2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

FEDERAL CCR RULE

WESTLAND ASH MANAGEMENT FACILITY CELL B, DICKERSON, MARYLAND

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1. INTRODUCTION

The Federal Coal Combustion Residuals (CCR) Rule (40 Code of Federal Regulations [CFR] Part 257.90(e)) (USEPA, 2015) requires owners and or operators of existing CCR landfills to prepare a Groundwater Monitoring and Corrective Action Report (Report) no later than 31 January 2018. Geosyntec Consultants (Geosyntec) has prepared this Report for Cell B at the Westland Ash Management Facility in Dickerson, Maryland (Site). This Report summarizes the groundwater monitoring activities conducted pursuant to the CCR Rule through December 31, 2017.

2. SITE DESCRIPTION

2.1 Site Description

The Site is located in Dickerson, Montgomery County, Maryland (**Figure 1**) and is operated by GenOn MD Ash Management LLC (MD Ash). The Site is a dry ash management operation and does not have CCR surface impoundments (SI) as defined in the CCR Rule. The Site encompasses 180 acres of which approximately 64.4 acres have been used to manage CCR at landfill Cell B. Cell C is located downgradient of Cell B and is inactive and therefore not regulated by the Federal CCR Rule. The active area of Cell B was constructed with a geosynthetic bottom liner and associated leachate collection system that directs leachate to Pond 003 located to the west of Cell C. The remaining portion of Cell B is not lined but does include a leachate collection layer constructed using bottom ash. Leachate collected from the unlined areas of Cell B is also directed to Pond 003. Non-contact storm water runoff is directed to Pond 002. Ponds 002 and 003, which are used to manage storm water and leachate (not wet ash), respectively, are also exempt from the Federal CCR Rule. Features of the Site and their locations are presented on **Figure 2**.

2.2 Regional Physiographic Setting

The Site is located in the Culpepper Basin portion of the Piedmont province of Maryland and was previously used for agricultural purposes. Fractured sandstones and siltstones of the Poolesville Member of the Manassas Sandstone (referred to as the New Oxford Formation by others), with interbedded shale layers, form the upper aquifer at the Site. The overlying saprolite soils are unsaturated. Bedrock bedding planes strike north-south and dip 10-20 degrees to the west.

Groundwater in the upper aquifer generally follows topography and flows along bedding planes toward the west but is locally influenced by Big Stream to the south and flows along bedrock strike. The hydraulic conductivity of the interbedded thin shale layers is greater than that of the massive sandstones that comprise most of the bedrock stratigraphic sequence. Therefore, CCR constituent migration in groundwater flow along the shale horizons. Groundwater monitoring wells are screened in the shale layers.

3. GROUNDWATER MONITORING SYSTEM

This section describes the groundwater monitoring well network for the CCR Rule at Cell B. This network utilizes monitoring wells initially installed as part of a separate site-wide hydrogeologic investigation. As described in the *Basis for Groundwater Monitoring Network* (Geosyntec, 2017a), the groundwater monitoring network around Cell B was designed to comply with 40 CFR 257.91.

Groundwater quality is monitored around Cell B through a network of ten monitoring wells. As shown on **Figure 2**, there are three upgradient monitoring wells (D-2, D-3 and D-4) that are used to measure background conditions and seven downgradient monitoring wells (MW-03, MW-09, MW-10S, MW-12, MW-13, D-6R, and Core-2S) that are used as compliance wells.

Federal CCR Rule compliance and background monitoring wells at the Site are designed to monitor the upper aquifer conditions. Monitoring well construction and soil boring logs were provided in *Basis for Groundwater Monitoring Network* (Geosyntec, 2017a). Compliance and background monitoring well construction details are summarized in **Table 1**.

4. CCR RULE GROUNDWATER KEY ACTIVITIES COMPLETED (2015 – 2017)

4.1 Monitoring Well Installation

Six permanent compliance groundwater monitoring wells (Core-2S, MW-03, MW-09, MW-10S, MW-12 and MW-13) were installed at the Site between June and August 2015 using a ProSonic 600C track mounted drilling rig. Background monitoring wells D-2, D-3 and D-4, and compliance monitoring well D-6R were previously installed in 1981 and 2002, respectively. An 8-inch diameter sonic core barrel was utilized to install the six new bedrock borings. Continuous core samples were obtained at each new boring in order to log the geology.

From June to September 2015, geophysical logging and hydraulic testing were conducted in the new boreholes prior to well construction. The packer testing used a 10-foot long straddle packer assembly and was completed to select an appropriate depth for the permanent monitoring well screen. Screen depth was selected based upon a combination of hydrogeologic information and chemical analysis of depth-discreet groundwater samples collected at each test interval. Transducer data collected during the packer testing were used to estimate hydraulic conductivity of each packer interval. Calculated hydraulic conductivity data for the screened intervals were used in **Appendix A** herein to estimate the groundwater flow velocity at the Site.

New monitoring wells were constructed inside each borehole using 10-feet of 2-inch diameter 0.01-inch machine slotted Schedule 40 poly vinyl chloride (PVC) screen and 2-inch diameter PVC riser pipe. A #2 Filpro® sand pack was installed around each screen and extended two to three feet above the top of the screen. A minimum 3-foot thick bentonite chip seal was installed over the sand pack. The bentonite was allowed to swell for approximately one hour before grouting the

overlying well annulus. The grout mixture consisted of 95 pounds sulfate resistant Type V Portland cement, five pounds bentonite powder, and five to six gallons of water. The borehole was pressure grouted from the bottom to the top via a tremie pipe lowered to the top of the bentonite seal. Final well construction details are included in the *Basis for Groundwater Monitoring Network* (Geosyntec, 2017a) and are summarized in **Table 1**.

Each monitoring well was developed using a "purge and surge" method following installation to reduce turbidity and to ensure that proper communication between the well screen, filter pack, and the surrounding aquifer was established. The well was surged periodically using a surge block during the development process, an electric submersible pump was used to remove suspended sediments from within the well. The field scientist monitored the development process and recorded turbidity and water quality measurements during development.

The monitoring system was certified by a Professional Engineer (P.E.) as meeting the performance standard in the 40 CFR 257.91(a) (Geosyntec, 2017a).

4.2 Sampling and Analysis Plan

A Sampling and Analysis Plan (SAP) was prepared for the Baseline Monitoring Program and the Detection Monitoring Program prior to collection of any groundwater samples (Geosyntec, 2015). The SAP was posted to the operating record. The SAP documents the monitoring locations, sample collection and analysis protocol, and the quality assurance protocol employed.

4.3 Groundwater Monitoring

Baseline groundwater monitoring was conducted on a quarterly basis and Detection Monitoring has begun on a semi-annual basis at the Site using the monitoring well network consisting of seven compliance monitoring wells and three background monitoring wells. Groundwater monitoring was conducted in accordance with the *Sampling and Analysis Plan* (SAP) provided in Geosyntec (2015). As shown in **Table 2**, there were eight baseline monitoring program events (September 2015 through April 2017) and one detection monitoring program event (October 2017). Two additional monitoring events were completed at well Core-2S in August and September 2017 to collect the seventh and eighth rounds for fluoride and radium because they were inadvertently omitted from the first few monitoring events at that well.

4.3.1 Groundwater Elevation and Flow Velocities

Groundwater elevation monitoring commenced in September 2015. A synoptic round of water level measurements was made in the monitoring wells prior to each monitoring event. Groundwater elevation measurements were collected in accordance with the SAP. Potentiometric surface maps based on the elevations measured during the September 2015 through January 2017 monitoring events are presented on **Figures 3** through **9**. Groundwater elevation data are summarized in **Table 3**. **Figure 3** through **Figure 9** show overall groundwater around Cell B

flows from northeast to southwest. It should be noted that a potentiometric surface map was not generated for the April 2017 groundwater monitoring event, because only the monitoring wells sampled were measured for depth to water and Site-wide water levels were not collected.

As shown in **Appendix A** and on **Figures 3 through 9**, the average hydraulic gradient around Cell B ranged from 0.0079 ft/ft between monitoring wells D-2 and D-6R to 0.0258 ft/ft between monitoring wells D-2 and MW-3. **Table A-1** shows groundwater flow velocities at the Site ranged from $1.93X10^{-5}$ centimeters per second (cm/sec) (20 inches/month: 20 feet/year) between monitoring wells D-2 and MW-3 to $4.16\ X10^{-6}$ cm/sec (4.3 inches/month; 4.3 feet/year) between monitoring wells D-2 and MW-13.

4.3.2 Baseline Monitoring Program

As shown in **Table 2**, baseline groundwater monitoring at the Site began in September 2015 and continued through April 2017 at most wells and through September 2017 at well Core-2S. All monitoring wells were sampled at least eight times during the baseline sampling period.

In accordance with 40 CFR 257.94(b), groundwater samples collected during the baseline groundwater monitoring period were analyzed for 40 CFR 257 Appendix III and Appendix IV list parameters. Analytical results are presented in **Tables 4** through **7**.

Background groundwater samples collected during the baseline monitoring period were used to calculate statistical estimates of the range of background concentrations for Appendix III list constituents. The background concentration for each constituent was derived from the aggregated background dataset (i.e., combined background wells D-2, D-3, and D-4). A parametric upper prediction limit (UPL) was calculated for normally distributed constituents (pH and total dissolved solids) of the background dataset using 95% parametric prediction limit (EPA Unified Guidance, 2009, Equation 18.7). Per the Unified Guidance (USEPA, 2009; page 18.16), the maximum detected background value in each dataset was selected as the UPL for nonparametric datasets. The calculated background concentrations for Appendix III list constituents are presented in **Table 8**.

4.3.3 Detection Monitoring Program

In October 2017, the first detection monitoring program event was conducted. In accordance with 40 CFR 257.94(a) of the CCR Rule, samples were analyzed for Appendix III list parameters only. Prior to sampling, a synoptic round of groundwater measurements was collected from the compliance and background monitoring wells. Groundwater elevation data are presented in **Table 3**. Analytical results are summarized in **Tables 9** and **10**.

4.4 Data Usability

Upon receipt of laboratory analytical reports, the data were evaluated for usability. Analytical data were checked for the following:

- Samples were analyzed within the method specified hold times;
- Samples were received within holding temperature;
- The chain of custody was complete;
- Precision was within SAP control limits using relative percent differences of blind duplicate samples;
- Matrix spike and matrix spike duplicate recoveries and laboratory control samples were within the SAP control limits; and
- Potential for positive bias was evaluated using method blanks concentrations.

Upon completion of the data usability assessment the data were qualified as needed and added to the data tables. All data received were considered complete and usable.

4.5 Selection of Background Statistical Methods

The baseline monitoring data from the three background wells were used to select statistical methods for calculating the range of background concentrations for Appendix III parameters. The resulting background concentrations are summarized in **Table 8** based upon upper prediction limit (UPL) methods. The calculations are documented and certified by a P.E. as being appropriate for the background data set in Geosyntec (2017b).

5. DETECTION MONITORING STATISTICS

In accordance with 40 CFR 257.93(b)(2), detection monitoring statistics were not required to be evaluated until the first quarter of 2018 (i.e. within 90 days after completion of sampling and analysis) and therefore are not included in this report. Detection monitoring statistics will be calculated in the required timeframe and included in the next annual report.

6. ASSESSMENT MONITORING STATISTICS

The site is not in Assessment Monitoring.

7. PROBLEMS ENCOUNTERED AND RESOLUTIONS

The following section discusses problems encountered during the baseline monitoring period and the first detection monitoring event. Additionally, this section discusses the resolutions to those problems encountered.

Problem: Dedicated pumps in the older D-series wells interfered with groundwater elevation measurements during the first baseline monitoring program event.

Resolution: The dedicated pumps were permanently removed.

Problem: Monitoring well MW-22S was intended to be a background monitoring well. Under another regulatory program, the Maryland Department of Environment indicated that they did not consider the water quality data from MWS-22S to be representative of background.

Resolution: MW-22S was dropped from the CCR Rule monitoring system after April 2016.

8. STATUS OF MONITORING PROGRAM

In October 2017, the Site transitioned from baseline monitoring to detection monitoring. The Site was in the baseline monitoring program from September 2015 through August 2017.

9. PLANNED KEY ACTIVITIES FOR 2018

The following section outlines the activities planned for 2018.

January 2018: The 2017 Annual Groundwater Monitoring and Corrective Action Report will be entered into the facility's operating record and notification will be sent to the Maryland Department of Environment (MDE)**.**

January 2018: Testing of the October 2017 detection monitoring program sample results for a statistically significant increase (SSI) over background will be completed.

February 2018: The 2017 Annual Groundwater Monitoring and Corrective Action Report will be posted to the public internet site.

February 2018: The first 2018 semi-annual groundwater detection monitoring program event will be conducted.

June 2018: Testing of the February 2018 detection monitoring program sample results for a SSI over background will be completed.

July 2018: The second 2018 semi-annual groundwater detection monitoring program event will be conducted.

November 2018: Testing of the July 2018 detection monitoring program sample results for a SSI over background will be completed.

December 2018: Preparation of the 2018 Annual Groundwater Monitoring and Corrective Action Report will begin.

