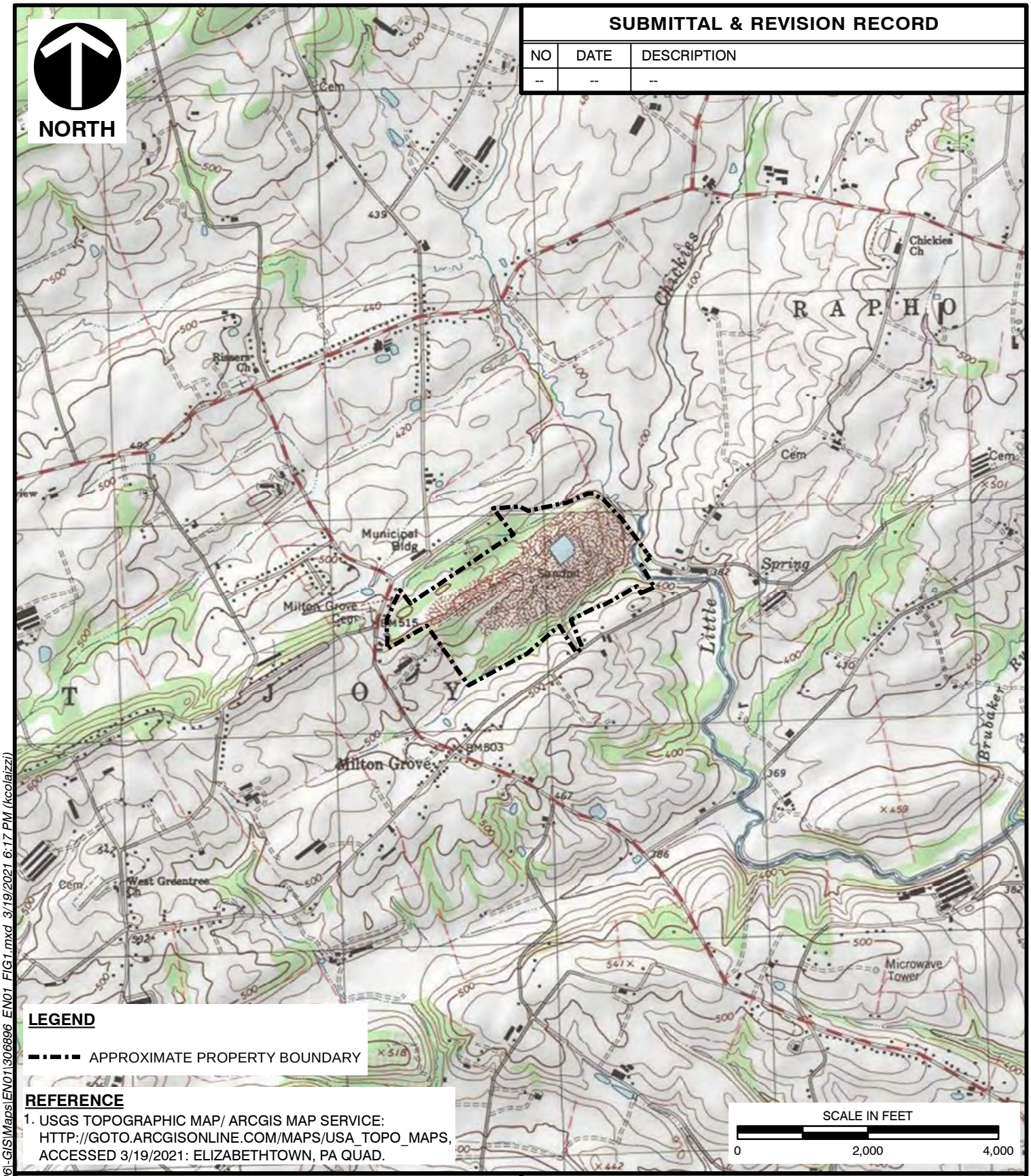
TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

