ATTACHMENT PTA-IX - KEY MAP, NEAR-VICINITY MAP, AND REGIONAL MAP

The information in this section is compiled from the original Part A application, TR 1 submittal (October 1, 2021), TR 1 supplement (April 13, 2022) and TR 2 submittal, which addresses the tie in of the waste management boundary, the revised access into the site, revised road relocations, and identification of an initial disposal unit area.

A Key Map has been developed for the Facility, and is included as **Figure No. 1 (No change from original submittal)**. The map shows the general location of the Facility and includes important features within one mile from the perimeter [§9 VAC 20-81-460.B]. A Near-Vicinity Map is also included, as **Figure No. 2A (TR 2 modification)**. This map shows important features within 500 feet of the perimeter of the Facility boundary, and includes all required layers [§9 VAC 20-81-460.C]. Property ownership and parcel boundaries within 500' of the facility boundary have changed since the original Part A was issued and hence parcel information has been updated to match the current 2023 County GIS information. **Figure No. 3 (TR 1 submittal)** is a Regional Map for the Facility. It includes important features within one, three, and five miles of the waste management boundary [§9 VAC 20-81-460.C.3, 120.I, and 460.H].

This attachment also includes the boundary survey with metes and bounds **(Figure 2B)** and a figure showing the Waste Management Boundary with bearings and distances **(Figure 2C).** Both figures were previously provided with the **TR 1 submittal** but have been updated with minor changes based on TR 2 comments relative to consistency and to update the road system. In addition, a drawing exhibit with bearings and distances is provided for the initial disposal unit area as **Figure 2D**. The currently proposed initial disposal unit area is within the Waste Management Boundary and will not impact streams or wetlands.

Note that there are no site specific benchmarks set at this time. There are three monuments identified in the Boundary Exhibit (Figure 2B) and state plane coordinates provided for these three monuments.

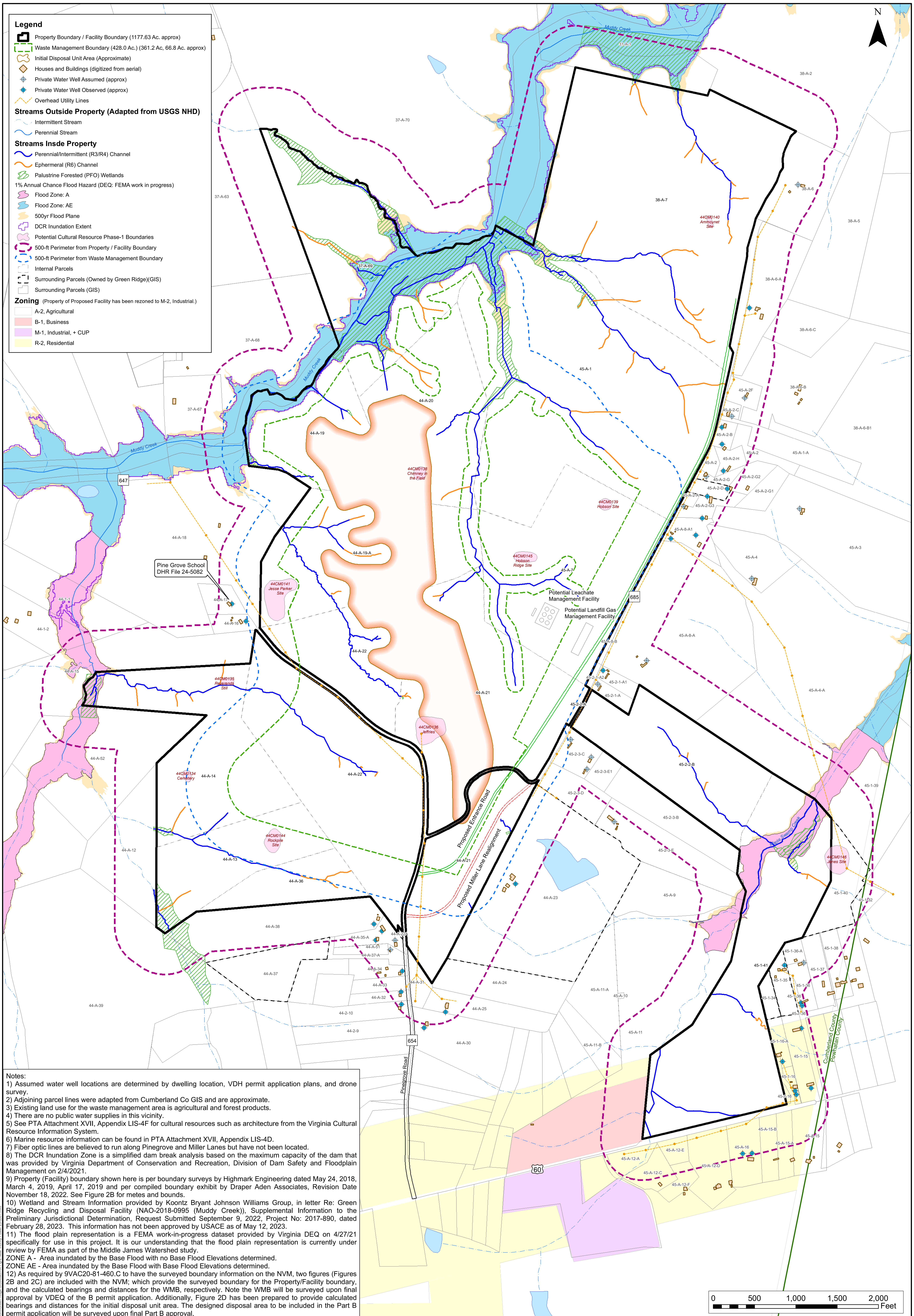
The Waste Management Boundary and initial disposal unit area are tied to the property boundary as illustrated in Figures 2C and 2D in response to the TR 2 comment requesting such.

The following is a list of the documents associated with this section:

PTA Attachment IX – Figure 1 – Key Map Dated December 9, 2019 (Original Part A)
PTA Attachment IX – Figure 2A – Near-Vicinity Map Dated May 12, 2023
PTA Attachment IX – Figure 2B – Near Vicinity Map – Property/Facility Boundary Dated May 12, 2023
PTA Attachment IX – Figure 2C – Near Vicinity Map – Waste Management Boundary Dated May 12, 2023

PTA Attachment IX – Figure 2D – Near Vicinity Map – Initial Disposal Unit Area Dated May 12, 2023

PTA Attachment IX – Figure: 3 – Regional Map Dated August 31, 2021



Notes:
1) Assumed water well locations are determined by dwelling location, VDH permit application plans, and drone survey.
2) Adjoining parcel lines were adapted from Cumberland Co GIS and are approximate.
3) Existing land use for the waste management area is agricultural and forest products.
4) There are no public water supplies in this vicinity.
5) See PTA Attachment XVII, Appendix LIS-4F for cultural resources such as architecture from the Virginia Cultural Resource Information System.
6) Marine resource information can be found in PTA Attachment XVII, Appendix LIS-4D.
7) Fiber optic lines are believed to run along Pinegrove and Miller Lanes but have not been located.
8) The DCR Inundation Zone is a simplified dam break analysis based on the maximum capacity of the dam that was provided by Virginia Department of Conservation and Recreation, Division of Dam Safety and Floodplain Management on 2/4/2021.
9) Property (Facility) boundary shown here is per boundary surveys by Highmark Engineering dated May 24, 2018, March 4, 2019, April 17, 2019 and per compiled boundary exhibit by Draper Aden Associates, Revision Date November 18, 2022. See Figure 2B for metes and bounds.
10) Wetland and Stream Information provided by Koontz Bryant Johnson Williams Group, in letter Re: Green Ridge Recycling and Disposal Facility (NAO-2018-0995 (Muddy Creek)), Supplemental Information to the Preliminary Jurisdictional Determination, Request Submitted September 9, 2022, Project No: 2017-890, dated February 28, 2023. This information has not been approved by USACE as of May 12, 2023.
11) The flood plain representation is a FEMA work-in-progress dataset provided by Virginia DEQ on 4/27/21 specifically for use in this project. It is our understanding that the flood plain representation is currently under review by FEMA as part of the Middle James Watershed study.
ZONE A - Area inundated by the Base Flood with no Base Flood Elevations determined.
ZONE AE - Area inundated by the Base Flood with Base Flood Elevations determined.
12) As required by 9VAC20-81-460.C to have the surveyed boundary information on the NVM, two figures (Figures 2B and 2C) are included with the NVM; which provide the surveyed boundary for the Property/Facility boundary, and the calculated bearings and distances for the WMB, respectively. Note the WMB will be surveyed upon final approval by VDEQ of the B permit application. Additionally, Figure 2D has been prepared to provide calculated bearings and distances for the initial disposal unit area. The designed disposal area to be included in the Part B permit application will be surveyed upon final Part B approval.