10. REFERENCES

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U.S. EPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

TABLES

TABLE 1
WELL CONSTRUCTION DETAILS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Well ID	Compliance / Background	Permit Number	Installation Date	Northing feet Maryland State Plane 1900 NAD 1983	Easting feet Maryland State Plane 1900 NAD 1983	Ground Surface Elevation (ft msl)	Top of Casing Elevation (ft msl)	Inner Casing Diameter (inches)	Top of Sand Pack (ft bgs)	Screen Interval (ft bgs)	Screen Length (feet)	Screen Slot Size (inch)
CORE-2S	Compliance	MO-15-0119	6/30/2015	555694.88	1181659.23	298.07	300.82	2	33.0	35-45	10	0.010
D-2	Background	Unknown	6/1981	556397.52	1183798.46	358.37	366.03	4	32.0	110-120	10	0.010
D-3	Background	Unknown	6/1981	555135.30	1183455.78	359.32 [1]	361.82	4	40.0	86-96	10	0.010
D-4	Background	Unknown	6/1981	554151.88	1183976.22	335.41 [1]	337.91	4	Unknown	125-135	10	0.010
D-6R	Compliance	Unknown	6/2002	555014.92	1181455.87	277.90	281.075	4	51.0	55-70	15	Unknown
MW-03	Compliance	MO-15-0078	7/2/2015	556361.94	1182081.25	309.96	312.48	2	48.0	50-60	10	0.010
MW-09	Compliance	MO-15-0084	8/4/2015	555744.29	1181107.48	271.00	273.9	2	58.0	60-70	10	0.010
MW-10S	Compliance	MO-15-0100	6/29/2015	555127.15	1181077.31	268.29	271.03	2	36	38-48	10	0.010
MW-12	Compliance	MO-15-0106	8/6/2015	554978.07	1182086.13	293.26	296.11	2	32.0	34-44	10	0.010
MW-13	Compliance	MO-15-0107	8/7/2015	554733.88	1182475.50	308.02	310.77	2	48.0	50-60	10	0.010

Notes:

ft msl feet above mean sea level

ft bgs feet below ground surface

[1] Elevation is an estimated value

TABLE 2
SUMMARY OF 2015-2017 MONITORING EVENTS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Monitoring Program:	Baseline Monitoring																				
Monitoring Event:	3Q 2015			4Q 2015			1Q 2016			2Q 2016			3Q 2016			4Q 2016			1Q 2017		
Sample Date: / Well ID	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Background Wells																					
D2			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
D3			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
D4			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
Compliance Wells																					
CORE-2S			III,IV [1,2]			III,IV [1,2]		III,IV [1,2]		III,IV				III,IV		III,IV			III,IV		
D-6R			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
MW-03			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
MW-09			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
MW-10S			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
MW-12			III,IV			III,IV		III,IV		III,IV				III,IV		III,IV			III,IV		
MW-13			III,IV			III,IV		III,IV		III,IV				III,IV			III,IV		III,IV		

Monitoring Program:	Baseline Monitoring							Detection Monitoring			
Monitoring Event:	2Q 2017			3Q 2017			Total Baseline Sampling Events [4]	4Q 2017			Total Detection Sampling Events
Sample Date: / Well ID	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17		Oct-17	Nov-17	Dec-17	
Background Wells											
D2	III,IV						8	III			1
D3	III,IV						8	III			1
D4	III,IV						8	III			1
Compliance Wells											
CORE-2S	III,IV	III,IV [3]			III,IV [3]	III,IV [3]	11	III			1
D-6R	III,IV						8	III			1
MW-03	III,IV						8	III			1
MW-09	III,IV						8	III			1
MW-10S	III,IV						8	III			1
MW-12	III,IV						8	III			1
MW-13	III,IV						8	III			1

Notes:

III Groundwater samples collected for laboratory analysis of 40 CFR 257 Appendix III parameters.

IV Groundwater samples collected for laboratory analysis of 40 CFR 257 Appendix IV parameters.

[1] Fluoride inadvertantly omitted.

[2] Radium inadvertantly omitted.

[3] Location was sampled for fluoride and radium, only.

[4] All background and compliance monitoring wells met the minimum number of samples collected. Monitoring well Core-2s was sampled on 11 different sampling events, which resulted in 8 complete sample sets.

TABLE 3
GROUNDWATER ELEVATION MEASUREMENTS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Well ID	Top of Casing Elevation [1] (ft msl)	Depth to Water Measurement Date	Depth to Water (ft btoic)	Groundwater Elevation (ft msl)
CORE-2S	300.82	9/14/2015	15.38	285.44
		12/7/2015	13.23	287.59
		2/8/2016	10.65	290.17
		4/21/2016	13.25	287.57
		8/1/2016	13.23	287.59
		10/25/2016	16.58	284.24
		1/16/2017	15.09	285.73
		4/12/2017	13.51	287.31
		5/31/2017	13.89	286.93
		8/2/2017	14.23	286.59
		9/13/2017	14.55	286.27
		10/26/2017	16.16	284.66
D-2	366.03	9/18/2015	22.29	343.74
		12/7/2015	12.46	353.57
		2/8/2016	7.77	358.26
		4/21/2016	18.21	347.82
		8/1/2016	20.46	345.57
		10/25/2016	21.40	344.63
		1/16/2017	18.05	347.98
		4/12/2017	11.24	354.79
		10/26/2017	19.36	346.67
D-3	361.82	9/14/2015	44.55	317.27
		12/7/2015	48.21	313.61
		2/8/2016	44.59	317.23
		4/21/2016	47.80	314.02
		8/1/2016	50.45	311.37
		10/25/2016	50.34	311.48
		1/16/2017	50.06	311.76
		4/12/2017	47.35	314.47
		10/26/2017	49.30	312.52
D-4	337.91	[2]	[2]	[2]
		12/7/2015	24.24	313.67
		2/8/2016	22.49	315.42
		4/21/2016	25.56	312.35
		8/1/2016	41.87	296.04
		10/25/2016	27.61	310.30
		1/16/2017	26.32	311.59
		4/12/2017	26.65	311.26
		10/26/2017	26.55	311.36
D-6R	281.08	9/14/2015	30.55	250.53
		12/7/2015	28.96	252.12
		2/8/2016	28.05	253.03
		4/21/2016	29.42	251.66
		8/1/2016	29.30	251.78
		10/25/2016	30.29	250.79
		1/16/2017	29.70	251.38
		4/12/2017	28.92	252.16
		10/26/2017	30.21	250.87

TABLE 3
GROUNDWATER ELEVATION MEASUREMENTS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Well ID	Top of Casing Elevation [1] (ft msl)	Depth to Water Measurement Date	Depth to Water (ft btoic)	Groundwater Elevation (ft msl)
MW-03	312.48	9/14/2015	5.67	306.81
		12/7/2015	6.91	305.57
		2/8/2016	6.37	306.11
		4/21/2016	6.86	305.62
		8/1/2016	6.91	305.57
		10/25/2016	7.49	304.99
		1/16/2017	7.41	305.07
		4/12/2017	6.55	305.93
		10/26/2017	7.90	304.58
MW-09	273.90	9/14/2015	42.48	231.42
		12/7/2015	40.49	233.41
		2/8/2016	39.11	234.79
		4/21/2016	41.09	232.81
		8/1/2016	41.87	232.03
		10/25/2016	43.08	230.82
		1/16/2017	42.91	230.99
		4/12/2017	41.12	232.78
		10/26/2017	41.71	232.19
MW-10S	271.03	9/14/2015	32.43	238.60
		12/7/2015	29.62	241.41
		2/8/2016	27.05	243.98
		4/21/2016	28.93	242.10
		8/1/2016	30.69	240.34
		10/25/2016	32.20	238.83
		1/16/2017	31.86	239.17
		4/12/2017	29.14	241.89
		10/26/2017	30.70	240.33
MW-12	296.11	9/14/2015	25.59	270.52
		12/7/2015	24.96	271.15
		2/8/2016	22.50	273.61
		4/21/2016	24.33	271.78
		8/1/2016	20.72	275.39
		10/25/2016	25.18	270.93
		1/16/2017	23.80	272.31
		4/12/2017	23.89	272.22
		10/26/2017	24.46	271.65
MW-13	310.77	9/14/2015	32.13	278.64
		12/7/2015	31.07	279.70
		2/8/2016	30.08	280.69
		4/21/2016	31.39	279.38
		8/1/2016	31.44	279.33
		10/25/2016	32.44	278.33
		1/16/2017	31.79	278.98
		4/12/2017	31.27	279.50
		10/26/2017	31.18	279.59

Notes:

ft msl feet above mean sea level
ft btoic feet below top of inner case
NM Not measured
[1] Top of casing elevation is an estimated value based on ground elevation.
[2] An incorrect measurement was made at this well due to the presence of equipment.

TABLE 4
BASELINE MONITORING PROGRAM APPENDIX III ANALYTICAL DATA - BACKGROUND WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

	Analyte:	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	TDS
Well ID	Sample Date	µg/L	mg/L	mg/L	mg/L	S.U.	mg/L	mg/L
D-2	9/23/2015	<8.3 U	37.6	11.4	<0.25 U	7.4 J	17.4	213
	12/8/2015	13.9 J	37.3	12.5	<0.25 U	7.5 J	17.4	215
	2/10/2016	9.6 J	36.4	13.3	<0.25 U	7.7	17.9	171
	4/25/2016	<8.3 U	39.2	13.2	<0.25 U	7.5 J	16.8	190
	8/2/2016	<8.3 U	37.5	11.7	<0.25 U	7.7 J	17.3	211
	10/26/2016	<8.3 U	36.8	11.7	<0.25 U	7.7 J	17.1	210
	1/17/2017	<8.3 U	38.4	12.4	<0.25 U	7.6	18.7	209
	4/13/2017	<8.3 U	< 37.3 U	11.6	<0.25 U	7.5	16.4	223
D-3	9/18/2015	21.4 J	48.6	15.6	<0.25 U	7.8 J	21.2	287
	12/8/2015	13.5 J	49.8	16.8	<0.25 U	7.6 J	23.7	240
	12/8/2015 [1]	12.3 J	50.7	16.9	<0.25 U	7.6 J	25.0	259
	2/8/2016	11.0 J	50.7	16.3	<0.25 U	7.9 J	22.1	230
	2/8/2016 [1]	10.8 J	49.5	16.8	<0.25 U	7.8 J	23.0	215
	4/25/2016	9.4 J	49.5	17.5	<0.25 U	7.6 J	21.7	247
	8/2/2016	< 50.0 U	46.6	17.0	<0.25 U	7.8 J	21.9	239
	10/26/2016	8.5 J	44.2	15.9	<0.25 U	8.0 J	21.9	239
	10/26/2016 [1]	19.9 J	45.1	15.7	<0.25 U	7.9	21.8	247
	1/17/2017	<8.3 U	50.6	16.9	<0.25 U	7.8	25.1	237
	4/13/2017	< 50.0 U	< 53.5 U	16.0	<0.25 U	7.7	25.4	265
D-4	9/23/2015	11.9 J	53.4	8.6	<0.25 U	7.9 J	17.2	280
	12/9/2015	10.9 J	49.4	8.8	<0.25 U	7.9 J	16.3	200
	2/8/2016	8.6 J	49.5	10.5	<0.25 U	8.0 J	14.8	193
	4/25/2016	11.6 J	50.0	9.6	<0.25 U	7.7 J	16.0	200
	4/25/2016 [1]	<8.3 U	48.7	10.0	<0.25 U	7.7 J	16.2	208
	8/2/2016	12.1 J	47.4	9.0	<0.25 U	8.0 J	15.7	222
	8/2/2016 [1]	50.0 U	48.5	8.9	<0.25 U	7.9	15.5	183
	10/28/2016	<8.3 U	46.6	9.3	<0.25 U	8.1	15.5	215
	1/18/2017	13.7 J	49.4	10.0	<0.25 U	7.5	17.4	201
	4/13/2017	< 50.0 U	< 50.8 U	9.2	<0.25 U	7.8	15.6	267

Notes:

µg/L micrograms per Liter
mg/L milligrams per Liter
S.U. Standard Units
J Constituent detected below reportable quantitation limit; result is an estimated value.
U Constituent not detected above method detection limit.
NS Not Sampled
[1] Duplicate sample collected.