THIRD QUARTER 2021
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				SURFACE WATER						
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MGSU01**	**MGSD02**	**MGSD03**	**MGSD04**	**MGSD05**	**MGSU06**	**MGSU07**
Inorganics										
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	< 10	13	< 10	< 10
Chloride	mg/L	EPA 300.0	250*	42.2	22.3	12.2	20.0	20.3	19.3	25.9
Iron	mg/L	EPA 200.7	0.3*	0.24	0.14	0.18	0.09	1.25	0.63	0.42
Iron, dissolved	mg/L	EPA 200.7	0.3*	< 0.05	< 0.05	< 0.05	< 0.05	0.06	0.15	0.05
pH - Field	su	Field	NA	7.20	7.10	7.26	8.03	7.45	6.71	7.14
pH - Lab	su	SM 4500-H+ B	NA	7.92 H	7.99 H	7.64 H	8.12 H	7.74 H	7.82 H	7.99 H
Sodium	mg/L	EPA 200.7	NA	27.2	14.5	10.4	12.1	11.1	14.6	15.6
Sodium, dissolved	mg/L	EPA 200.7	NA	26.6	14.3	10.3	11.9	12.0	14.9	15.4
Specific Conductance - Field	µmhos/cm	Field	NA	414	311	289	311	286	335	301
Specific Conductance - Lab	µmhos/cm	EPA 120.1	NA	410	302	278	304	280	331	295
Sulfate	mg/L	EPA 300.0	250*	25.6	16.4	18.9	23.2	15.4	17.6	14.0
Total Organic Carbon	mg/L	SM 5310 C	NA	1.8	4.6	1.6	3.1	7.4	5.8	4.8
Total Organic Halogen	µg/L	EPA 9020	NA							

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or PADEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist).
* These values represent secondary MCLs.
Dry Points:

FIGURES



SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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LEGEND

APPROXIMATE PROPERTY BOUNDARY

REFERENCE

1. USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS, ACCESSED 3/19/2021: ELIZABETHTOWN, PA QUAD.

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WASTE MANAGEMENT
LANCASTER LANDFILL
ELIZABETHTOWN, PENNSYLVANIA

SITE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	1
DATE:	09/05/2018	SCALE:	1 " = 2,000 '	PROJECT NO:	306-896	* Hand signature on file	

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NORTH

SUBMITTAL & REVISION RECORD		
NO	DATE	DESCRIPTION
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MGSU07
MGSU06
E-Town Rd
Trail Rd S
Milton Grove Rd N
Milton Grove Rd S
Sunnyside Rd
Meadow View Rd
Echo Valley Rd
Jonestield Rd
Hillrop Cir
Ashwood Ln
Horseshoe Rd
Ridge Rd
Clover Leaf Rd
Sunnyside Rd
Quarry Rd

U-C10A
U-C10B
U-C10C
U-C10D
U-C9A
MW-109DR
Trib 07965 to Little Chickies Creek
MGSD02
GMP-3R
MW-104D
MW-110DR
Trib 07967 to Little Chickies Creek
Trib 07966 to Little Chickies Creek
U-C9C
U-C9B
CELL 10
CELL 7
CELL 9
CELL 1
CELL 11
CELL 2
CELL 3
CELL 8
CELL 4
CELL 5
CELL 6A
CELL 6B
380
400
420
440
460
480
Little Chickies Creek
LOCATION C
MW-105D
U-C8A
LOCATION B
MW-111DR
MGSD05
MGSD04
MW-106D
GMP-4
U-C2
GMP-2
MGSU01
LOCATION A
MW-101U
GMP-1R
U-C5
MW-107DR
LOCATION D
Trib 07964 to Little Chickies Creek
MGSD03
U-C6B
MW-108DR
U-C6A

SCALE IN FEET
0 1,000 2,000

LEGEND

- GROUNDWATER MONITORING WELLS
- SURFACE WATER POINTS
- UNDERDRAIN POINTS
- DUST FALL MONITORING POINTS
- GAS MONITORING PROBES
- PADEP 305B STREAM
- APPROXIMATE CELL LOCATION
- APPROXIMATE PROPERTY BOUNDARY

REFERENCE

1. APRIL, 2016 IMAGERY PROVIDED BY CORNERSTONE.
2. ESRI WORLD IMAGERY / ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY ACCESSED 7/15/2021, IMAGERY DATE: 2017.