FIGURE: PTA ATTACHMENT IX FIGURE 2A
PROJECT NUMBER: 18020117-090102
DATE: 05-12-23
SCALE: 1" = 500'
CHECKED BY: LPK
DRAWN BY: NCS
DESIGNED BY: WDK

REVISIONS
Response to TR-1, 8/31/21 Letter Attachment 5.
TR-2 Response, 5/12/2023 Minor Updates to TR-1 Reponse

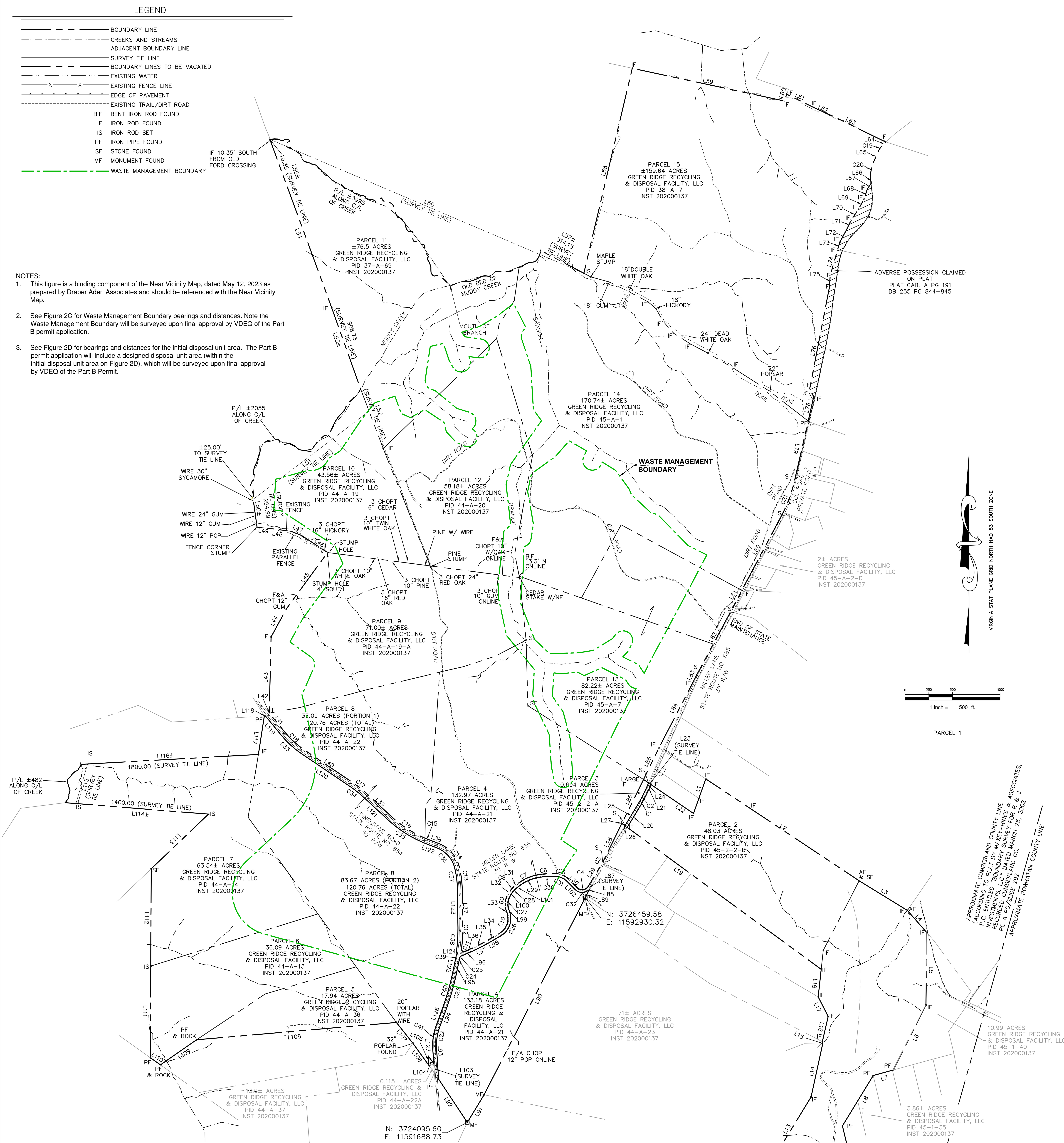
Near Vicinity Map

Green Ridge Recycling and Disposal Facility
Cumberland Co., Virginia

GREEN RIDGE
RECYCLING AND DISPOSAL FACILITY

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia
Virginia Beach, VA

COMMONWEALTH OF VIRGINIA
MICHAEL D. LAWLESS
No. 832
CERTIFIED PROFESSIONAL GEOLOGIST
DRAFT



NOTES:

1. This figure is a binding component of the Near Vicinity Map, dated May 12, 2023 as prepared by Draper Aden Associates and should be referenced with the Near Vicinity Map.
2. See Figure 2C for Waste Management Boundary bearings and distances. Note the Waste Management Boundary will be surveyed upon final approval by VDEQ of the Part B permit application.
3. See Figure 2D for bearings and distances for the initial disposal unit area. The Part B permit application will include a designed disposal unit area (within the initial disposal unit area on Figure 2D), which will be surveyed upon final approval by VDEQ of the Part B Permit.

NOTES:

1.) SOURCE OF MERIDIAN: VIRGINIA STATE PLANE GRID NORTH NAD 83 SOUTH BASED UPON A BOUNDARY SURVEY PERFORMED BY HIGHMARK ENGINEERING ON APRIL 17, 2019.
2.) THIS EXHIBIT DRAWING WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT OR TITLE REPORT AND ALL EASEMENTS AND ENCUMBRANCES THAT MIGHT BE DISCLOSED IN A TITLE SEARCH MAY NOT BE SHOWN.
3.) THE PROPERTY LINES AND PLANIMETRIC FEATURES SHOWN HEREON ARE TAKEN FROM A PLAT PREPARED AND PROVIDED BY HIGHMARK ENGINEERING, ENTITLED EXTERIOR BOUNDARY SURVEY OF FIFTEEN PARCELS OF LAND CONTAINING ±1177.63 ACRES, DATED APRIL 17, 2019.
4.) STATE PLANE COORDINATES ADDED TO MONUMENTS.