TABLE 5
BASELINE MONITORING PROGRAM APPENDIX IV ANALYTICAL DATA - BACKGROUND WELL

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

	Analyte:	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (III+VI)	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium-226	Radium-228
Well ID	**Sample Date**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	
D-2	9/23/2015	<0.33 U	0.89 J	406	0.24 J	<0.23 U	9.4	1.2 J	<0.25 U	4.3	<8.0 U	<0.050 U	<1.7 U	<0.50 U	<0.15 U	0.958	<0.861 U
	12/8/2015	<0.33 U	0.47 J	368	<0.071 U	<0.23 U	1.4 J	<0.90 U	<0.25 U	1.8	<8.0 U	<0.050 U	<1.7 U	<0.50 U	<0.15 U	0.974	<3.00 U
	2/10/2016	<0.33 U	<0.40 U	362	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	0.94 J	<8.0 U	<0.050 U	<2.1 U	<0.50 U	<0.15 U	12.9	<1.19 U
	4/25/2016	<0.33 U	0.58 J	364	0.12 J	<0.20 U	6.4	<5.0 U	<0.25 U	3.1	<8.0 U	<0.20 U	<2.1 U	<0.50 U	<0.15 U	<1.00 U	<3.00 U
	8/2/2016	<0.48 U	<0.40 U	354	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.49 J	<4.8 U	<0.050 U	<1.7 U	<0.44 U	<0.16 U	0.652	<3.00 U
	10/26/2016	<0.48 U	<0.40 U	342	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.52 J	5.2 J	<0.050 U	2.1 J	<0.44 U	<0.16 U	1.06	< 0.915 U
	1/17/2017	<0.48 U	0.64 J	354	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.40 J	<4.8 U	<0.050 U	<1.7 U	<0.44 U	<0.16 U	0.399	<1.53 U
	4/13/2017	<0.48 U	<0.40 U	365 U	<0.11 U	<0.19 U	0.62 J	<1.9 U	<0.25 U	0.34 J	<4.8 UJ	<0.050 U	<1.7 U	<0.44 U	<0.16 U	0.182	<0.733 U
D-3	9/18/2015	0.40 J	0.52 J	81.3	<0.071 U	<0.23 U	3.7	<0.90 U	<0.25 U	53.0	8.2 J	<0.050 U	<1.7 U	<0.50 U	<0.15 U	<1.00 U	<3.00 U
	12/8/2015	1.1	0.41 J	102	<0.071 U	<0.23 U	1.6 J	<0.90 U	<0.25 U	10.9	<8.0 U	<0.050 U	<1.7 U	<0.50 U	<0.15 U	<1.00 U	<3.00 U
	12/8/2015 [1]	0.72 J	<0.40 U	105	<0.071 U	<0.23 U	0.76 J	<0.90 U	<0.25 U	9.1	8.4 J	<0.050 U	<1.7 U	<0.50 U	<0.15 U	1.06	<3.00 U
	2/8/2016	<0.33 U	0.82 J	101	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	3.8	8.2 J	<0.050 U	<2.1 U	<0.50 U	<0.15 U	0.545	<0.377 U
	2/8/2016 [1]	0.40 J	0.47 J	96.1	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	3.0	12.2 J	<0.050 U	<2.1 U	<0.50 U	<0.15 U	<0.612 U	<0.487 U
	4/25/2016	0.44 J	0.56 J	97.6	<0.071 U	<0.20 U	15.2	<5.0 U	<0.25 U	2.3	8.1 J	<0.20 U	3.0 J	<0.50 U	<0.15 U	1.29	<0.974 U
	8/2/2016	<0.48 U	<0.40 U	75.8	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	1.5	7.0 J	<0.050 U	8.8 J	<0.44 U	<0.16 U	<1.00 U	<3.00 U
	10/26/2016	<0.48 U	0.65 J	67.8	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	1.8	14 J	<0.050 U	10 U	<0.44 U	<0.16 U	< 0.093 U	< 1.25 U
	10/26/2016 [1]	<0.48 U	0.46 J	69.7	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	1.3	13.3 J	<0.050 U	2.3 J	<0.44 U	<0.16 U	1.15	1.86
	1/17/2017	0.91 J	0.87 J	85.9	<0.11 U	<0.19 U	0.75 J	<1.9 U	<0.25 U	7.0	7.1 J	<0.050 U	<1.7 U	<0.44 U	<0.16 U	<0.354 U	<0.758 U
	4/13/2017	0.63 J	0.60 J	< 97.2 U	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	1.0	20.0 U	<0.050 U	<1.7 U	<0.44 U	<0.16 U	7.12	<0.27 U
D-4	9/23/2015	<0.33 U	2.4	807	0.90	<0.23 U	8.7	2.3 J	<0.25 U	5.0	12.7 J	<0.050 U	<1.7 U	<0.50 U	<0.15 U	0.952	<1.13 U
	12/9/2015	<0.33 U	0.40 J	422	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	1.1	<8.0 U	<0.050 U	<1.7 U	<0.50 U	<0.15 U	0.611	<3.00 U
	2/8/2016	<0.33 U	0.44 J	429	<0.071 U	<0.23 U	0.84 J	<0.90 U	<0.25 U	0.51 J	<8.0 U	<0.050 U	<2.1 U	<0.50 U	<0.15 U	<-0.0544 U	<0.189 U
	4/25/2016	<0.33 U	0.54 J	420	<0.071 U	<0.20 U	0.75 J	<5.0 U	<0.25 U	0.39 J	<8.0 U	<0.20 U	<2.1 U	<0.50 U	<0.15 U	<0.426 U	<1.38 U
	4/25/2016 [1]	<0.33 U	<0.40 U	404	<0.071 U	<0.20 U	0.74 J	<5.0 U	<0.25 U	0.31 J	<8.0 U	<0.20 U	<2.1 U	<0.50 U	<0.15 U	<1.00 U	<3.00 U
	8/2/2016	<0.48 U	0.61 J	391	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.13 J	<4.8 U	<0.050 U	<1.7 U	<0.44 U	<0.16 U	0.728	<3.00 U
	8/2/2016 [1]	<0.48 U	0.47 J	399	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	1.0 U	<4.8 U	<0.050 U	<1.7 U	<0.44 U	<0.16 U	1.13	<3.00 U
	10/28/2016	<0.48 U	0.68 J	378	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	<0.090 U	<4.8 U	<0.050 U	9.0 J	<0.44 U	<0.16 U	1.60	< 0.289 U
	1/18/2017	<0.48 U	0.67 J	384	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.15 J	<4.8 U	<0.050 U	3.1 J	<0.44 U	<0.16 U	0.402	<0.436 U
	4/13/2017	<0.48 U	0.72 J	< 408 U	<0.11 U	<0.19 U	<0.59 UJ	<1.9 U	<0.25 U	0.18 J	<4.8 UJ	<0.050 U	<1.7 U	<0.44 U	<0.16 U	<0.0199 U	<1.04 U

Notes:

µg/L micrograms per Liter
mg/L milligrams per Liter
pCi/L picocurie per Liter
[1] Duplicate sample collected.

J Constituent detected below reportable quantitation limit; result is an estimated value.
U Constituent not detected above method detection limit.
NS Not Sampled

TABLE 6
BASELINE MONITORING PROGRAM APPENDIX III ANALYTICAL DATA - COMPLIANCE WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Analyte:		Boron		Calcium		Chloride	Fluoride	pH	Sulfate	TDS
Well ID	Sample Date	µg/L		mg/L		mg/L	mg/L	S.U.	mg/L	mg/L
Core-2S	9/18/2015	267	278	193	197	204	NS	NS	218	1,060
	9/18/2015 [1]	216	190	190	197	197	NS	NS	191	1,070 J
	12/14/2015	177	183	184	184	182	NS	NS	168	937
	2/10/2016	197	191	174	172	185	NS	NS	172	750
	4/27/2016	252	246	199	198	221	<0.25 U	7.8 J	219	875
	8/8/2016	168	167	189	190	62.7	<0.25 U	7.8	184	952
	10/28/2016	278	326	210	215	213	<0.25 U	8.0	221	964 J
	1/20/2017	252	234	208	198	188	<0.25 U	6.7	202	916
	4/14/2017	200	216	173	185	165	<0.25 U	7.7	184	859
	5/31/2017	NS	NS	NS	NS	NS	<0.25 U	7.5	NS	NS
	8/3/2017	NS	NS	NS	NS	NS	<0.25 U	7.7	NS	NS
	8/3/2017 [1]	NS	NS	NS	NS	NS	<0.25 U	7.7	NS	NS
	9/13/2017	NS	NS	NS	NS	NS	<0.25 U	7.32 [2]	NS	NS
D-6R	9/14/2015	4,520	4,840	680	694	369	<0.25 U	7.4 J	1,230	2,490 U
	12/9/2015	4,800	5,180	689	698	350	<0.25 U	7.2 J	1,290	2,510
	2/10/2016	5,050	5,140	712	724	393	<0.25 U	7.3	1,290	2,480 J
	4/22/2016	5,240	5,240	710	717	404	<0.25 U	7.2 J	1,220	2,660 J
	8/4/2016	4,740	5,040	693	706	349	<0.25 U	7.6 J	1,250	2,670
	10/26/2016	4,510	4,470	637	637	351	<0.25 U	7.7 J	1,200	2,500
	1/17/2017	5,140	4,760	643	592	349	<0.25 U	7.0	1,340	2,550
	4/13/2017	5,430	5,300	721	675	326	<0.25 U	7.3	1,250	2,660 J
MW-03	9/15/2015	9,580	10,200	476	506	294	<0.25 U	7.0 J	1,200	2,160
	9/15/2015 [1]	9,600	496	496	520	295	<0.25 U	6.49 [2]	1,130	2,190
	12/14/2015	9,130	9,660	481	496	247	<0.25 U	6.9 J	1,140	2,010
	2/16/2016	6,680	6,640	343	496	171	<0.25 U	7.6	837	1,560
	4/27/2016	7,990	7,960	377	496	196	<0.25 U	7.1 J	907	1,800
	8/4/2016	8,150	8,340	379	496	203	<0.25 U	6.8	991	1,940
	10/31/2016	11,200	11,100	505	487	291	<0.25 U	6.9	1,250	2,520
	1/18/2017	9,680	9,640	473	475	293	<0.25 U	6.8	1,180	2,210
	4/14/2017	8,680	8,630	415	421	227	<0.25 U	6.8	1,070	1,940
	4/14/2017 [1]	8,520	413	413	418	207	NS	6.27 [2]	1,050	2,220
MW-09	9/17/2015	2,420	2,510	398	296	96.4	<0.25 U	7.7 J	510	1,140
	12/16/2015	2,520	2,580	273	296	90.1	<0.25 U	8.0 J	432 J	1,110
	2/11/2016	2,820	2,750	402	287	97.1	<0.25 U	7.8 J	479	1,150
	4/29/2016	2,690	2,520	290	272	99.2	<0.25 U	8.0 J	495	1,040
	8/3/2016	2,520	2,450	280	276	101	<0.25 U	7.8	529	1,350
	10/27/2016	2,710	2,690	292	284	102	<0.25 U	7.7	506	1,300
	1/24/2017	2,850	2,800	302	294	104	<0.25 U	7.4	516	1,180
	4/14/2017	2,680	2,760	342	290	104	<0.25 U	7.3	576	1,400
MW-10S	9/15/2015	193	191	314	323	122	<0.25 U	7.6 J	500	1,320
	12/15/2015	186	188	321	320	114	<0.25 U	7.7 J	509	1,270
	2/11/2016	183	195	294	304	111	<0.25 U	7.8 J	474	991
	4/28/2016	211	223	307	326	106	<0.25 U	7.7 J	500	1,280
	8/5/2016	281	244	353	334	97.2	<0.25 U	7.6	538	1,270
	10/31/2016	288	298	355	354	107	<0.25 U	7.6	636	1,470
	1/24/2017	317	317	363	370	109	<0.25 U	7.3	660	1,480
	4/14/2017	324	283	348	340	94.8	<0.25 U	7.5	626	1,710 J
MW-12	9/14/2015	5,490	5,900	366	376	101	<0.25 U	7.1 J	880	1,530
	12/15/2015	4,620	5,480	326	329	91.8	<0.25 U	7.4 J	713	1,440
	12/15/2015 [1]	4,700	304	304	311	85.8	0.49 J	7.7 J	641	1,500
	2/16/2016	3,890	4,210	272	279	88.7	0.41 J	7.5	587	1,110
	4/27/2016	4,770	5,200	362	370	144	<0.25 U	7.1 J	776	1,640
	4/27/2016 [1]	4,860	5,250	369	374	134	<0.25 U	7.1 J	768	1,550
	8/8/2016	5,590	5,550	389	383	107	<0.25 U	7.4	882	2,000
	10/31/2016	7,480	7,220	381	380	98.3	<0.25 U	7.0	939	1,860
	1/24/2017	5,340	5,380	303	302	93.3	<0.25 U	6.8	639	1,320
	4/13/2017	6,360	6,410	337	338	86.5	<0.25 U	6.8	804	1,590
	4/13/2017 [1]	5,710	316	316	326	88.5	<0.25 U	6.9	729	1,820

TABLE 6
BASELINE MONITORING PROGRAM APPENDIX III ANALYTICAL DATA - COMPLIANCE WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Analyte:		Boron		Calcium		Chloride	Fluoride	pH	Sulfate	TDS
Well ID	Sample Date	µg/L		mg/L		mg/L	mg/L	S.U.	mg/L	mg/L
MW-13	9/15/2015	<50.0 U	<50.0 U	41.9	46.2	8.9	<0.25 U	8.0 J	24.1	210 J
	12/9/2015	16.7 J	10.2 J	45.0	44.2	9.4	<0.25 U	7.8 J	24.7	227
	2/16/2016	<50.0 U	<50.0 U	46.9	46.1	11.6	0.47 J	8.1	32.4	232
	4/27/2016	<50.0 U	8.4 J	44.4	47.6	11.1	<0.25 U	8.0 J	26.6	215
	8/8/2016	10.7 J	<8.3 U	45.5	46.0	10.3	<0.25 U	7.9	24.8	222
	11/1/2016	20.3 J	20.3 J	43.9	43.9	10.4	<0.25 U	7.2	24.8	216
	1/23/2017	<8.3 U	<8.3 U	47.0	45.2	10.8	<0.25 U	7.1	27.8	219
	1/23/2017 [1]	8.4 J	46.8	46.8	47.0	11.2	<0.25 U	7.2	27.6	199
	4/13/2017	9.4 J	11.3 J	47.9	46.8	11.1	<0.25 U	7.6	26.3	243

Notes:

µg/L micrograms per Liter
mg/L milligrams per Liter
S.U. Standard Units
J Constituent detected below reportable quantitation limit; result is an estimated value.
U Constituent not detected above method detection limit.
NS Not Sampled
[1] Duplicate sample collected.
[2] The result is a field measurement.