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WASTE MANAGEMENT
LANCASTER LANDFILL
ELIZABETHTOWN, PENNSYLVANIA

SAMPLE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	2
DATE:	04/07/2021	SCALE:	1 " = 1,000 '	PROJECT NO:	306-896	* Hand signature on file	

P:\300-000\306-896\-GIS\Maps\EN01\306896_EN01_FIG2.mxd 4/7/2021 9:07 AM (kcolaizzi)

SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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LEGEND

- MW-101U — GROUNDWATER MONITORING WELLS
- 400 — APPROXIMATE GROUNDWATER ELEVATION CONTOUR
- APPROXIMATE CELL LOCATION
- PADEP 305B STREAM
- HYDRAULIC GRADIENT MEASURED BETWEEN MW-101U AND MW-104D
- GROUNDWATER FLOW DIRECTION

REFERENCE

1. APRIL, 2016 IMAGERY PROVIDED BY CORNERSTONE.

NOTES

1. ELEVATIONS ARE MEASURED IN FEET ABOVE MEAN SEA LEVEL.
2. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
3. POTENTIOMETRIC CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. ACTUAL STATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.
4. THE GROUNDWATER ELEVATION AT MW-107DR HAS BEEN OMITTED FROM THE CONTOUR CALCULATIONS DUE TO HISTORIC ANOMALOUS DATA FROM THIS WELL.

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WASTE MANAGEMENT
LANCASTER LANDFILL
ELIZABETHTOWN, PENNSYLVANIA

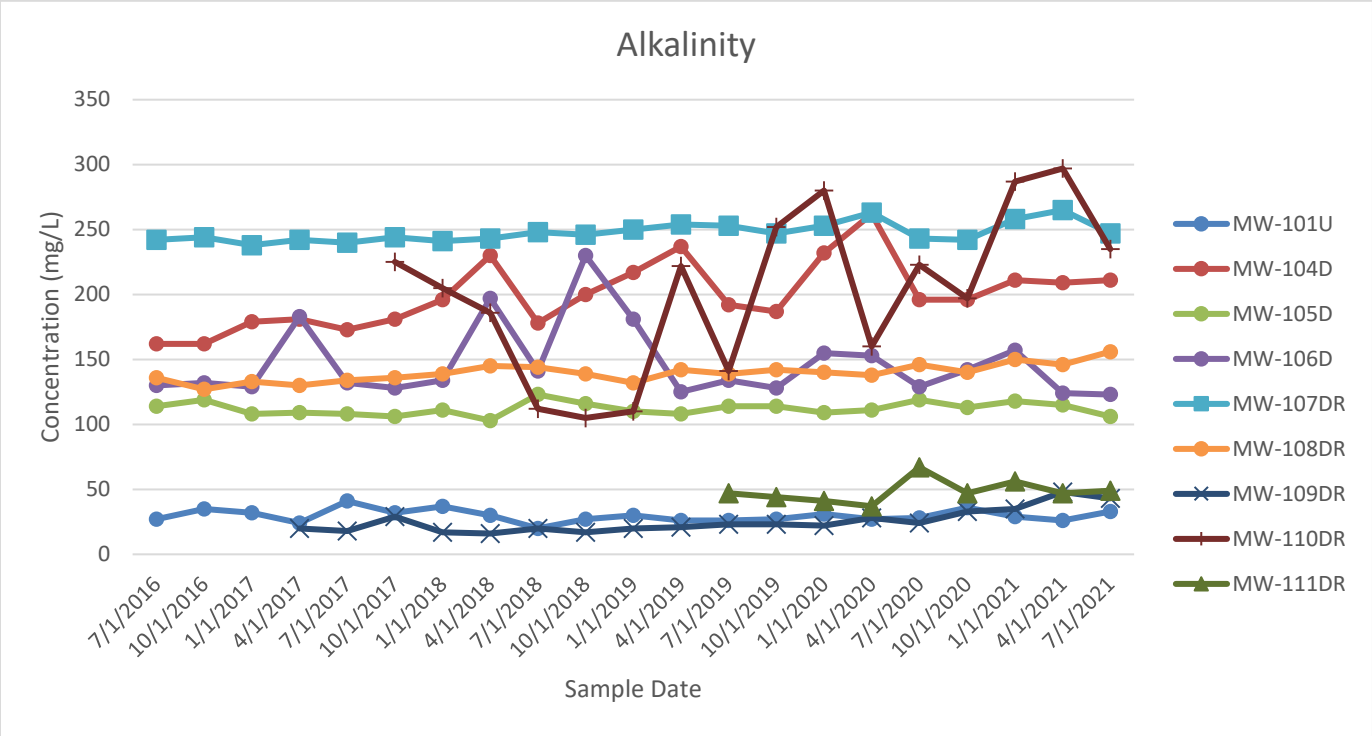
NEW OXFORD FORMATION
POTENTIOMETRIC SURFACE MAP