LINE TABLE

LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING
L1	385.35	N19°35'50"E	L27	0.42	S26°14'11"W	L53	908.73±	N19°36'48"W	L79	648.19	S12°53'59"W	L105	99.87	S03°52'09"E
L2	1937.45	S56°25'26"E	L28	454.32	S26°14'11"W	L54	1876.11	N20°10'30"W	L80	898.91	S27°58'06"W	L106	285.18	N35°51'08"W
L3	595.36	S58°25'22"E	L29	285.93	S31°04'56"W	L55	10.35±	N20°10'30"W	L81	195.23	S27°31'32"W	L107	279.81	N38°24'23"W
L4	309.62	S41°12'28"E	L30	118.38	N44°23'36"W	L56	3592.70	S66°54'50"E	L82	814.25	S28°12'54"W	L108	2110.87	S85°02'47"W
L5	763.34	S00°37'00"W	L31	44.69	S51°36'34"W	L57	514.15±	S62°08'21"E	L83	22.45	S24°08'33"W	L109	462.84	S55°15'39"W
L6	764.88	S26°44'27"W	L32	33.57	S32°46'24"W	L58	2216.24	N13°18'24"E	L84	840.56	S27°28'44"W	L110	129.67	N55°00'15"W
L7	218.55	S74°30'35"W	L33	28.80	S18°40'58"E	L59	1636.78	S77°51'06"E	L85	369.46	S25°58'56"W	L111	964.98	N00°14'00"E
L8	620.87	S31°27'47"W	L34	194.33	S60°03'44"W	L60	75.92	N19°53'40"E	L86	516.17	S26°14'11"W	L112	1023.00	N00°14'00"E
L9	1469.41	S13°30'22"E	L35	125.08	S63°25'14"W	L61	316.13	S63°46'30"E	L87	32.28	S33°09'57"E	L113	833.96	N46°20'56"E
L10	1795.34	S76°29'02"W	L36	90.36	S66°42'28"W	L62	220.64	S65°33'39"E	L88	37.80	S31°15'29"W	L114	1512.28±	N85°26'19"W
L11	1019.98	N05°22'07"E	L37	393.10	N00°42'17"W	L63	620.40	S63°58'26"E	L89	70.18	S26°14'11"W	L115	434.22	N16°29'57"E
L12	626.60	N54°01'07"E	L38	109.87	N69°04'52"W	L64	56.53	S44°35'18"W	L90	2331.37	S27°11'10"W	L116	1870.00±	N86°49'28"E
L13	900.50	N31°25'07"E	L39	345.57	N47°09'43"W	L65	128.14	S23°56'23"W	L91	339.87	S31°18'50"W	L117	410.59	N08°48'18"E
L14	562.26	N12°19'07"E	L40	612.99	N55°59'35"W	L66	58.71	S03°32'52"E	L92	546.44	N33°34'50"W	L118	10.49	N86°27'36"E
L15	35.97	N00°23'36"W	L41	261.09	N39°29'21"W	L67	68.38	S34°04'11"W	L93	315.65	N03°52'09"W	L119	264.71	S39°29'21"E
L16	268.49	N13°03'26"E	L42	0.94	N79°37'24"E	L68	113.65	S18°15'29"W	L94	211.29	N20°02'45"E	L120	612.99	S55°59'35"E
L17	231.47	N27°01'16"W	L43	801.08	N01°20'33"E	L69	120.70	S28°59'33"W	L95	146.08	N12°05'16"E	L121	345.57	S47°09'43"E
L18	292.39	N06°16'38"E	L44	339.57	N28°33'06"E	L70	135.59	S34°09'02"W	L96	147.34	N66°42'28"E	L122	109.87	S69°04'52"E
L19	2529.31	N53°49'23"W	L45	732.15	N36°12'46"E	L71	116.17	S25°43'40"W	L97	126.82	N63°25'14"E	L123	393.10	S00°42'17"E
L20	254.60	N31°15'29"E	L46	328.56	N56°48'05"W	L72	149.26	S28°06'03"W	L98	195.21	N60°03'44"E	L124	5.00	S80°38'34"E
L21	59.56	N23°55'11"E	L47	123.75	N68°48'05"W	L73	81.90	S16°03'34"W	L99	28.80	N18°40'58"W	L125	146.08	S12°05'16"W
L22	541.07	S55°51'56"E	L48	292.88	N82°48'05"W	L74	281.89	S16°02'26"W	L100	33.57	N32°46'24"E	L126	211.29	S20°02'45"W
L23	30.60	N54°45'31"W	L49	61.98	N84°25'32"W	L75	117.47	S03°40'31"W	L101	44.69	N51°36'34"E	L127	148.00	S03°52'09"E
L24	65.57	S23°55'09"W	L50	319.99±	N07°56'08"W	L76	1099.43	S10°57'50"W	L102	118.38	S44°23'36"E			
L25	252.02	S31°15'29"W	L51	1532.15	N52°45'23"E	L77	88.55	S28°53'50"E	L103	172.36	N17°17'19"W			
L26	40.29	N53°49'23"W	L52	250.00	N20°48'05"W	L78	263.11	S12°42'38"W	L104	100.00	N35°51'08"W			

CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA	CHD DIRECTION	CHORD	CURVE	LENGTH	RADIUS	DELTA	CHD DIRECTION	CHORD
C1	201.65	1574.41	7°20'18"	N27°35'20"E	201.51	C22	239.48	573.74	23°54'54"	S08°05'18"W	237.74
C2	197.80	1544.41	7°20'17"	N27°35'20"E	197.66	C23	355.84	2562.00	7°57'29"	N16°04'01"E	355.56
C3	7.53	89.00	4°50'45"	N28°39'34"E	7.52	C24	43.81	1612.00	1°33'25"	N11°18'34"E	43.80
C4	139.32	76.37	104°31'27"	N83°20'40"E	120.79	C25	24.51	25.00	56°10'37"	S38°37'09"W	23.54
C5	152.00	204.98	42°29'08"	N65°38'04"W	148.54	C26	288.62	210.00	78°44'43"	N20°41'23"E	266.43
C6	202.37	830.00	13°58'11"	S86°11'02"W	201.87	C27	157.16	175.00	51°27'22"	S07°02'43"W	151.94
C7	231.13	480.00	27°35'23"	S65°24'15"W	228.91	C28	54.24	165.00	18°50'10"	S42°11'29"W	54.00
C8	64.11	195.00	18°50'10"	S42°11'29"W	63.82	C29	216.69	450.00	27°35'23"	S65°24'15"W	214.60
C9	184.11	205.00	51°27'22"	S07°02'43"W	177.98	C30	195.05	800.00	13°58'11"	S86°11'02"W	194.57
C10	247.39	180.00	78°44'43"	N20°41'23"E	228.37	C31	129.78	175.01	42°29'08"	N65°38'18"W	126.82
C11	52.54	25.00	120°24'43"	S53°05'11"E	43.39	C32	179.99	106.37	96°56'54"	N87°07'56"E	159.27
C12	220.82	1617.00	7°49'28"	N03°12'27"E	220.65	C33	293.99	1020.60	16°30'15"	S47°44'28"E	292.97
C13	250.21	1125.00	12°44'36"	N07°04'35"W	249.70	C34	181.79	1179.40	8°49'53"	N51°34'39"W	181.61
C14	342.67	352.91	55°37'59"	N41°15'52"W	329.36	C35	492.32	1286.90	21°55'10"	S58°07'17"E	489.33
C15	45.18	1236.90	2°05'35"	S68°02'05"E	45.18	C36	294.12	302.91	55°37'59"	N41°15'52"W	282.70
C16	428.01	1236.90	19°49'35"	S57°04'30"E	425.88	C37	239.09	1075.00	12°44'36"	N07°04'35"W	238.60
C17	189.50	1229.40	8°49'53"	N51°34'39"W	189.31	C38	275.19	1567.00	10°03'43"	N04°19'34"E	274.83
C18	279.59	970.60	16°30'15"	S47°44'28"E	278.62	C39	74.92	1572.00	2°43'50"	N10°43'21"E	74.91
C19	65.69	182.29	20°38'50"	S34°15'53"W	65.34	C40	350.29	2522.00	7°57'29"	N16°04'01"E	350.01
C20	171.22	356.90	27°29'14"	S10°11'46"W	169.58	C41	256.17	613.74	23°54'54"	S08°05'18"W	254.32
C21	381.35	1450.00	15°04'08"	N20°26'03"E	380.25						

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• Raleigh, NC
• Fayetteville, NC
• Northern Virginia
• Virginia Beach, VA