TABLE 7
BASELINE MONITORING PROGRAM APPENDIX IV ANALYTICAL DATA - COMPLIANCE WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

	Analyte:	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (III+VI)	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium-226	Radium-228
Well ID	**Sample Date**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	
Core-2S	9/18/2015	<0.33 U	0.84 J	130	0.092 J	<0.23 U	8.1 J	1.8 J	NS	0.86 J	9.8 J	<0.050 U	2.8 J	36.5	<0.15 U	NS	NS
	9/18/2015 [1]	<0.33 U	0.84 J	147	0.12 J	<0.23 U	20.9 J	1.8 J	NS	1.0	<8.0 U	<0.050 U	5.8 J	33.7	<0.15 U	NS	NS
	12/14/2015	<0.33 U	1.3 J	140	0.17 J	<0.23 U	3.5	<0.90 U	NS	1.1	<8.0 U	<0.050 U	<2.1 U	34.0	<0.15 U	NS	NS
	2/10/2016	<0.33 U	0.51 J	109	<0.071 U	<0.23 U	1.1 J	<0.90 U	NS	0.20 J	<8.0 U	<0.050 U	2.1 J	33.0	<0.15 U	NS	NS
	4/27/2016	<0.33 U	0.43 J	120	<0.071 U	<0.20 U	5.5	<0.90 U	<0.25 U	0.17 J	<8.0 U	<0.050 U	4.2 J	38.3	<0.15 U	<0.176 U	<1.65 U
	8/8/2016	<0.48 U	<0.40 U	111	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	<0.090 U	<4.8 U	<0.050 U	2.6 J	35.0	<0.16 U	0.685	<0.173 U
	10/28/2016	<0.48 U	0.68 J	95.8	<0.11 U	<0.19 U	0.74 J	<1.9 U	<0.25 U	<0.090 U	12.0 J	<0.050 U	3.6 J	47.2	<0.16 U	0.501	1.59 U
	1/20/2017	<0.48 U	0.74 J	103	<0.11 U	<0.19 U	2.5	<1.9 U	<0.25 U	0.81 J	6.4 J	<0.050 U	3.5 J	44.7	<0.16 U	2.13	1.87
	4/14/2017	<0.48 U	0.74 J	92.2	<0.11 U	<0.19 U	0.75 J	<1.9 U	<0.25 U	<0.090 U	10.9 J	<0.050 U	<1.7 U	40.0	<0.16 U	<0.354 U	<0.769 U
	5/31/2017	NS	NS	NS	NS	NS	NS	NS	<0.25 U	NS	NS	NS	NS	NS	NS	0.313	<0.838 U
	8/3/2017	NS	NS	NS	NS	NS	NS	NS	<0.25 U	NS	NS	NS	NS	NS	NS	<0.0519 U	<0.171 U
	8/3/2017 [1]	NS	NS	NS	NS	NS	NS	NS	<0.25 U	NS	NS	NS	NS	NS	NS	0.340	<-0.145 U
	9/13/2017	NS	NS	NS	NS	NS	NS	NS	<0.25 U	NS	NS	NS	NS	NS	NS	0.834	<-0.325 U
D-6R	9/14/2015	<0.33 U	<0.40 U	23.5	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	<0.13 U	740	0.28	17.6	81.3	<0.15 U	<1.00 U	<3.00 U
	12/9/2015	<0.33 U	<0.40 U	25.1 J	<0.071 U	<0.23 U	0.72 J	<0.90 U	<0.25 U	<0.13 U	760	0.19 J	28.9	77.5	<0.15 U	<1.00 U	<3.00 U
	2/10/2016	0.50 J	0.61 J	23.6	<0.071 U	<0.23 U	<0.70 U	<0.90 U	<0.25 U	<0.13 U	808	0.16 J	27.3	82.8	<0.15 U	1.82	<0.435 U
	4/22/2016	1.7	<0.40 U	30.2	<0.071 U	<0.20 U	0.88 J	<0.90 U	<0.25 U	<0.13 U	809	0.39	30.9	80.7	<0.15 U	4.30	<1.15 U
	8/4/2016	1.3	<0.40 U	24.8	<0.11 U	<0.19 U	1.6 J	<1.9 U	<0.25 U	<0.090 U	778	0.23	29.2	79.7	<0.16 U	<0.228 U	<0.448 U
	10/26/2016	6.2	0.61 J	36.0	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.21 J	848	<0.050 U	22.7	72.6	<0.16 U	0.414 U	1.42 U
	1/17/2017	2.4	0.62 J	37.2	<0.11 U	<0.19 U	0.60 J	<1.9 U	<0.25 U	0.22 J	845	0.074 J	28.6	84.0	<0.16 U	<0.143 U	<0.548 U
	4/13/2017	<0.48 U	1.1 J	23.5	<0.11 U	<0.19 U	<0.59 U	<1.9 U	<0.25 U	0.17 J	841	0.23	35.4	83.9	<0.16 U	<0.250 U	<-0.672 U
MW-03	9/15/2015	<0.33 U	0.82 J	64.4	<0.071 U	<0.23 U	4.5	<0.90 U	<0.25 U	<0.13 U	166	1.2	1,010	57.8	<0.15 U	0.550	1.38 U
	9/15/2015 [1]	<0.33 U	0.50 J	65.8	<0.071 U	<0.23 U	4.3	<0.90 U	<0.25 U	<0.13 U	169	1.2	1,010	57.6	<0.15 U	<1.00 U	<3.00 U
	12/14/2015	<0.33 U	1.2 J	56.4	0.12 J	<0.23 U	4.3	<0.90 U	<0.25 U	0.18 J	155	0.95	1,010	58.6	<0.15 U	<1.00 U	<3.00 U
	2/16/2016	<0.33 U	0.72 J	41.2	<0.071 U	<0.23 U	3.3	<0.90 U	<0.25 U	<0.13 U	123	0.71	1,040	45.5	<0.15 U	<0.838 U	<0.542 U
	4/27/2016	0.98 J	0.77 J	66.8	<0.071 U	<0.20 U	4.0	<0.90 U	<0.25 U	0.29 J	146	<0.42 U	1,250	49.0	<0.15 U	0.656	<1.34 U
	8/4/2016	<0.48 U	0.79 J	46.4	<0.11 U	0.23 J	2.9	<1.9 U	<0.25 U	<0.090 U	155	0.57	1,420	54.4	<0.16 U	0.746	<1.43 U
	10/31/2016	0.54 J	1.1 J	66.1	<0.11 U	0.25 J	6.1	<1.9 U	<0.25 U	0.62 J	189	0.86	1,250	54.3	<0.16 U	0.378 U	1.47 U
	1/18/2017	<0.48 U	1.1 J	45.6	<0.11 U	0.33 J	3.8	<1.9 U	<0.25 U	0.24 J	145	0.88	1,190	48.7	<0.16 U	1.49	2.10
	4/14/2017	<0.48 U	1.0 J	41.4	<0.11 U	0.24 J	3.0	<1.9 U	<0.25 U	<0.090 U	163	0.81	1,300	42.8	<0.16 U	<-0.157 U	<0.816 U
	4/14/2017 [1]	<0.48 U	1.2 J	41.7	<0.11 U	0.26 J	3.1	<1.9 U	NS	0.13 J	148	0.71	1,300	42.7	<0.16 U	<0.0645 U	1.66
MW-09	9/17/2015	<0.33 U	11.6	243	2.1	<0.23 U	76.0	21.0	<0.25 U	22.2	47.7	<0.050 U	<1.7 U	64.2	0.57	<1.00 U	<3.00 U
	12/16/2015	1.3 J	0.75 J	72.4	<0.071 J	<0.23 U	3.8	1.7 J	<0.25 U	0.53	13.5 U	<0.050 U	<16.0 U	45.2	<0.15 U	<0.553 U	<0.728 U
	2/11/2016	0.90 J	10.9	202	1.2	<0.23 U	41.0	13.0	<0.25 U	8.0	39.6	<0.050 U	6.2 J	57.1	0.21 J	0.909	<-0.182 U
	4/29/2016	2.7	1.4 J	80.7	0.15 J	<0.20 U	8.2	2.7 J	<0.25 U	1.6	25.0	<0.050 U	13.0	45.1	<0.15 U	0.497	1.72
	8/3/2016	1.4	0.88 J	66.8	<0.11 U	<0.19 U	3.7	2.4 J	<0.25 U	1.0	14.3 J	<0.050 U	6.8 J	41.2	<0.16 U	0.949	<3.00 U
	10/27/2016	2.4	1.1 J	70.6	0.11 J	<0.19 U	4.2	2.4 J	<0.25 U	1.2	23.2	<0.050 U	16.1	47.1	<0.16 U	0.480	0.534 U
	1/24/2017	1.1	0.85 J	58.2	<0.11 U	<0.19 U	3.4	<1.9 U	<0.25 U	0.89 J	15.6 J	<0.050 U	6.0 J	66.9	<0.16 U	<0.0429 U	<0.767 U
	4/14/2017	<0.48 U	8.1	261	1.2	<0.19 U	36.3	11.3	<0.25 U	13.4	34.5	<0.050 U	2.4 J	61.1	0.24 J	0.495	1.98

TABLE 7
BASELINE MONITORING PROGRAM APPENDIX IV ANALYTICAL DATA - COMPLIANCE WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

	Analyte:	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (III+VI)	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium-226	Radium-228
Well ID	**Sample Date**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	
MW-10S	9/15/2015	<0.33 U	0.52 J	108	<0.071 U	<0.23 U	4.2	<0.90 U	<0.25 U	0.15 J	8.1 J	<0.050 U	<1.7 U	131	<0.15 U	<1.00 U	<3.00 U
	12/15/2015	<0.33 U	0.58 J	118	<0.071 U	<0.23 U	8.7	<0.90 U	<0.25 U	0.50 J	<8.0 U	<0.050 U	6.3 J	138	<0.15 U	0.680	<3.00 U
	2/11/2016	<0.33 U	0.47 J	120	<0.071 U	<0.23 U	4.4	<0.90 U	<0.25 U	0.27 J	14.3 J	<0.050 U	<2.1 U	150	<0.15 U	<0.73 U	<0.824 U
	4/28/2016	<0.33 U	0.70 J	158	<0.071 U	<0.20 U	6.2	<0.90 U	<0.25 U	0.90 J	120 J	<0.050 U	5.2 J	161	<0.15 U	0.711	<0.384 U
	8/5/2016	<0.48 U	0.62 J	128	<0.11 U	<0.19 U	3.0	<1.9 U	<0.25 U	0.47 J	6.8 J	<0.050 U	<1.7 U	177	<0.16 U	<0.396 U	<0.459 U
	10/31/2016	<0.48 U	1.9 J	168	0.18 J	<0.19 U	140	3.3 J	<0.25 U	1.8	25.1	<0.050 U	5.1 J	186	<0.16 U	0.390	1.49 U
	1/24/2017	<0.48 U	0.78 J	59.5	<0.11 U	<0.19 U	3.2	<1.9 U	<0.25 U	0.13 J	17.2 J	<0.050 U	<1.7 U	179	<0.16 U	<0.102 U	<1.09 U
	4/14/2017	<0.48 U	0.79 J	76.2	<0.11 U	<0.19 U	3.5	<1.9 U	<0.25 U	0.094 J	20.1	<0.050 U	4.2 J	177	<0.16 U	<0.239 U	<-0.170 U
MW-12	9/14/2015	0.49 J	0.65 J	104	<0.071 U	<0.23 U	9.9	<0.90 U	<0.25 U	0.59 J	281	0.18 J	866	326	<0.15 U	0.882	<3.00 U
	12/15/2015	<0.33 U	0.61 J	68.5	<0.071 U	<0.23 U	6.1	<0.90 U	<0.25 U	0.13 J	202	0.26	569	263	<0.15 U	<0.225 U	<-0.206 U
	12/15/2015 [1]	<0.33 U	1.0 J	68.5	<0.071 U	<0.23 U	6.3	<0.90 U	0.49 J	0.14 J	202	0.29	565	272	<0.15 U	NS	NS
	2/16/2016	0.72 J	<0.40 U	67.4	<0.071 U	<0.23 U	6.3	<0.90 U	0.41 J	0.21 J	190	<0.050 U	539	297	<0.15 U	<0.643 U	1.49
	4/27/2016	0.35 J	<0.40 U	68.5	<0.071	<0.20	6.0	1.1	<0.25	0.30	247	<0.050	767	435	<0.15	0.555	<0.929 U
	4/27/2016 [1]	<0.33 U	0.46 J	69.7	<0.071	<0.20	6.1	<0.90	<0.25	0.29	251	0.060	770	434	<0.15	0.437	<-0.462 U
	8/8/2016	<0.48 U	0.52 J	69.4	<0.11 U	<0.19 U	4.8	<1.9 U	<0.25 U	<0.090 U	305	0.30	1,100	408	<0.16 U	0.851	<0.0876 U
	10/31/2016	<0.48 U	0.52 J	62.4	<0.11 U	<0.19 U	9.3	<1.9 U	<0.25 U	<0.090 U	251	0.48	868	295	<0.16 U	0.48 U	1.62 U
	1/24/2017	<0.48 U	0.57 J	50.3	<0.11 U	<0.19 U	5.6	<1.9 U	<0.25 U	0.36 J	170	0.18 J	531	216	<0.16 U	<0.133 U	<-0.0898 U
	4/13/2017	<0.48 U	0.89 J	64.3	<0.11 U	<0.19 U	7.6	<1.9 U	<0.25 U	0.23 J	199	0.30	678	258	<0.16 U	0.326	<0.283 U
	4/13/2017 [1]	<0.48 U	0.82 J	59.7	<0.11 U	<0.19 U	6.9	<1.9 U	<0.25 U	0.29 J	179	0.28	588	248	<0.16 U	2.11	<-0.447 U
MW-13	9/15/2015	<0.33 U	<0.40 U	62.8	<0.071 U	<0.23 U	1.9 J	<0.90 U	<0.25 U	0.31 J	<8.0 U	<0.050 U	<1.7 U	0.78 J	<0.15 U	1.57	<3.00 U
	12/9/2015	<0.33 U	0.66 J	78.4	0.13 J	<0.23 U	2.9	<0.90 U	<0.25 U	0.79 J	<8.0 U	<0.050 U	<10.0 U	0.91 J	<0.15 U	<1.00 U	<3.00 U
	2/16/2016	<0.33 U	1.2 J	96.3	0.39 J	<0.23 U	5.7	<0.90 U	0.47 J	2.4	<8.0 U	<0.050 U	<2.1 U	1.4 J	<0.15 U	<0.247 U	<0.0617 U
	4/27/2016	<0.33 U	0.47 J	66.0	<0.071 U	<0.20 U	1.7 J	<0.90 U	<0.25 U	0.43 J	<8.0 U	<0.050 U	<2.1 U	10.0 J	<0.15 U	0.554	<1.15 U
	8/8/2016	<0.48 U	<0.40 U	62.5	<0.11 U	<0.19 U	1.4 J	<1.9 U	<0.25 U	0.20 J	<4.8 U	<0.050 U	6.4 J	0.90 J	<0.16 U	0.542	<0.681 U
	11/1/2016	<0.48 U	<0.40 U	52.4	<0.11 U	<0.19 U	1.3 J	<1.9 U	<0.25 U	0.17 J	5.7 J	<0.050 U	2.8 J	0.92 J	<0.16 U	0.448	2.69 U
	1/23/2017	<0.48 U	0.68 J	54.0	<0.11 U	<0.19 U	2.4	<1.9 U	<0.25 U	0.49 J	6.8 J	<0.050 U	<1.7 U	1.2 J	<0.16 U	<0.323 U	<-0.125 U
	1/23/2017 [1]	<0.48 U	0.75 J	56.3	<0.11 U	<0.19 U	1.3 J	<1.9 U	<0.25 U	0.31 J	7.8 J	<0.050 U	2.4 J	1.1 J	<0.16 U	NS	NS
	4/13/2017	<0.48 U	0.94 J	82.3	0.14 J	<0.19 U	2.5	<1.9 U	<0.25 U	0.90 J	12.8 J	<0.050 U	6.1 J	1.0 J	<0.16 U	0.484	<0.430 U