DRAWN BY:	JDM	CHECKED BY:	NLB	APPROVED BY:	TEA*	FIGURE NO:	3
DATE:	09/03/2021	SCALE:	1 " = 300 '	PROJECT NO:	306-896	* Hand signature on file	

P:\300-000\306-896\-GIS\Maps\EN02\306896_EN02_FIG_3_SECOND_QUARTER_POTENTIOMETRIC_SURFACE_MAP_20210903.mxd 10/7/2021 3:30 PM (jmendicino)

FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



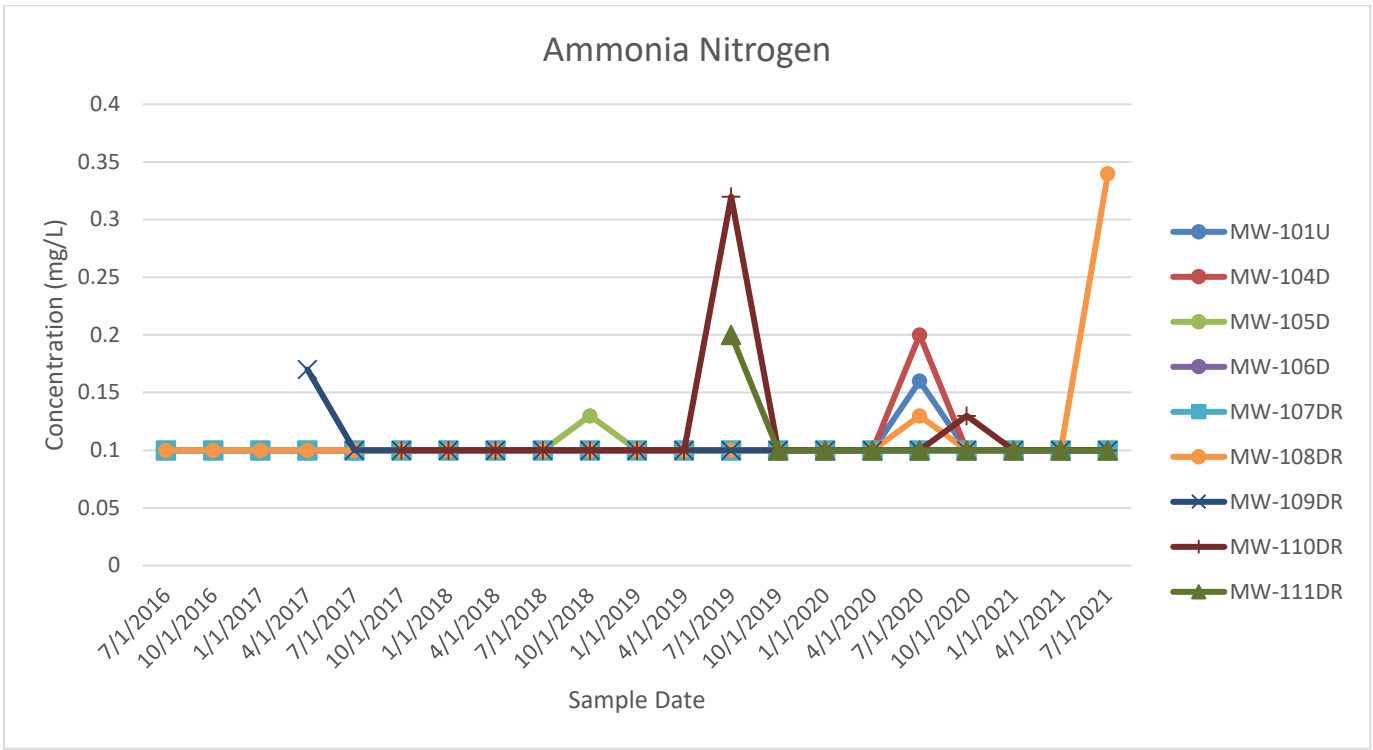
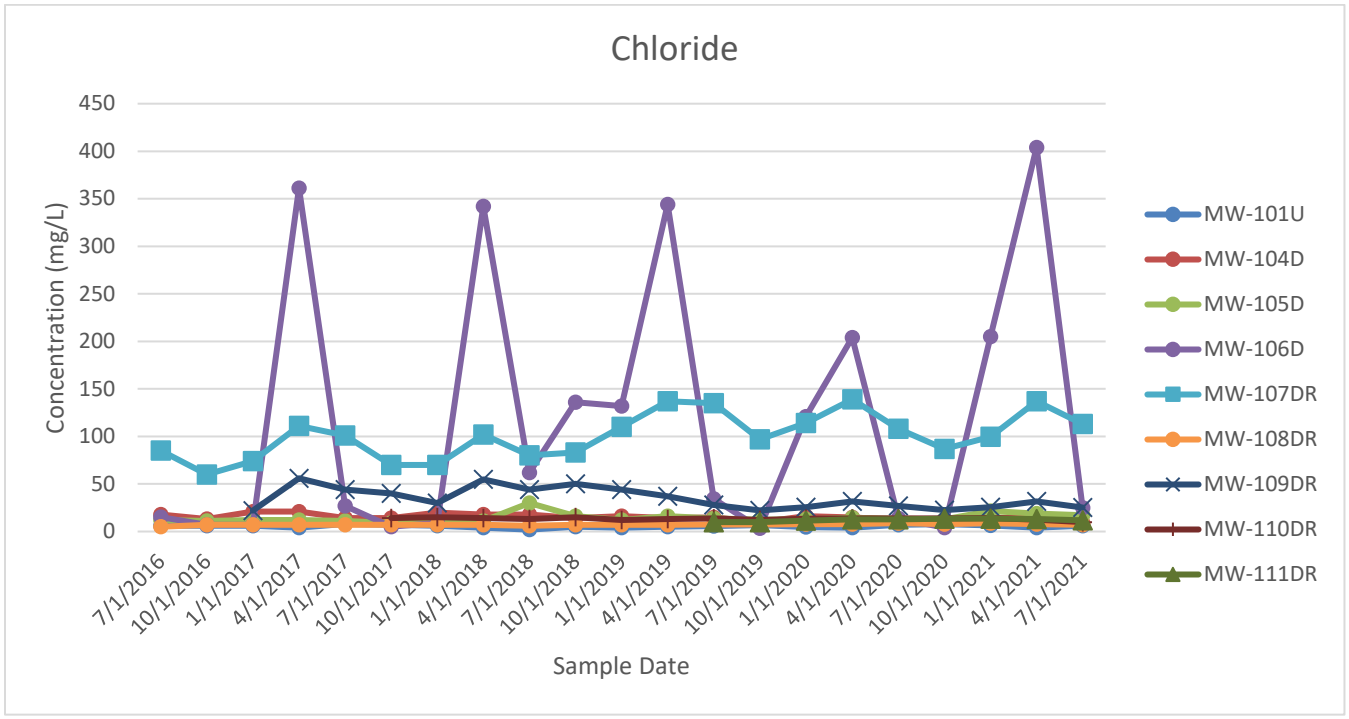


FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



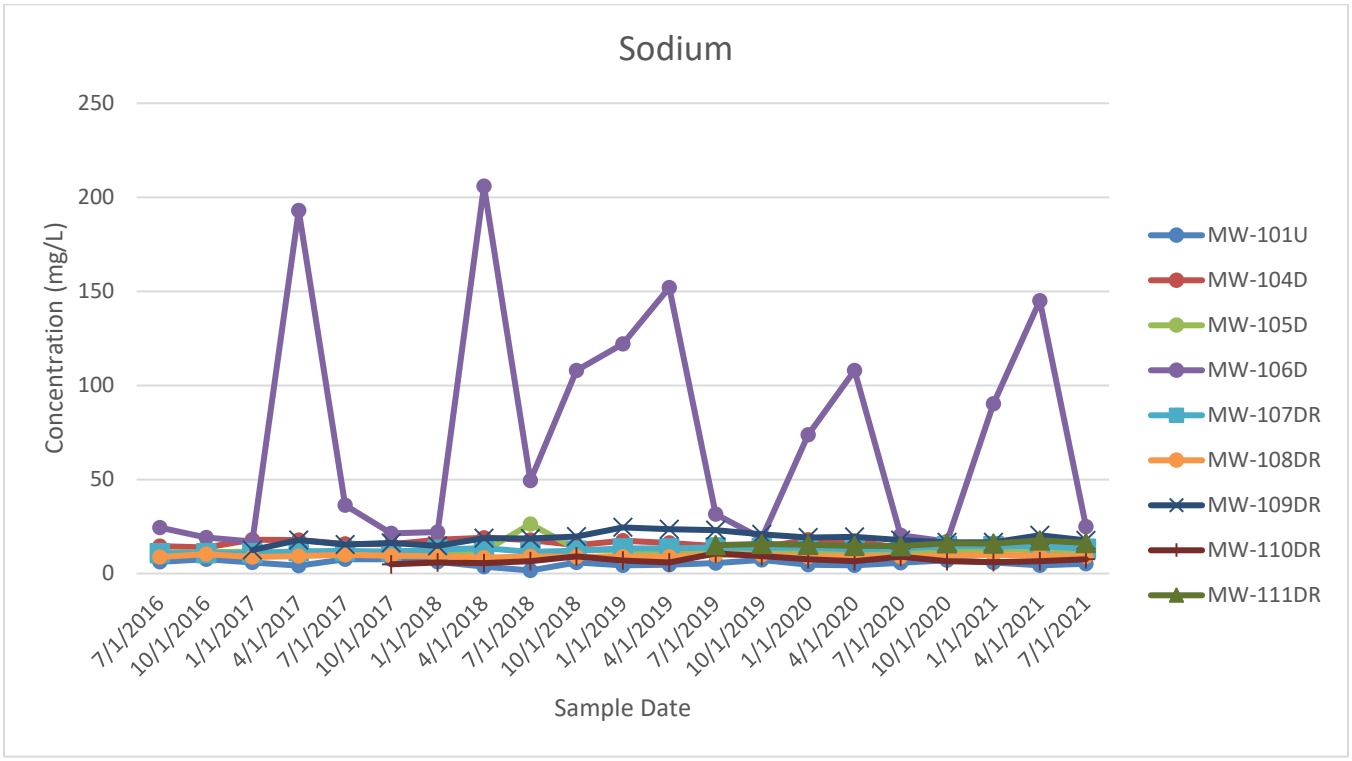
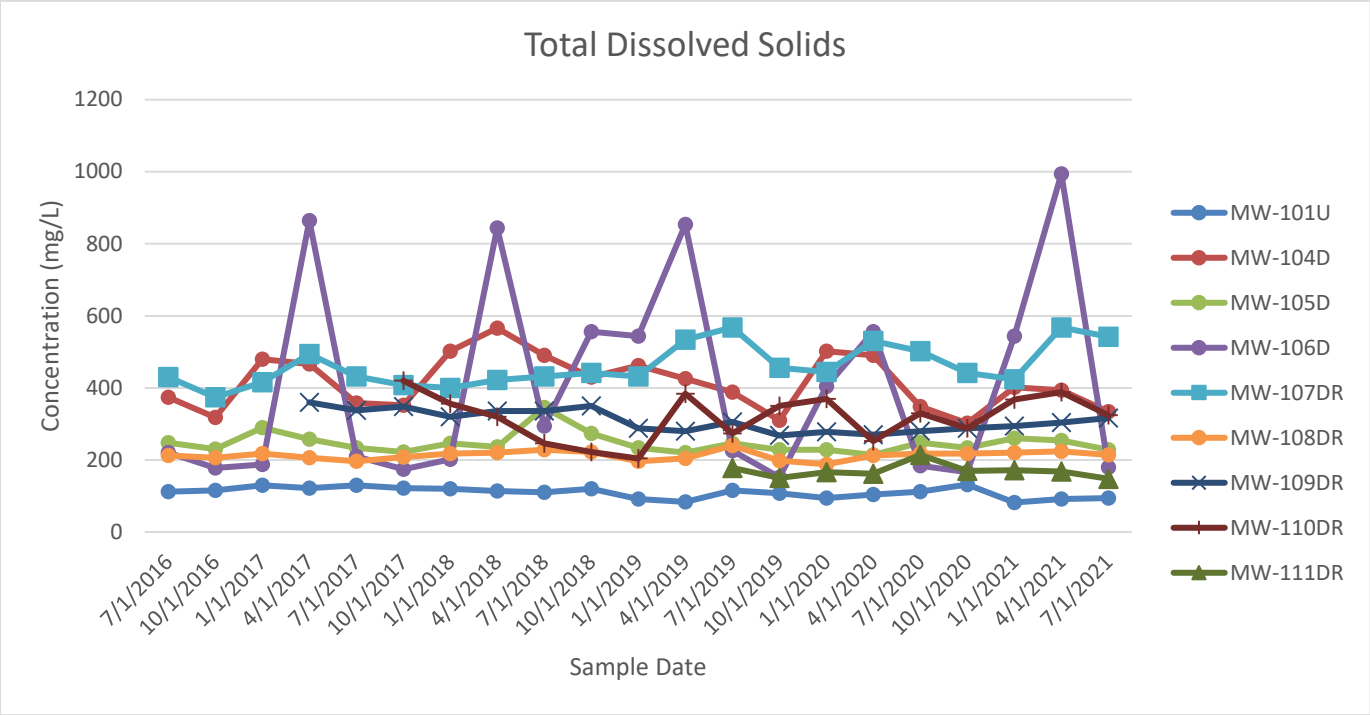


FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



APPENDICES (on CD)

Appendix A – PADEP Form 21 Groundwater and Surface Water Laboratory Results
Appendix B – PADEP EDD and Geochemical Testing Laboratory Reports, Quality Assurance/Quality Control Report, and Field Forms
Appendix C – PADEP Form 50 Leachate Laboratory Results
Appendix D – Methane Probe Monitoring Results
Appendix E – Dust Fall Monitoring Results