NEAR VICINITY MAP - PROPERTY/FACILITY BOUNDARY
SURVEYED METES AND BOUNDS

OVERALL BOUNDARY
GREEN RIDGE RECYCLING AND DISPOSAL FACILITY

HAMILTON DISTRICT - CUMBERLAND COUNTY, VIRGINIA

DESIGNED BY:
DRAWN BY: DAJ
CHECKED BY: CAS
SCALE: 1" = 500'
DATE: 05/12/2023

REVISIONS

NOVEMBER 6, 2019
OWNER INFORMATION

NOVEMBER 18, 2019
CLIENT DEED INFO

APRIL 21, 2021
PARCEL LABELS UPDATED

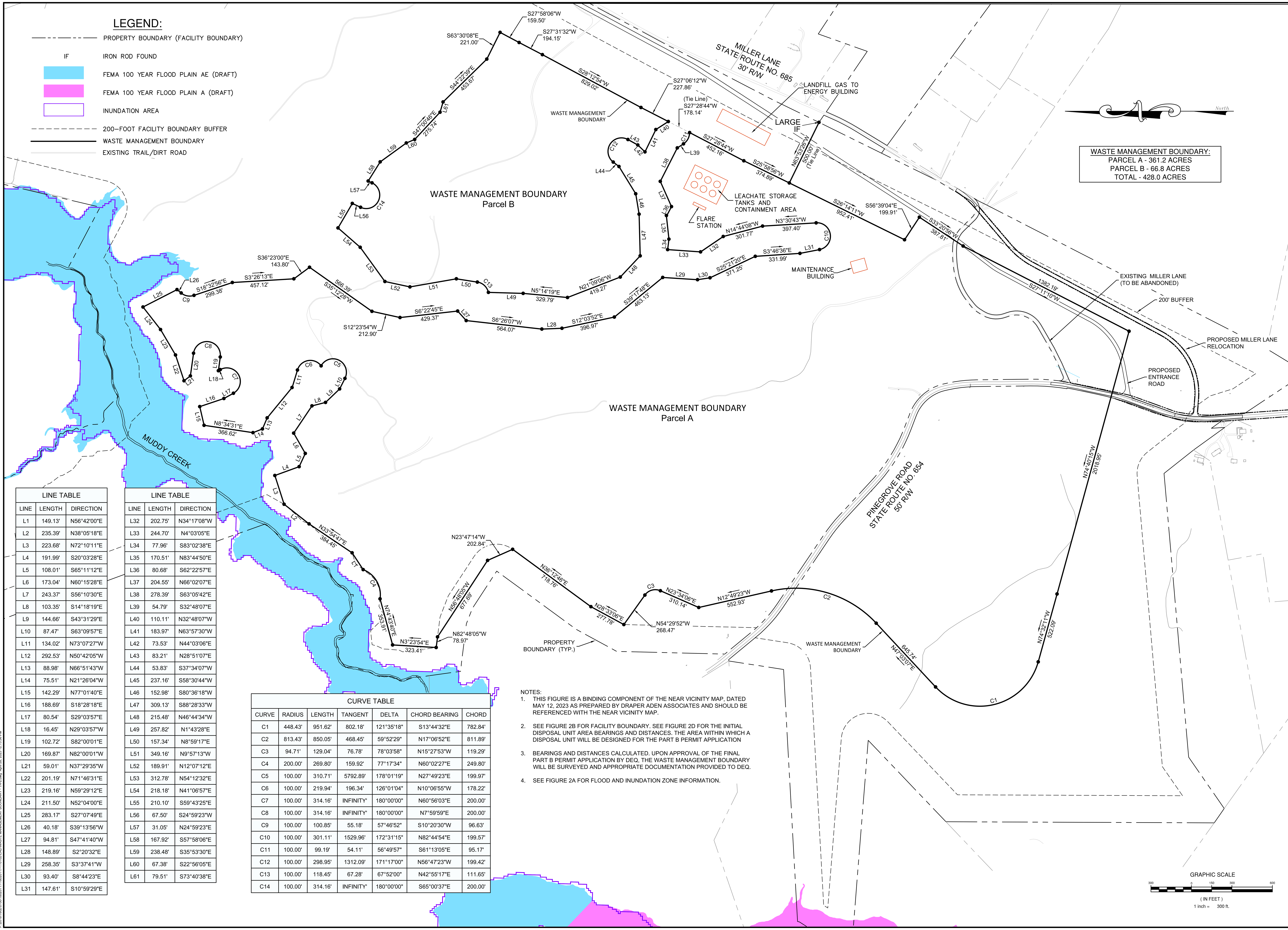
NOVEMBER 18, 2022
SURVEY TIE LINE

REVISIONS CON'T

TR-2 RESPONSE,
May 12, 2023, Minor updates to original Part A application

PROJECT NUMBER:
18020117-090102

PTA ATTACHMENT IX
FIGURE 2B



LINE TABLE		
LINE	LENGTH	DIRECTION
L1	149.13'	N56°42'00"E
L2	235.39'	N38°05'18"E
L3	223.68'	N72°10'11"E
L4	191.99'	S20°03'28"E
L5	108.01'	S65°11'12"E
L6	173.04'	N60°15'28"E
L7	243.37'	S56°10'30"E
L8	103.35'	S14°18'19"E
L9	144.66'	S43°31'29"E
L10	87.47'	S63°09'57"E
L11	134.02'	N73°07'27"W
L12	292.53'	N50°42'05"W
L13	88.98'	N66°51'43"W
L14	75.51'	N21°26'04"W
L15	142.29'	N77°01'40"E
L16	188.69'	S18°28'18"E
L17	80.54'	S29°03'57"E
L18	16.45'	N29°03'57"W
L19	102.72'	S82°00'01"E
L20	169.87'	N82°00'01"W
L21	59.01'	N37°29'35"W
L22	201.19'	N71°46'31"E
L23	219.16'	N59°29'12"E
L24	211.50'	N52°04'00"E
L25	283.17'	S27°07'49"E
L26	40.18'	S39°13'56"W
L27	94.81'	S47°41'40"W
L28	148.89'	S2°20'32"E
L29	258.35'	S3°37'41"W
L30	93.40'	S8°44'23"E
L31	147.61'	S10°59'29"E

LINE TABLE		
LINE	LENGTH	DIRECTION
L32	202.75'	N34°17'08"W
L33	244.70'	N4°03'05"E
L34	77.96'	S83°02'38"E
L35	170.51'	N83°44'50"E
L36	80.68'	S62°22'57"E
L37	204.55'	N66°02'07"E
L38	278.39'	S63°05'42"E
L39	54.79'	S32°48'07"E
L40	110.11'	N32°48'07"W
L41	183.97'	N63°57'30"W
L42	73.53'	N44°03'06"E
L43	83.21'	N28°51'07"E
L44	53.83'	S37°34'07"W
L45	237.16'	S58°30'44"W
L46	152.98'	S80°36'18"W
L47	309.13'	S88°28'33"W
L48	215.48'	N46°44'34"W
L49	257.82'	N1°43'28"E
L50	157.34'	N8°59'17"E
L51	349.16'	N9°57'13"W
L52	189.91'	N12°07'12"E
L53	312.78'	N54°12'32"E
L54	218.18'	N41°06'57"E
L55	210.10'	S59°43'25"E
L56	67.50'	S24°59'23"W
L57	31.05'	N24°59'23"E
L58	167.92'	S57°58'06"E
L59	238.48'	S35°53'30"E
L60	67.38'	S22°56'05"E
L61	79.51'	S73°40'38"E

CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	DELTA	CHORD BEARING	CHORD
C1	448.43'	951.62'	802.18'	121°35'18"	S13°44'32"E	782.84'
C2	813.43'	850.05'	468.45'	59°52'29"	N17°06'52"E	811.89'
C3	94.71'	129.04'	76.78'	78°03'58"	N15°27'53"W	119.29'
C4	200.00'	269.80'	159.92'	77°17'34"	N60°02'27"E	249.80'
C5	100.00'	310.71'	5792.89'	178°01'19"	N27°49'23"E	199.97'
C6	100.00'	219.94'	196.34'	126°01'04"	N10°06'55"W	178.22'
C7	100.00'	314.16'	INFINITY'	180°00'00"	N60°56'03"E	200.00'
C8	100.00'	314.16'	INFINITY'	180°00'00"	N7°59'59"E	200.00'
C9	100.00'	100.85'	55.18'	57°46'52"	S10°20'30"W	96.63'
C10	100.00'	301.11'	1529.96'	172°31'15"	N82°44'54"E	199.57'
C11	100.00'	99.19'	54.11'	56°49'57"	S61°13'05"E	95.17'
C12	100.00'	298.95'	1312.09'	171°17'00"	N56°47'23"W	199.42'
C13	100.00'	118.45'	67.28'	67°52'00"	N42°55'17"E	111.65'
C14	100.00'	314.16'	INFINITY'	180°00'00"	S65°00'37"E	200.00'

NOTES:

1. THIS FIGURE IS A BINDING COMPONENT OF THE NEAR VICINITY MAP, DATED MAY 12, 2023 AS PREPARED BY DRAPER ADEN ASSOCIATES AND SHOULD BE REFERENCED WITH THE NEAR VICINITY MAP.
2. SEE FIGURE 2B FOR FACILITY BOUNDARY. SEE FIGURE 2D FOR THE INITIAL DISPOSAL UNIT AREA BEARINGS AND DISTANCES. THE AREA WITHIN WHICH A DISPOSAL UNIT WILL BE DESIGNED FOR THE PART B PERMIT APPLICATION
3. BEARINGS AND DISTANCES CALCULATED. UPON APPROVAL OF THE FINAL PART B PERMIT APPLICATION BY DEQ, THE WASTE MANAGEMENT BOUNDARY WILL BE SURVEYED AND APPROPRIATE DOCUMENTATION PROVIDED TO DEQ.
4. SEE FIGURE 2A FOR FLOOD AND INUNDATION ZONE INFORMATION.