Notes:

µg/L micrograms per Liter
mg/L milligrams per Liter
pCi/L picocurie per Liter
[1] Duplicate sample collected.

J Constituent detected below reportable quantitation limit; result is an estimated value.
J- Constituent detected below reporting limit; result is an estimated value with a low bias.
U Constituent not detected above method detection limit.
NS Not Sampled

TABLE 8
BACKGROUND CONCENTRATIONS FOR APPENDIX III PARAMETERS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B - Maryland

Appendix III Parameter	Unit	UPL [1]
Boron	µg/L	25
Calcium	mg/L	53.4
Chloride	mg/L	17.5
Fluoride	mg/L	[2]
pH	S.U.	7.02-8.45
Sulfate	mg/L	25.4
Total Dissolved Solids	mg/L	325

Notes:

MCL Maximum Contaminant Level
SMCL Secondary Maximum Contaminant Level
UPL Upper Prediction Limit
µg/L micrograms per Liter
mg/L milligrams per Liter
S.U. Standard Units

[1] Subject to change as additional data are generated. Calculations provided in Statistical Analysis Calculations Package for Background Groundwater – Cell B, Westland Ash Storage Facility, Dickerson, MD (Geosyntec, 2017)

[2] The Double Quantification Rule (DQR) is used for background data sets with no detections.

TABLE 9
DETECTION MONITORING PROGRAM APPENDIX III ANALYTICAL DATA - BACKGROUND WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B, Maryland

	Analyte:	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	TDS
Well ID	Sample Date	µg/L	mg/L	mg/L	mg/L	S.U.	mg/L	mg/L
D-2	10/30/2017	<10.1 U	36.8	11.5	<0.25 U	7.3	16.3	212
D-3	10/27/2017	10.3 J	50.8	15.3	0.31 J	7.6	24.8	255
D-4	10/30/2017	<10.1 U	48.2	9.7	0.34 J	7.7	16.0	229

Notes:

µg/L micrograms per Liter
mg/L milligrams per Liter
S.U. Standard Units
J Constituent detected below reportable quantitation limit; result is an estimated value.
U Constituent not detected above method detection limit.
NS Not Sampled

TABLE 10
DETECTION MONITORING PROGRAM APPENDIX III ANALYTICAL DATA - COMPLIANCE WELLS

FEDERAL CCR RULE - 2017 ANNUAL GROUNDWATER AND CORRECTIVE ACTION REPORT
Westland Facility Cell B, Maryland

	Analyte:	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	TDS
Well ID	**Sample Date**	µg/L	mg/L	mg/L	mg/L	S.U.	mg/L	mg/L
Core-2S	10/26/2017	317	199	181	<0.25 U	7.6	228	1,030
D-6R	10/27/2017	5,180	676	338	<0.25 U	7.3	1,330	2,860
MW-03	10/26/2017	10,700	494	362	<0.25 U	6.7	1,330	2,640
MW-09	10/26/2017	2,580	276	95.2	<0.25 U	7.4	505	1,410
MW-10S	10/26/2017	311	353	86.5	<0.25 U	7.3	608	1,290
MW-12	10/26/2017	7,000	371	101	<0.25 U	6.7	991	1,990
MW-13	10/30/2017	<10.1 U	44.5	11.0	<0.25 U	7.4	24.9	256
	10/30/2017 [1]	<10.1 U	45.1	10.7	<0.25 U	7.6	24.6	221

Notes:

µg/L micrograms per Liter

mg/L milligrams per Liter

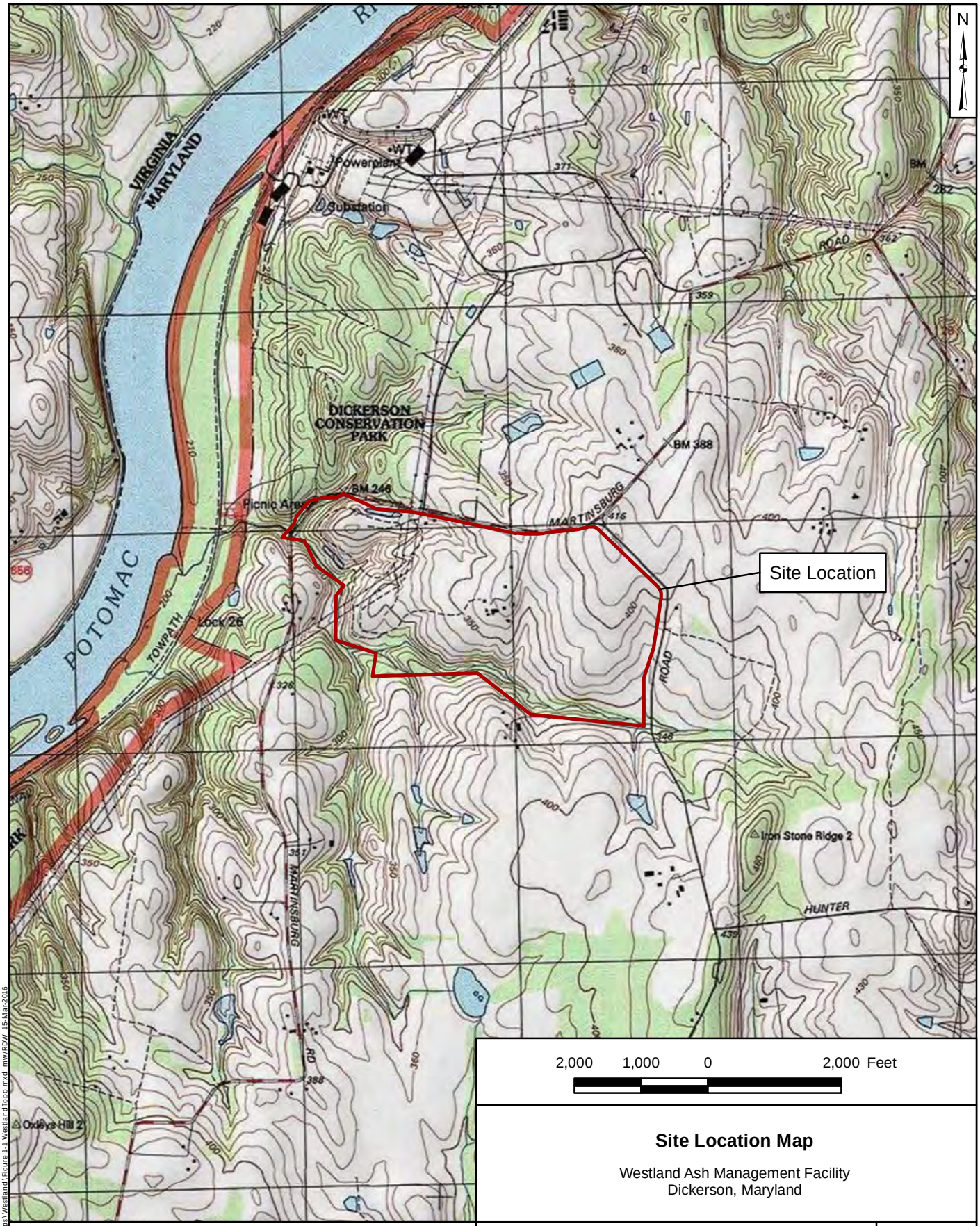
S.U. Standard Units

J Constituent detected below reportable quantitation limit; result is an estimated value.

U Constituent not detected above method detection limitt.

[1] Duplicate sample collected.

FIGURES



Site Location Map

Westland Ash Management Facility
Dickerson, Maryland

Source:
USGS Topographic Quadrangle - Dickerson, Maryland, provided by the National Geographic Society, i-cubed. © 2011 National Geographic Society, i-cubed

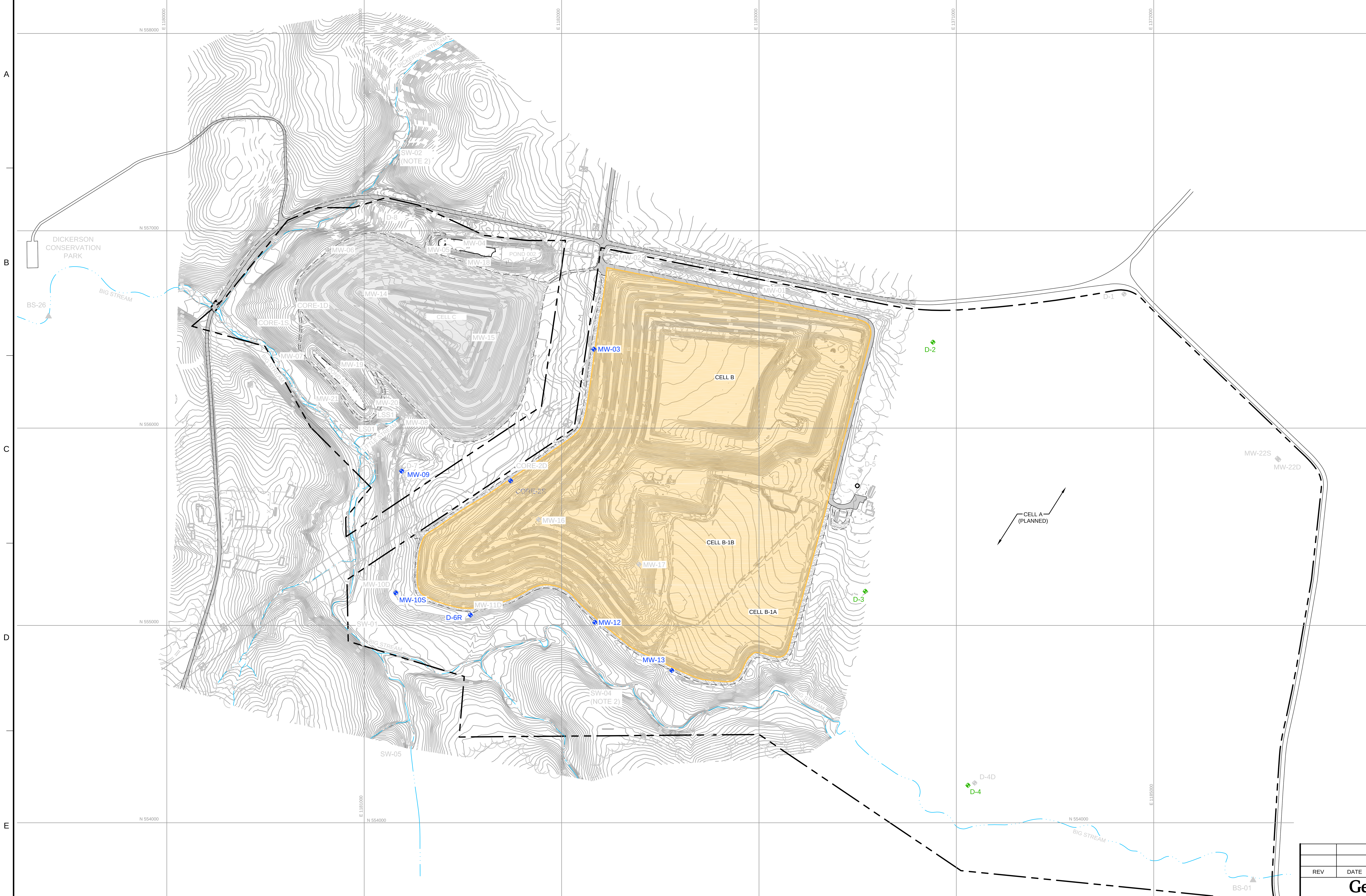
Geosyntec consultants

Columbia, Maryland

January 2018

Figure 1

Path: P:\GIS\NRG\GeoOn\Maps\Westland\Figure 1-1 Westland Topo.mxd: mw/RDW: 15-Mar-2016