P:\2018\1802\0100\18020117\18020117-110102\CAD\WASTE MANAGEMENT BOUNDARY - TR-2.dwg April 28, 2023 12:13:56 PM

COMMONWEALTH OF VIRGINIA MICHAEL D. LAWLESS No. 832 PROFESSIONAL GEOLOGIST DRAFT

Draper Aden Associates
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Blacksburg, VA 24060
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• Raleigh, NC • Fayetteville, NC • Northern Virginia • Virginia Beach, VA

GREEN RIDGE RECYCLING AND DISPOSAL FACILITY

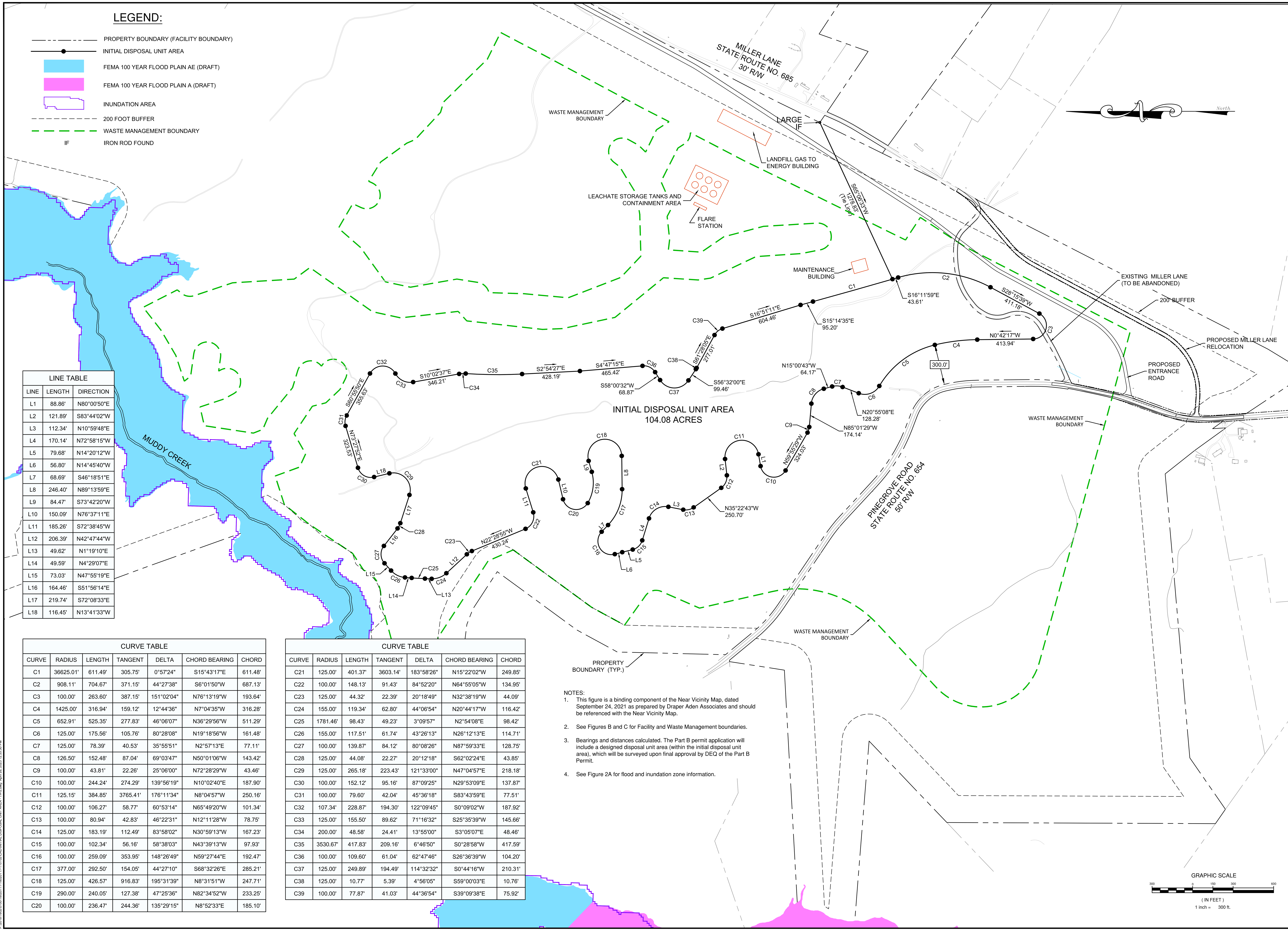
NEAR VICINITY MAP - WASTE MANAGEMENT BOUNDARY
CALCULATED BEARINGS AND DISTANCES

GREEN RIDGE RECYCLING AND DISPOSAL FACILITY
CUMBERLAND COUNTY, VIRGINIA

REVISIONS
August 31, 2021
Part A - TR-1 Response
June 27, 2022
Added tie lines
TR-2 Response
May 12, 2023 Minor updates to TR-1 response

DESIGNED BY: -
DRAWN BY: DLD
CHECKED BY: LPK
SCALE: 1" = 300'
DATE: 05/12/2023
PROJECT NUMBER: 18020117-090102

PTA ATTACHMENT IX
FIGURE 2C



LINE TABLE		
LINE	LENGTH	DIRECTION
L1	88.86'	N80°00'50"E
L2	121.89'	S83°44'02"W
L3	112.34'	N10°59'48"E
L4	170.14'	N72°58'15"W
L5	79.68'	N14°20'12"W
L6	56.80'	N14°45'40"W
L7	68.69'	S46°18'51"E
L8	246.40'	N89°13'59"E
L9	84.47'	S73°42'20"W
L10	150.09'	N76°37'11"E
L11	185.26'	S72°38'45"W
L12	206.39'	N42°47'44"W
L13	49.62'	N1°19'10"E
L14	49.59'	N4°29'07"E
L15	73.03'	N47°55'19"E
L16	164.46'	S51°56'14"E
L17	219.74'	S72°08'33"E
L18	116.45'	N13°41'33"W

CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	DELTA	CHORD BEARING	CHORD
C1	36625.01'	611.49'	305.75'	0°57'24"	S15°43'17"E	611.48'
C2	908.11'	704.67'	371.15'	44°27'38"	S6°01'50"W	687.13'
C3	100.00'	263.60'	387.15'	151°02'04"	N76°13'19"W	193.64'
C4	1425.00'	316.94'	159.12'	12°44'36"	N7°04'35"W	316.28'
C5	652.91'	525.35'	277.83'	46°06'07"	N36°29'56"W	511.29'
C6	125.00'	175.56'	105.76'	80°28'08"	N19°18'56"W	161.48'
C7	125.00'	78.39'	40.53'	35°55'51"	N2°57'13"E	77.11'
C8	126.50'	152.48'	87.04'	69°03'47"	N50°01'06"W	143.42'
C9	100.00'	43.81'	22.26'	25°06'00"	N72°28'29"W	43.46'
C10	100.00'	244.24'	274.29'	139°56'19"	N10°02'40"E	187.90'
C11	125.15'	384.85'	3765.41'	176°11'34"	N8°04'57"W	250.16'
C12	100.00'	106.27'	58.77'	60°53'14"	N65°49'20"W	101.34'
C13	100.00'	80.94'	42.83'	46°22'31"	N12°11'28"W	78.75'
C14	125.00'	183.19'	112.49'	83°58'02"	N30°59'13"W	167.23'
C15	100.00'	102.34'	56.16'	58°38'03"	N43°39'13"W	97.93'
C16	100.00'	259.09'	353.95'	148°26'49"	N59°27'44"E	192.47'
C17	377.00'	292.50'	154.05'	44°27'10"	S68°32'26"E	285.21'
C18	125.00'	426.57'	916.83'	195°31'39"	N8°31'51"W	247.71'
C19	290.00'	240.05'	127.38'	47°25'36"	N82°34'52"W	233.25'
C20	100.00'	236.47'	244.36'	135°29'15"	N8°52'33"E	185.10'

CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	DELTA	CHORD BEARING	CHORD
C21	125.00'	401.37'	3603.14'	183°58'26"	N15°22'02"W	249.85'
C22	100.00'	148.13'	91.43'	84°52'20"	N64°55'05"W	134.95'
C23	125.00'	44.32'	22.39'	20°18'49"	N32°38'19"W	44.09'
C24	155.00'	119.34'	62.80'	44°06'54"	N20°44'17"W	116.42'
C25	1781.46'	98.43'	49.23'	3°09'57"	N2°54'08"E	98.42'
C26	155.00'	117.51'	61.74'	43°26'13"	N26°12'13"E	114.71'
C27	100.00'	139.87'	84.12'	80°08'26"	N87°59'33"E	128.75'
C28	125.00'	44.08'	22.27'	20°12'18"	S62°02'24"E	43.85'
C29	125.00'	265.18'	223.43'	121°33'00"	N47°04'57"E	218.18'
C30	100.00'	152.12'	95.16'	87°09'25"	N29°53'09"E	137.87'
C31	100.00'	79.60'	42.04'	45°36'18"	S83°43'59"E	77.51'
C32	107.34'	228.87'	194.30'	122°09'45"	S0°09'02"W	187.92'
C33	125.00'	155.50'	89.62'	71°16'32"	S25°35'39"W	145.66'
C34	200.00'	48.58'	24.41'	13°55'00"	S3°05'07"E	48.46'
C35	3530.67'	417.83'	209.16'	6°46'50"	S0°28'58"W	417.59'
C36	100.00'	109.60'	61.04'	62°47'46"	S26°36'39"W	104.20'
C37	125.00'	249.89'	194.49'	114°32'32"	S0°44'16"W	210.31'
C38	125.00'	10.77'	5.39'	4°56'05"	S59°00'03"E	10.76'
C39	100.00'	77.87'	41.03'	44°36'54"	S39°09'38"E	75.92'

NOTES:

1. This figure is a binding component of the Near Vicinity Map, dated September 24, 2021 as prepared by Draper Aden Associates and should be referenced with the Near Vicinity Map.
2. See Figures B and C for Facility and Waste Management boundaries.
3. Bearings and distances calculated. The Part B permit application will include a designed disposal unit area (within the initial disposal unit area), which will be surveyed upon final approval by DEQ of the Part B Permit.
4. See Figure 2A for flood and inundation zone information.

P:\2018\1802\0100\18020117\18020117-110102\CAD\INITIAL DISPOSAL UNIT AREA - TR-2.dwg April 28, 2023 12:53:50 PM

COMMONWEALTH OF VIRGINIA
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• Northern Virginia
• Virginia Beach, VA

GREEN RIDGE
RECYCLING AND DISPOSAL FACILITY

NEAR VICINITY MAP - INITIAL DISPOSAL UNIT AREA
CALCULATED BEARINGS AND DISTANCES
TR 2 RESPONSE

GREEN RIDGE RECYCLING AND DISPOSAL FACILITY

CUMBERLAND COUNTY, VIRGINIA

REVISIONS

DESIGNED BY: -
DRAWN BY: DLD
CHECKED BY: LPK
SCALE: 1" = 300'
DATE: 05/12/2023
PROJECT NUMBER: 18020117-090102

PTA ATTACHMENT IX
FIGURE 2D

ATTACHMENT PTA-X - PROOF OF OWNERSHIP DOCUMENTS

This information was submitted to DEQ as part of the TR 1 response on October 1, 2021. There have been no modifications to the TR 1 information. This information is incorporated here as part of the TR 2 response.

The real property on which the Green Ridge facility will be located was originally purchased by a related company to Green Ridge Recycling and Disposal Facility, LLC, CWV Land Acquisition, LLC ("CWV Land") . The deeds provided therefore reflect that CWV Land is the record landowner. As of mid-January 2020, a plan of merger was executed in which CWV Land was merged into the applicant Green Ridge Recycling and Disposal Facility, LLC, which is the surviving entity, and therefore, pursuant Va. Code Section 13.1-1073, will be the owner of the real property. See documents filed with the Virginia State Corporation Commission attached. Final documentation relative to this merger and updated Exhibit are also attached.

The following deeds of ownership are provided herein:

American Timberland Property Deed (parcels 37-A-69, 44-A-20, 45-A-1, and 45-A-7)

Marion Property Deed (parcel 38-A-7)

Jones Property Deed (parcels 44-A-13, 44-A-14, 44-A-22, and 44-A-36)

Tinsley Property Deed (parcel 44-A-19)

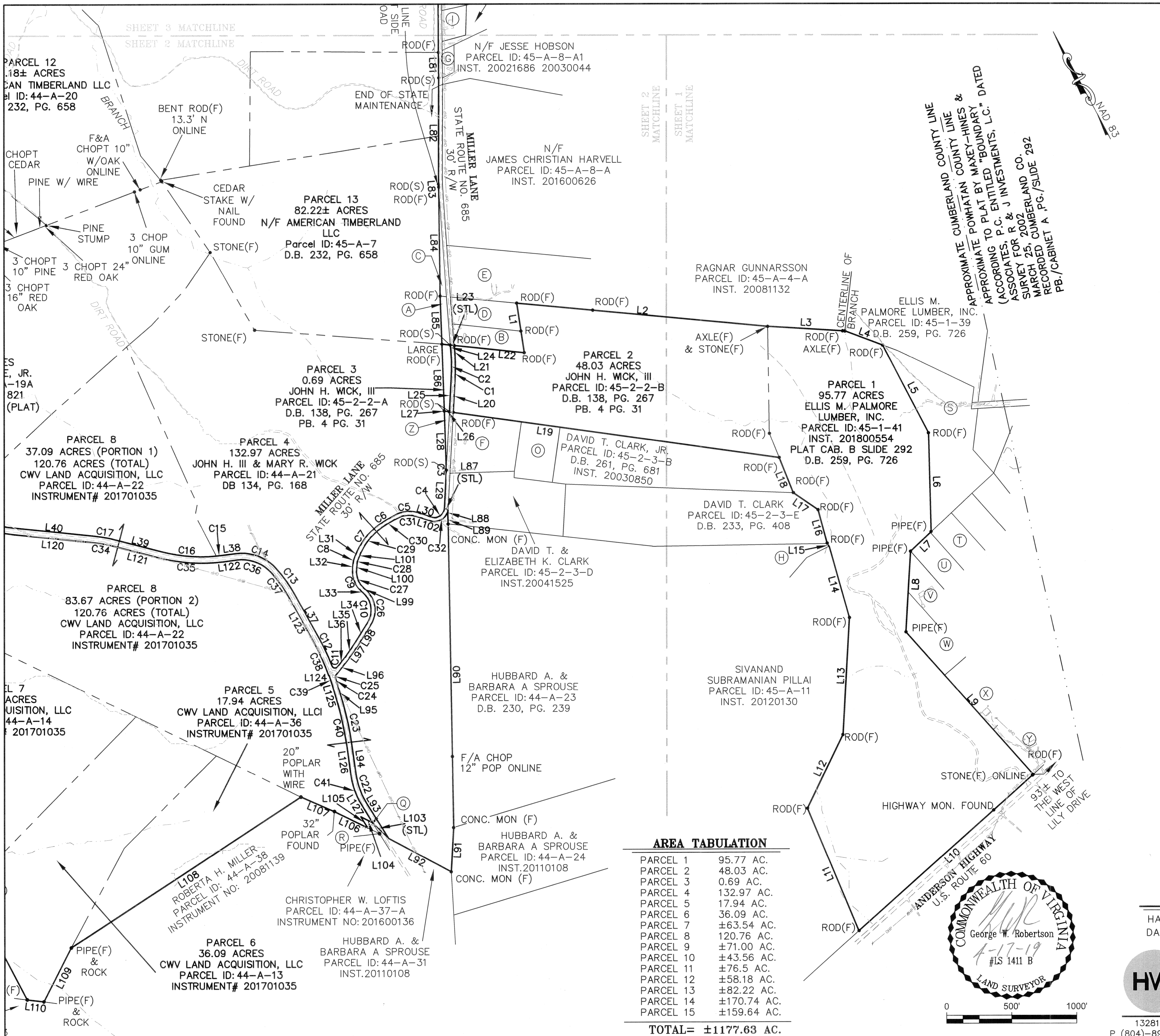
Carlisle Property Deed (parcel 44-A-19A)

Wick Property Deed (parcels 44-A-21, 45-2-2-A, and 45-2-2-B)

Palmore Property Deed and plat – Parcel 1 (parcel 45-1-41)

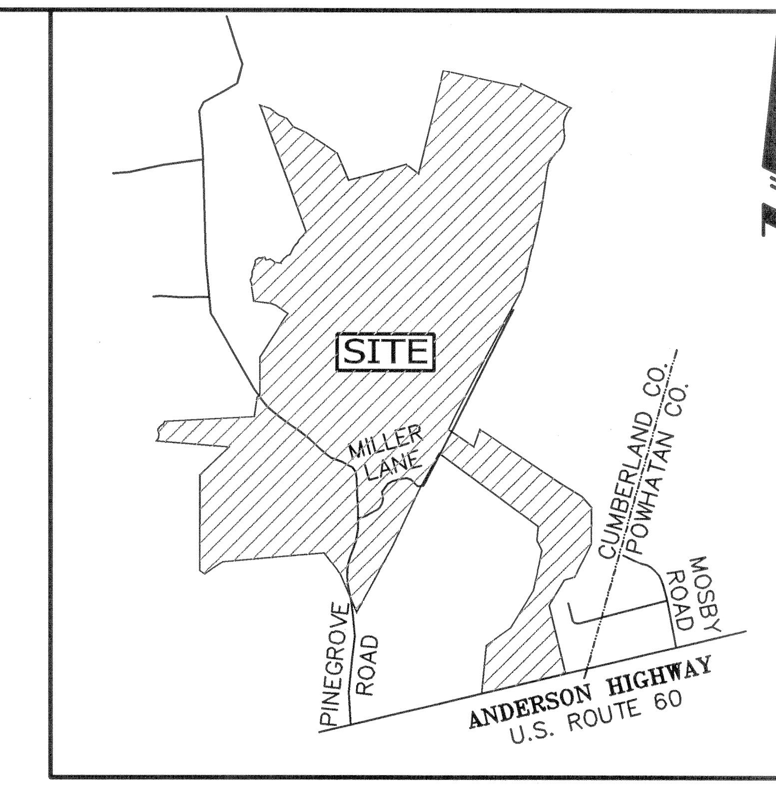
An exhibit showing the locations of the properties is attached. Note: Deeds may cover multiple parcels.

The original signed plat, entitled "Exterior Boundary Survey," prepared by Highmark Engineering, dated April 17, 2019, is also provided.



AREA TABULATION

PARCEL 1	95.77 AC.
PARCEL 2	48.03 AC.
PARCEL 3	0.69 AC.
PARCEL 4	132.97 AC.
PARCEL 5	17.94 AC.
PARCEL 6	36.09 AC.
PARCEL 7	±63.54 AC.
PARCEL 8	120.76 AC.
PARCEL 9	±71.00 AC.
PARCEL 10	±43.56 AC.
PARCEL 11	±76.5 AC.
PARCEL 12	±58.18 AC.
PARCEL 13	±82.22 AC.
PARCEL 14	±170.74 AC.
PARCEL 15	±159.64 AC.
TOTAL=	±1177.63 AC.



VICINITY MAP
1" = 4000'

NOTES

IMPROVEMENTS ARE NOT SHOWN ON THIS PLAT.

THIS PLAT REPRESENTS A CURRENT FIELD SURVEY.

EASEMENTS MAY EXIST THAT ARE NOT SHOWN.

ROD(S) SHALL BE SET BY APRIL 17, 2020.

ADJACENT OWNER INFORMATION & TAX MAP NUMBERS SHOWN FROM COUNTY GIS RECORDS

NO TITLE REPORT HAS BEEN FURNISHED.

OWNERSHIP/TITLE AND/OR RIGHTS TO PRIVATE CCC ROAD UNKNOWN

A GRAVEYARD MAY EXIST ON PARCEL 2. SEE D.B. 86 PG 270 & DB. 92 PG 218

STATE ROUTE 685 SHOWN TO BE 30FT RIGHT OF WAY. NO DEED OF DEDICATION FOUND. RIGHT OF WAY MAY BE PRESCRIPTIVE.

A PORTION OF THE PROPERTY SHOWN ON THIS PLAT LIES WITHIN FLOOD ZONE A AND X AS SHOWN ON FEMA FIRM MAP COMMUNITY PANEL NO'S: 5100430125B AND 5100430150B REVISED DATE JUNE 16, 2009

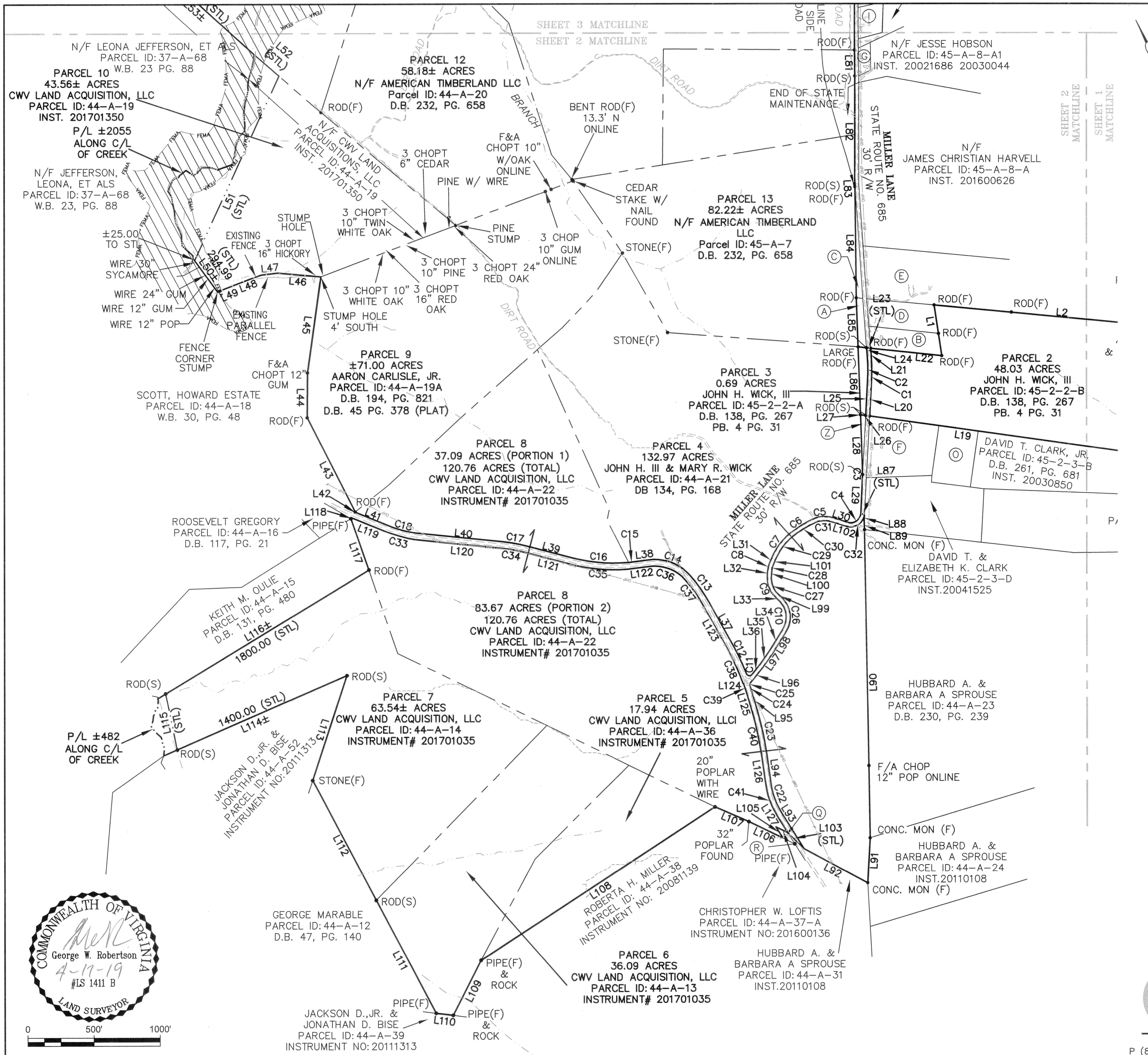
ROD(F)=IRON ROD FOUND
ROD(S)=IRON ROD SET
AXLE(F)=AXLE FOUND
STONE(F)=STONE FOUND
PIPE(F)=PIPE FOUND
CONC MON.(F)=CONCRETE MONUMENT FOUND