N

LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- BUILDING
- WATER / CHANNEL LINE
- WET AREA
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. EXISTING CONDITIONS COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 28 DECEMBER 2013 EXCEPT AS FOLLOWS. EXISTING LEACHATE TRANSMISSION PIPES WITHIN CELLS B, B-1A, AND B-1B OBTAINED FROM FLORA SURVEYING ASSOCIATES, INC. BASED ON FIELD-RUN SURVEY DATED 2010; LOCATIONS OF OTHER LEACHATE TRANSMISSION LINES ARE APPROXIMATE.
2. HORIZONTAL CONTROL IS MARYLAND STATE PLAN COORDINATE SYSTEM, NAD27; VERTICAL CONTROL IS NGVD29.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

TITLE: GROUNDWATER MONITORING WELL NETWORK

PROJECT: FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

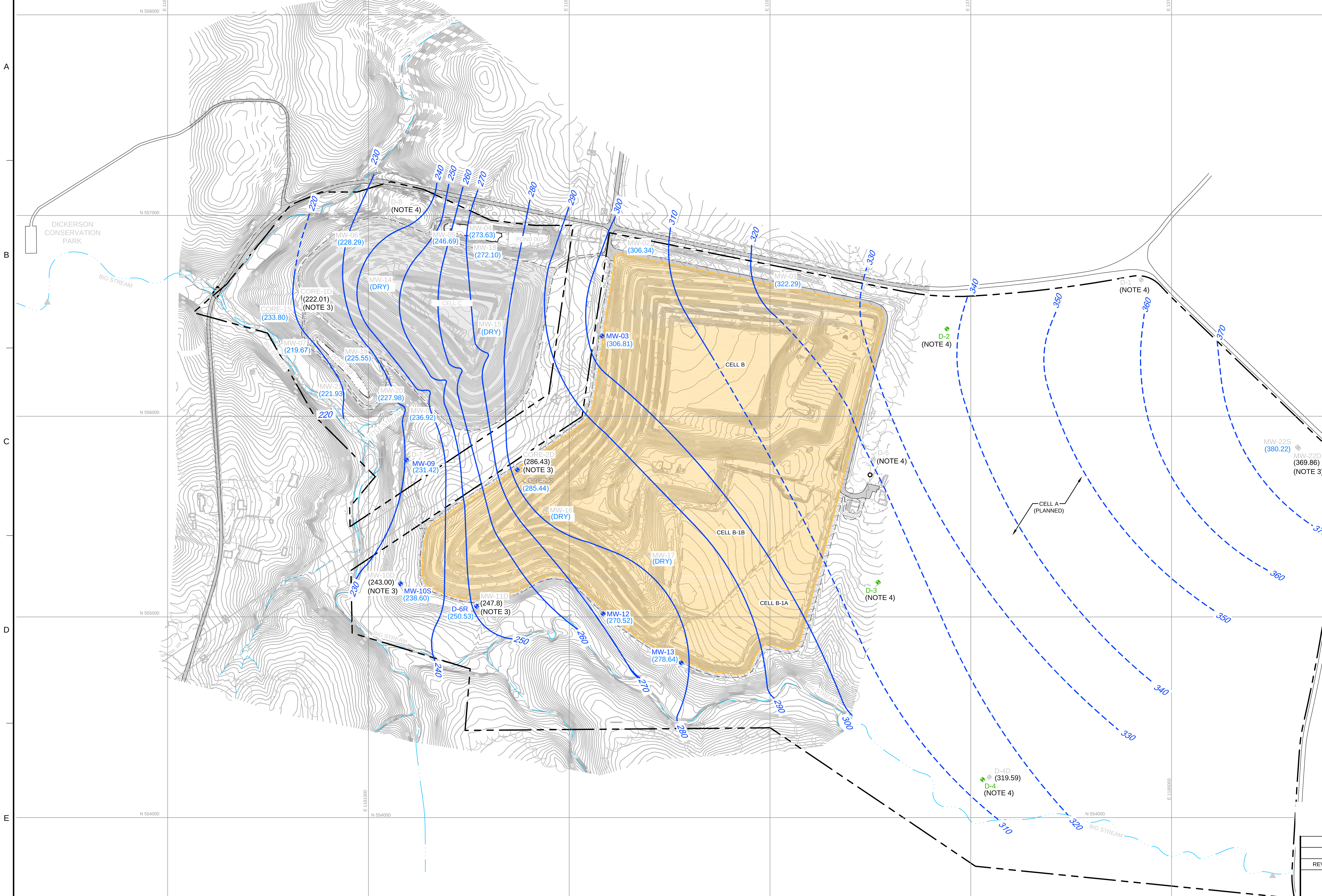
SITE: WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION

SIGNATURE

DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 2-3
REVIEWED BY:	RMG	FIGURE NO.:	
APPROVED BY:	MAJ		2



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 14 SEPTEMBER 2015. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.
4. WELLS WERE INACCESSIBLE AT THE TIME OF WATER LEVEL MEASUREMENTS.

0 250' 500'

SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA, MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

TITLE:

GROUNDWATER POTENTIOMETRIC SURFACE - SEPTEMBER 2015

PROJECT:

FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE:

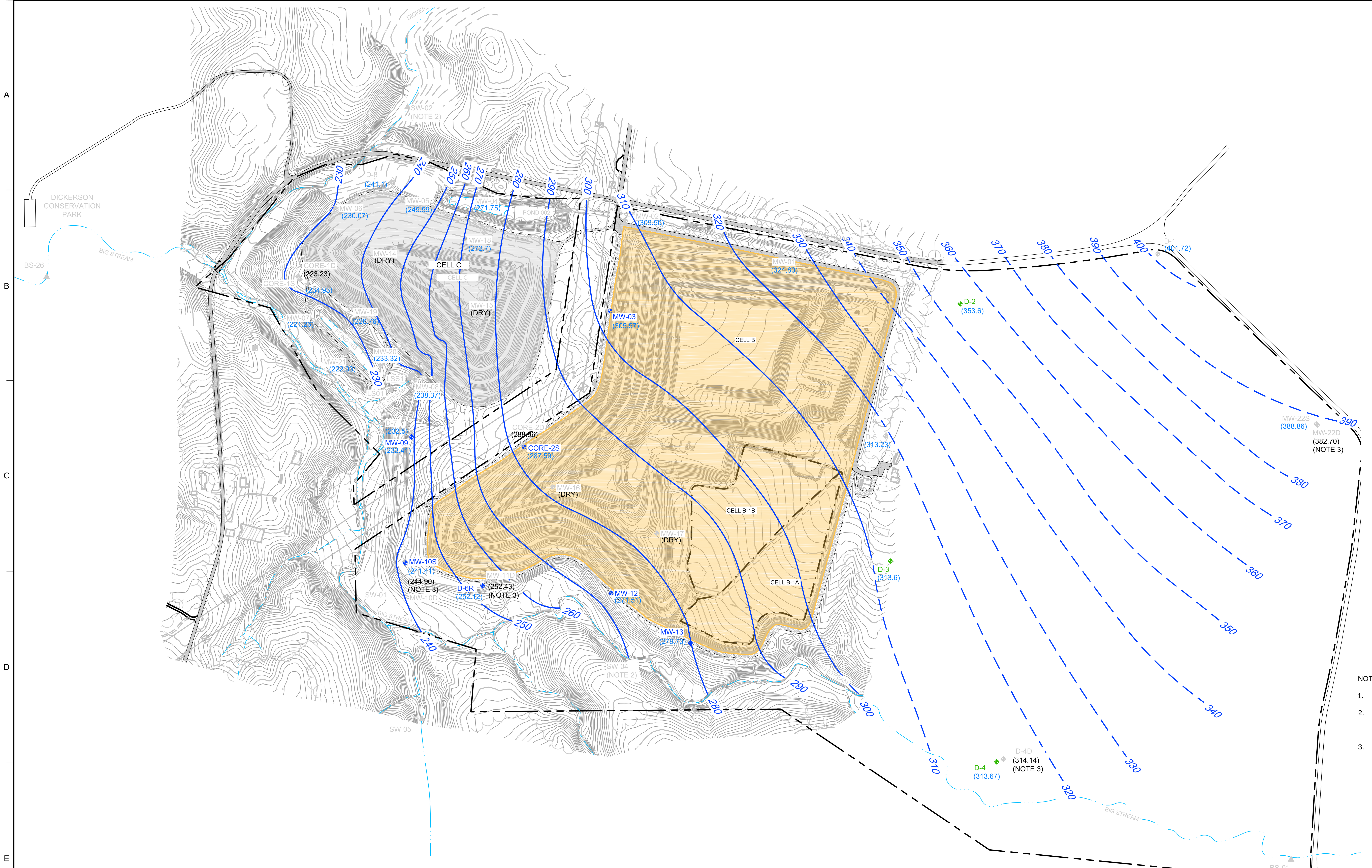
WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION

SIGNATURE

DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 2-3
REVIEWED BY:	RMG	FIGURE NO.:	
APPROVED BY:	MAJ		3



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 7 DECEMBER 2015. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA, MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

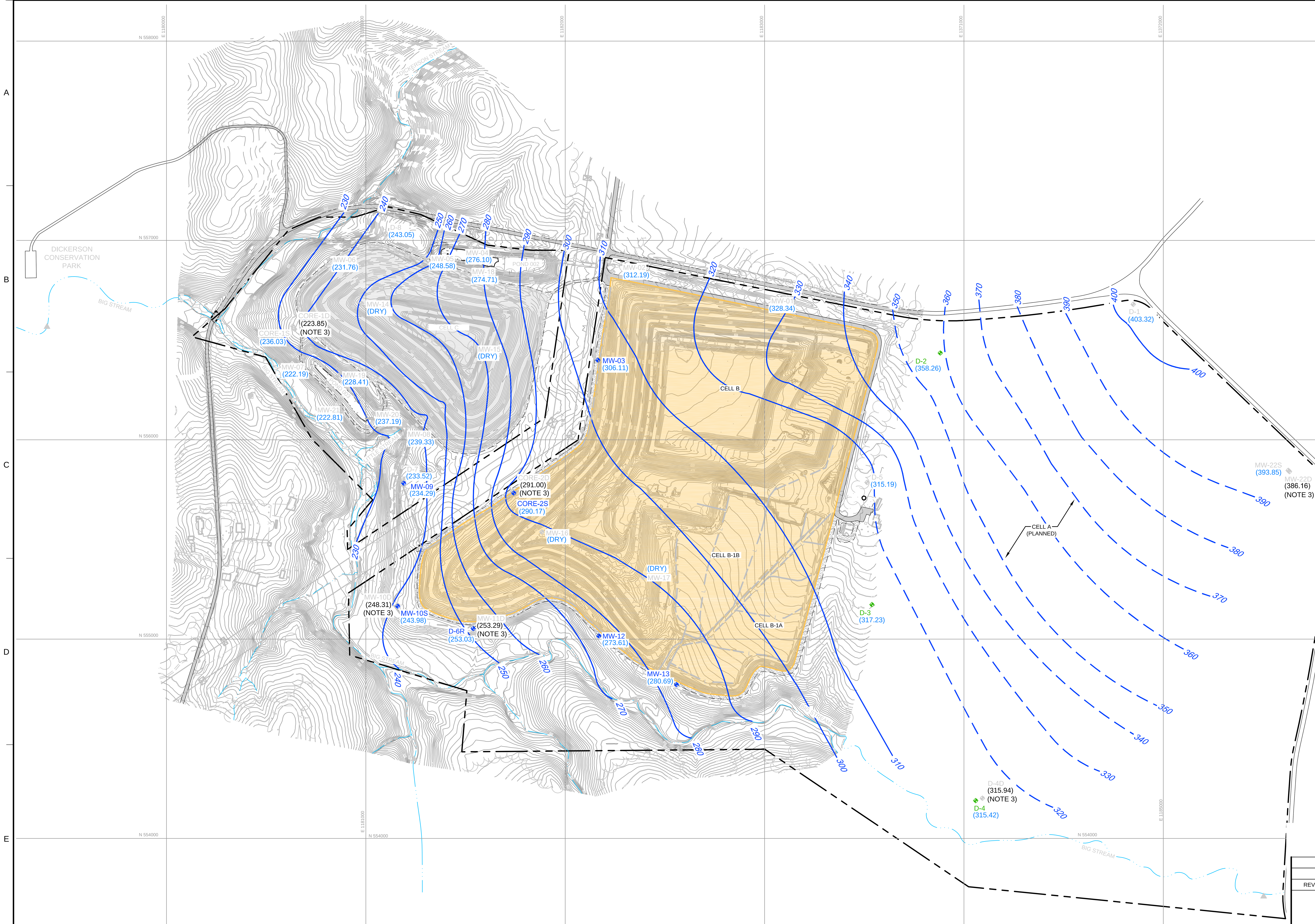
TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE - DECEMBER 2015

PROJECT:
FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE:
WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION
SIGNATURE
DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 4
REVIEWED BY:	RMG	FIGURE NO.:	
APPROVED BY:	MAJ		4



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 — POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 8 FEBRUARY 2016. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA, MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

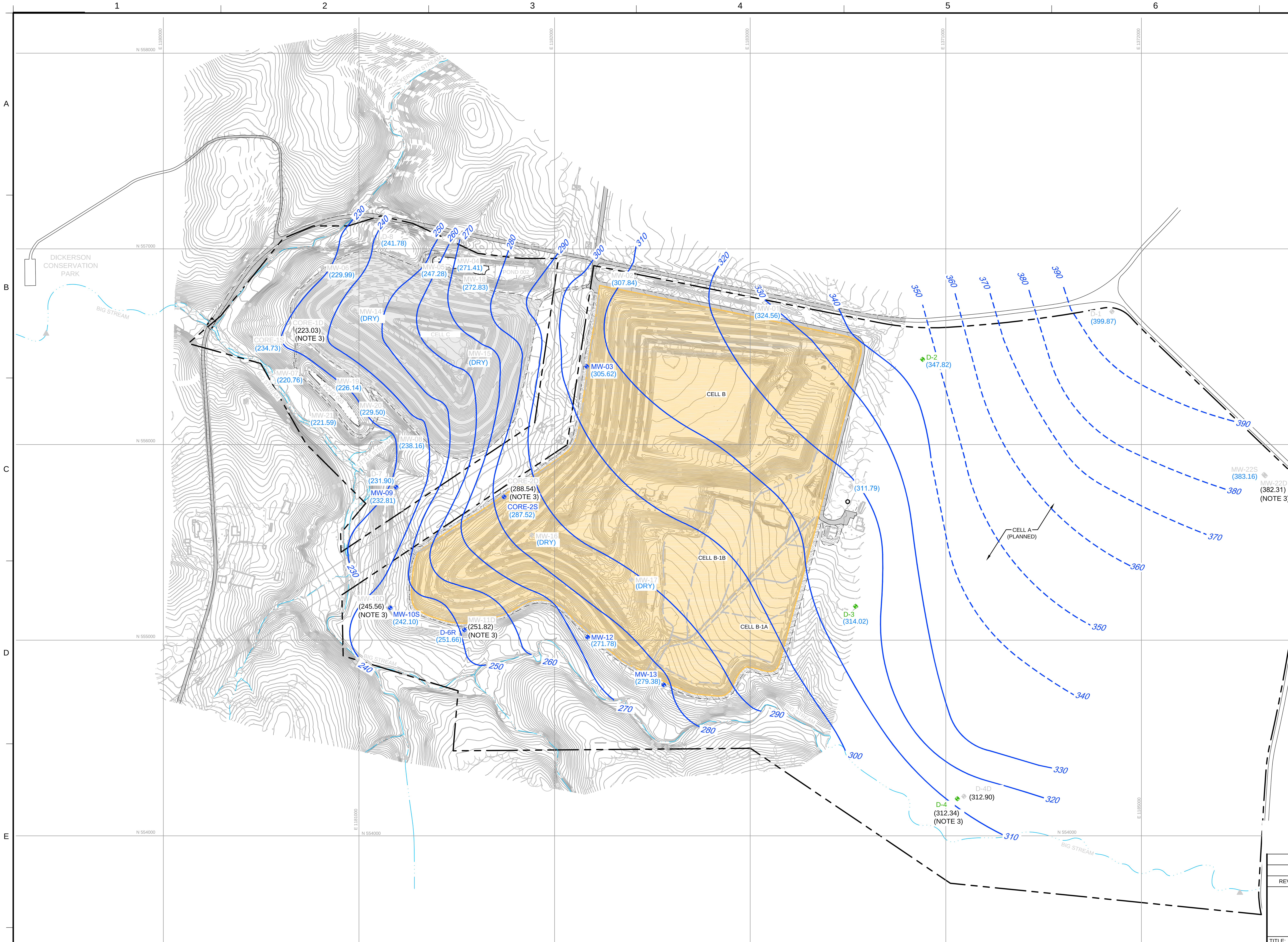
TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE - FEBRUARY 2016

PROJECT:
FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE:
WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION
SIGNATURE
DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 5
REVIEWED BY:	RMG	FIGURE NO.:	
APPROVED BY:	MAJ		5



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 21 APRIL 2016. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA, MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

TITLE: GROUNDWATER POTENTIOMETRIC SURFACE - APRIL 2016

PROJECT: FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

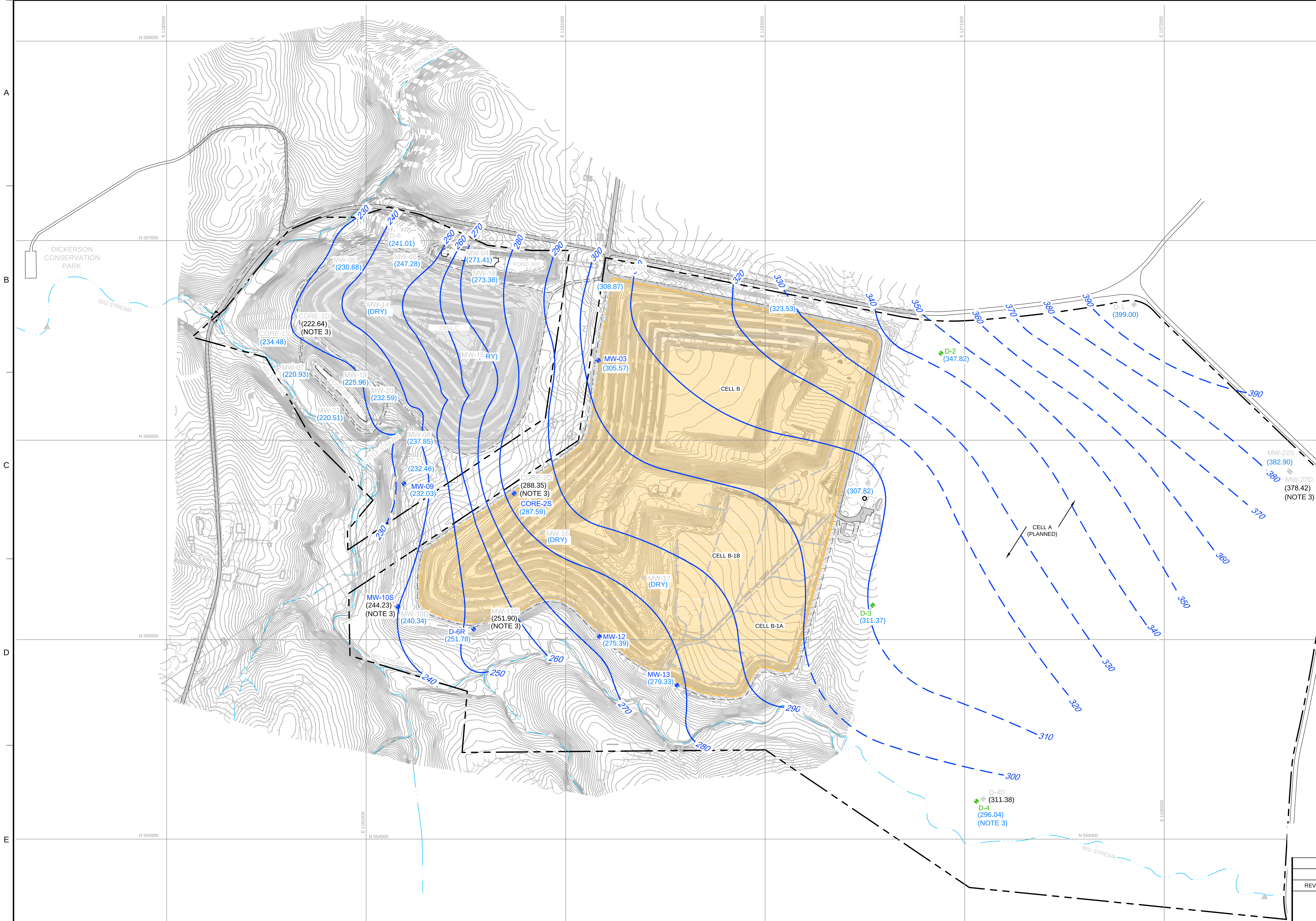
SITE: WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION

SIGNATURE

DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 6
REVIEWED BY:	RMG	FIGURE NO.:	6
APPROVED BY:	MAJ		



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 — POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 1 AUGUST 2016. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

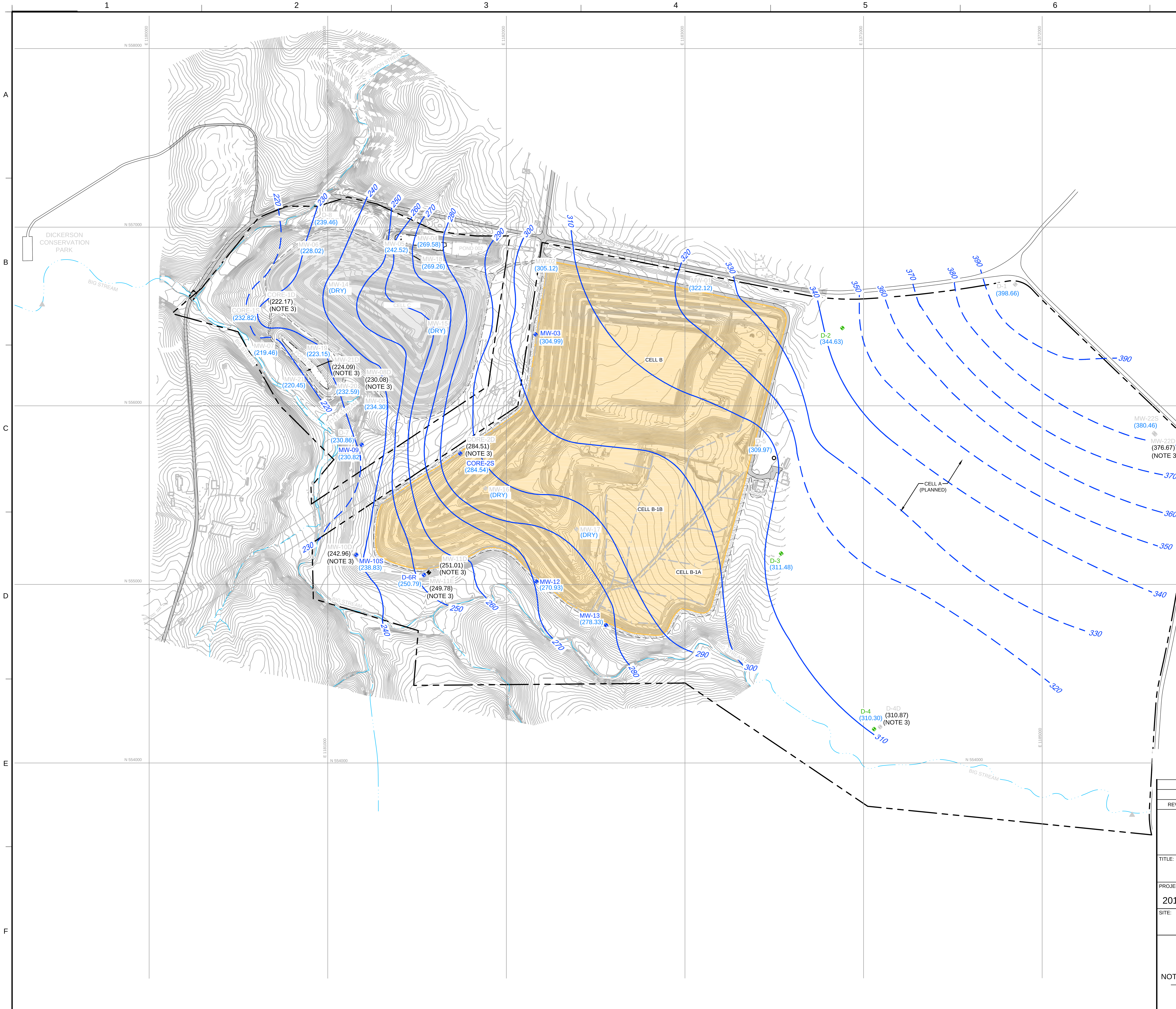
TITLE: GROUNDWATER POTENTIOMETRIC SURFACE - AUGUST 2016

PROJECT: FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE: WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION
SIGNATURE
DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 7
REVIEWED BY:	RMG	FIGURE NO.:	7
APPROVED BY:	MAJ		



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 25 OCTOBER 2016. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA, MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

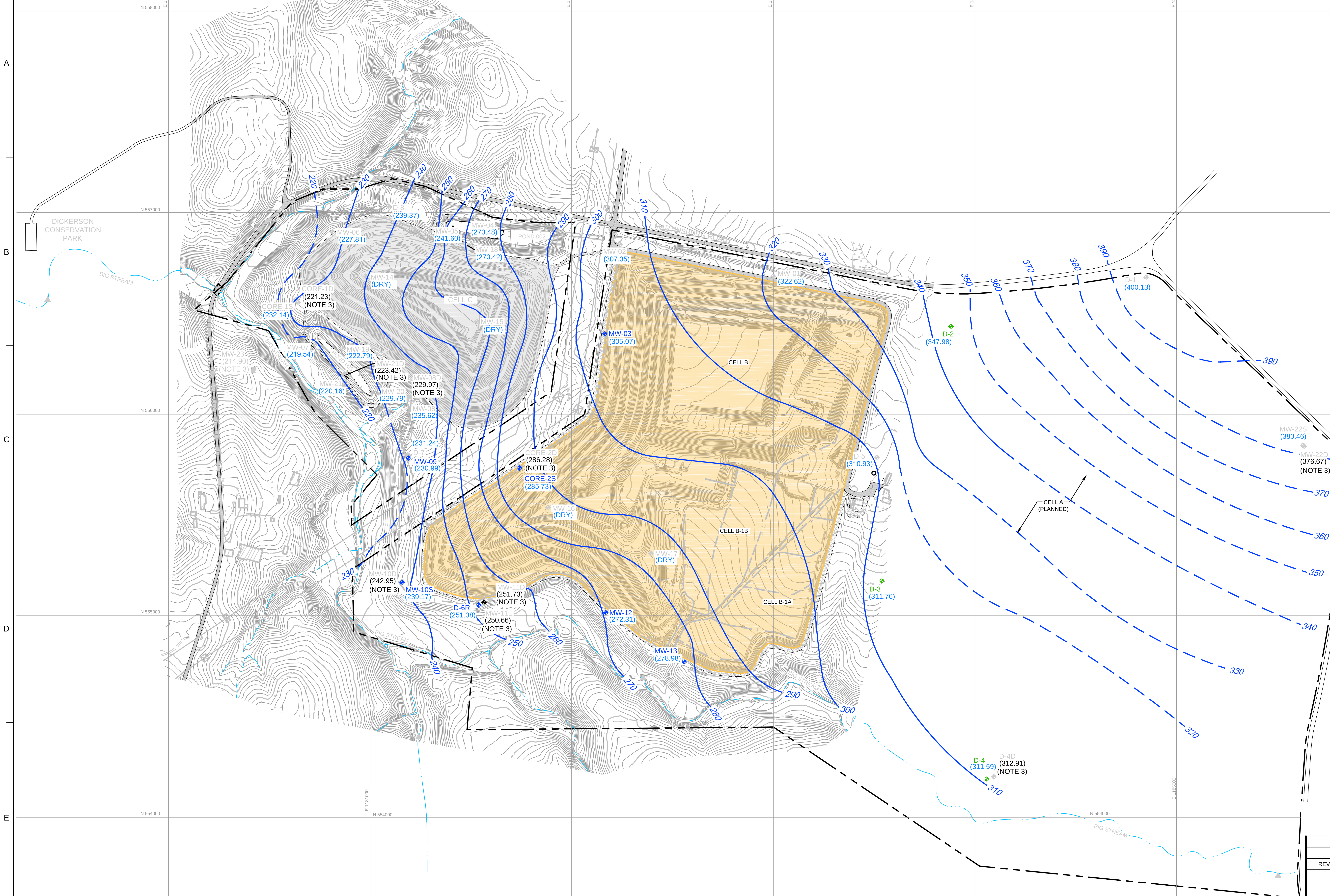
TITLE: GROUNDWATER POTENTIOMETRIC SURFACE - OCTOBER 2016

PROJECT: FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE: WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION
SIGNATURE
DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 8
REVIEWED BY:	RMG	FIGURE NO.:	8
APPROVED BY:	MAJ		



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE CELL LIMIT
- GRADE CONTOUR (FEET, MSL)
- PAVED / UNPAVED ROAD
- STRUCTURE
- STREAM
- LEACHATE COLLECTION / TRANSMISSION LINE
- TREELINE
- MONITORING WELL USED FOR WATER LEVELS ONLY
- SURFACE WATER STATION USED FOR WATER LEVELS ONLY
- BACKGROUND MONITORING WELL
- COMPLIANCE MONITORING WELL
- 300 POTENTIOMETRIC SURFACE CONTOUR (NOTE 2)
- INFERRED POTENTIOMETRIC SURFACE CONTOUR
- (398.33) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 2)
- (367.1) MEASURED GROUNDWATER ELEVATION (FEET-MSL) (NOTE 3)
- CCB MANAGEMENT UNITS NOT REGULATED UNDER THE CCR RULE (APPROXIMATE LIMITS)
- CCB MANAGEMENT UNIT REGULATED BY THE CCR RULE (APPROXIMATE LIMITS)

NOTES:

1. SEE FIGURE 2 FOR GENERAL NOTES.
2. POTENTIOMETRIC SURFACE DATA COLLECTED BY GEOSYNTEC CONSULTANTS ON 16 JANUARY 2017. MEASURED ELEVATION PROVIDED ADJACENT TO EACH MONITORING WELL ID IN FEET-MEAN SEA LEVEL.
3. MEASURED ELEVATION OF GROUNDWATER IN THIS DEEP WELL WAS NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE.

0 250' 500'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
10211 WINCOPIN CIRCLE, 4TH FLOOR
COLUMBIA MARYLAND 21044 USA
PHONE: 410.381.4333

GenOn

TITLE: GROUNDWATER POTENTIOMETRIC SURFACE - JANUARY 2017

PROJECT: FEDERAL CCR RULE
2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

SITE: WESTLAND ASH MANAGEMENT FACILITY CELL B
DICKERSON, MARYLAND

NOT FOR CONSTRUCTION
SIGNATURE
DATE

DESIGN BY:	MB	DATE:	JANUARY 2018
DRAWN BY:	JOC	PROJECT NO.:	MEM0823C
CHECKED BY:	MB	FILE:	FIG 9
REVIEWED BY:	RMG	FIGURE NO.:	
APPROVED BY:	MAJ		9

APPENDIX A

Groundwater Flow Velocity Calculation

Appendix A

Groundwater Velocity Calculation

Westland Ash Management Facility Cell B

Dickerson, Maryland

1. Governing Equation

Groundwater flow velocity at the Site was calculated between several monitoring wells around Cell B of the Site. The calculations were performed using the following equation.

$$V_{\eta} = \frac{K}{\eta} \times \frac{\Delta h}{\Delta l}$$

Where:

V_{η} = Groundwater velocity (cm per second)
K = Hydraulic conductivity estimated through aquifer pumping tests
η = Effective porosity %
Δh = Change in groundwater elevation between two points
Δl = Distance between two points

This equation is for Darcy flow through porous media, but is a reasonable approximation at the site-wide scale for fractured bedrock at Westland.

2. Hydraulic Conductivity

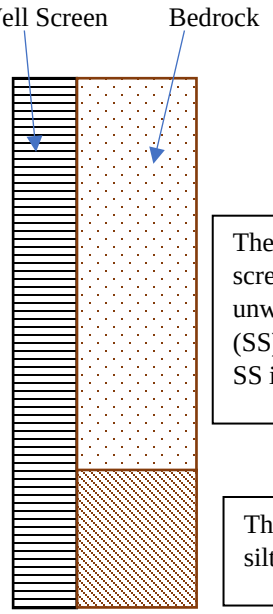
Hydraulic conductivity (*K*) was calculated at select monitoring wells around Phase II. The boreholes for monitoring wells Core 2S, MW-03, MW-09, MW-10S, MW-12, and MW-13 were packer tested prior to well installation. The location of the packer tested wells are shown on **Figure 3**. Straddle packer tests were used to calculate *K* of each monitoring well. The *K* value for each packer test interval within a given borehole was averaged, which generated an average *K* for each test interval. Average *K* values are presented in **Table A-1**. The average of the K value between two monitoring wells is presented on **Table A-2**.

3. Average Porosity

As shown on **Table A-1**, each monitoring well has an average porosity (η) calculated for each screen interval. The averaged η values were obtained from *Groundwater and Wells, Second Edition, Driscoll* [Driscoll, 1986]. A range for η is presented in [Driscoll, 1986] and the average for each η range was used in the calculation. The published η values and the calculated average η values are presented on **Table A-1**.

The averaged η value was then used to estimate an η value for each screen based on the geology observed during the well installation. See diagram below to see how η was estimated for each boring monitoring well screen.

EXAMPLE POROSITY ESTIMATION FOR WELL SCREEN



$$Average\ \eta\ of\ the\ well\ screen = (\eta_{SS} \times 0.8) + (\eta_{MS} \times 0.2)$$

$$Average\ \eta\ of\ the\ well\ screen = (5_{SS} \times 0.8) + (31_{MS} \times 0.2)$$

$$Average\ \eta\ of\ the\ well\ screen = (4) + (6.2)$$

$$Average\ \eta\ of\ the\ well\ screen = 10.2\%$$

The top 8 feet of the screen is screened in unweathered sandstone (SS). The average η of SS is 5%.

The bottom 2 feet of the screen is screened in siltstone (MS). The average η of MS is 31%.

Boring logs were provided in *Basis for Groundwater Monitoring Network* [Geosyntec, 2017a].

After the average η value was calculated for each well screen, the average of the η values between the two monitoring wells along a groundwater flow path was calculated. See **Table A-1** for the calculated average η for each monitoring well screen. The average η value between the two monitoring wells was the η used to calculate the groundwater velocity. Average η value between monitoring wells is presented on **Table A-2**.

4. Monitoring Well Selection

To estimate groundwater velocity, monitoring wells upgradient and downgradient of Cell B were selected. Ideally, monitoring wells should be along a groundwater flow path. Based on that requirement, the groundwater velocity was calculated between D-2 and the downgradient monitoring wells. See **Figure 4** to **Figure 11** for the selected well locations relative to groundwater flow.

5. Groundwater Velocity

Groundwater velocity around Cell B ranged from 1.93 X 10^{-5} centimeters per second (cm/sec) (20.00 inches/month) between monitoring wells D-2 and MW-3 to 4.16 X 10^{-6} cm/sec (4.31 inches/year) between monitoring wells D-2 and MW-13. The average groundwater velocity around Cell B was calculated at 6.45 X 10^{-6} cm/sec (6.68 inches/year). **Table A-2** presents the calculated groundwater velocities. Therefore, to be considered independent samples, groundwater monitoring events should be at least 1.5 months apart for groundwater to completely travel through the 8-inch diameter borehole.

APPENDIX A
TABLE A-1
Groundwater Flow Velocity Variables

Westland CCR Management Facility Cell B
Dickerson, Maryland

Groundwater Velocity Equation

$$V_\eta = \frac{K}{\eta} \times \frac{\Delta h}{\Delta l}$$

V_η = linear groundwater velocity
K = hydraulic conductivity (cm/sec)
η = effective porosity (unitless)
Δh = change in head between wells (ft)
Δl = distance between wells (ft)

Well ID:	Average Hydraulic Conductivity (K) (cm/sec) [3]
D-2 [1]	5.73E-05
Core-2S	7.22E-06
D-6R [2]	1.89E-05
MW-3	3.32E-04
MW-09	5.08E-08
MW-10S	1.12E-05
MW-12	2.66E-05
MW-13	5.04E-06

Upgradient Well	Downgradient Well	Δl (ft)	Δh (ft)
D-2	Core-2S	2,220	66.01
D-2	D-6R	2,737	101.48
D-2	MW-3	1,710	48.03
D-2	MW-09	2,772	121.1
D-2	MW-10S	2,997	112.19
D-2	MW-12	2,207	82.09
D-2	MW-13	2,115	73.9

Rock Type	Effective Porosity % (η) [4]	Average η
Sandstone (SS)	5	5
Sandstone (mod. Weathered)	15	15
Sandstone (highly weathered)	30	30
Siltstone (MS)	21 - 41	31

Well Location	Geology Observed in Screened Intreval	Average η of Screen
D-2 [5]	Unknown	27.5
Core-2S	50/50 High-moderate weather SS	22.5
D-6R [5]	Unknown	27.5
MW-3	Highly Weathered SS	30.0
MW-09	50/50 High-moderate weather SS	27.8
MW-10S	Highly Weathered SS	24.2
MW-12	50/50 SS - moderate weather SS	30.0
MW-13	Highly Weathered SS	30.2

Notes:
ft - feet
cm/sec - centimeters per second
[1] - Hydraulic conductivity is an average of the Cell B compliance monitoring wells.
[2] - Hydraulic conductivity is an average of MW-12 and MW-10s, which are located on either side of D-6R.
[3] - Average hydraulic conductivity is the average of the hydraulic conductivity calculated in the interval in which the well is screened.
[4] - Porosity is an average of the rock types observed at the Site.
[5] - Average porosity of the screen is an average of the Cell B compliance well screen porosity values.

APPENDIX A
Table A-2
Groundwater Flow Velocity Calculation

Westland CCR Management Facility Cell B
Dickerson, Maryland

Well ID:	Hydraulic Conductivity (K) (cm/sec)	Average Porosity of Screen Interval (%)	Average K (cm/sec) [1]	Average η	Δ h (ft)	Δ l (ft)	Δ h/Δ l	Linear Velocity (cm/sec)	Linear Velocity (inches/month)
D-2	6.37E-05	27.5	NA	NA	NA	NA	NA	**NA**	**NA**
Core-2S	7.22E-06	22.5	3.54E-05	0.24975	66.01	2,220	0.0297	**4.22E-06**	**4.37**
D-6R	6.37E-05	27.5	6.37E-05	0.2745	101.48	2,737	0.0371	**8.60E-06**	**8.90**
MW-3	3.32E-04	30.0	1.98E-04	0.28725	48.03	1,710	0.0281	**1.93E-05**	**20.00**
MW-09	5.08E-08	27.8	3.19E-05	0.27625	121.1	2,772	0.0437	**5.04E-06**	**5.21**
MW-10S	1.12E-05	24.2	3.74E-05	0.25825	112.19	2,997	0.0374	**5.43E-06**	**5.62**
MW-12	2.66E-05	30.0	4.51E-05	0.28725	82.09	2,207	0.0372	**5.84E-06**	**6.05**
MW-13	5.04E-06	30.2	3.43E-05	0.28825	73.9	2,115	0.0349	**4.16E-06**	**4.31**

Groundwater Velocity Mean	**6.45E-06 cm/sec**	**6.68 inches/month**
Groundwater Velocity Median	**5.43E-06 cm/sec**	**5.62 inches/month**

Groundwater Velocity Equation

$$V_\eta = \frac{K}{\eta} \times \frac{\Delta h}{\Delta l}$$

V_η = linear groundwater velocity
K = hydraulic conductivity (cm/sec)
η = effective porosity (unitless)
Δh = change in head between wells (ft)
Δl = distance between wells (ft)
[1] Average hydraulic conductivity is the average hydraulic conductivities between D-2 and identified well.