EXTERIOR BOUNDARY SURVEY

OF FIFTEEN PARCELS OF LAND
CONTAINING ±1177.63 ACRES

HAMILTON DISTRICT * CUMBERLAND COUNTY, VIRGINIA
DATE: APRIL 17, 2019 SCALE: 1" = 500'

HME HIGHMARK ENGINEERING
ENGINEERING EXCELLENCE.
13281 RIVERS BEND BLVD., SUITE 201 CHESTER, VA 23836
P (804)-895-2875 BGAMMON@HIGHMARKENG.COM F(804)-530-3964



EXTERIOR BOUNDARY SURVEY

OF FIFTEEN PARCELS OF LAND
CONTAINING ±1177.63 ACRES

HAMILTON DISTRICT * CUMBERLAND COUNTY, VIRGINIA
DATE: APRIL 17, 2019 SCALE: 1" = 500'

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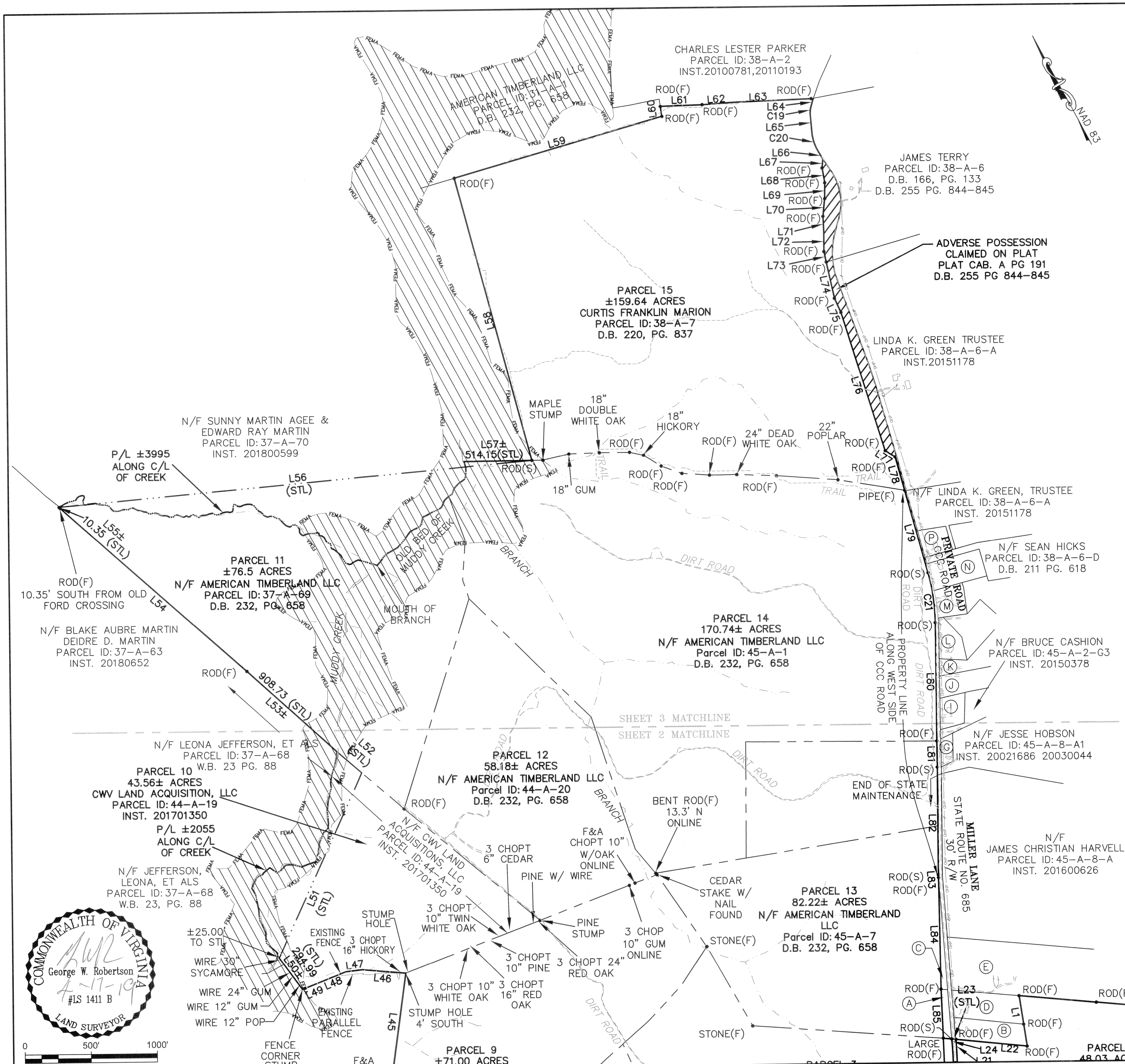

Ⓐ Ⓑ
N/F DAVID T. &
ELIZABETH CLARK
PARCEL ID: 45-2-1-A2 &
45-2-1-A
D.B. 213 PG. 406
P.B. 4 PG. 31

Ⓒ
N/F JAMES
CHRISTIAN HARVELL
PARCEL ID: 45-A-8-B
INST. 201600626

Ⓓ
N/F DAVID T. &
ELIZABETH K. CLARK
PARCEL ID: 45-2-1-A1
INST. 20021577 LOT 1B

Ⓔ
N/F JEFFREY C. SCALES
PARCEL ID: 45-A-8-A
INST. 20052008,
201600481

Ⓕ
ELOUISE M. BOOKER
PARCEL ID: 45-2-3-C
D.B. 205, PG. 431

Ⓖ
N/F CORA JAMES
PARCEL ID: 45-A-6
WB 24 PG. 285

Ⓗ
DAVID THOMAS
CLARK, TRUSTEE
PARCEL ID: 45-A-9
D.B. 217, PG. 5

Ⓘ
N/F STEVE A. GILLS
PARCEL ID: 45-A-2-A
D.B. 204 PG 443

Ⓙ
N/F WILLIAM
MATHEW HATCHER
Parcel ID: 45-A-2-D
INST. 201701205

Ⓚ
N/F MICHAEL L. GILES, II
PARCEL ID: 45-A-2-G
INST. 20110526

Ⓛ
N/F ALETHIA RENEE
GREGORY HOBSON
PARCEL ID: 45-A-2
INST. 201700577

Ⓜ
N/F JOHN L. WADE
PARCEL ID: 45-A-2-B
D.B. 174 PG. 283

Ⓝ
N/F SARAH CATOES
D.B. 186 PG. 515

Ⓞ
DAVID T. CLARK JR.
PARCEL ID: 45-2-3-E1
INST.20041866

Ⓟ
N/F ROOSEVELT JAMES JR
D.B. 174 PG. 308

Ⓠ
JERRY WEST
PARCEL ID: 44-A-22-A
D.B. 241, PG. 237

Ⓡ
DARLENE Y. SCOTT
PARCEL ID: 44-A-35-A
D.B. 150, PG. 608
W.B. 29, PG. 438

Ⓢ
ELLIS M. PALMORE
LUMBER, INC.
PARCEL ID: 45-1-40
D.B. 259, PG. 726

Ⓣ
ROBERT G. BELCH
PARCEL ID: 45-1-37
INST. 201600820

Ⓤ
ROY H. CROWDER
45-1-36-A
INST. 20100729

Ⓥ
GARLAND M &
VICKIE L. ISOM, JR.
PARCEL ID: 45-1-35
INST. 201600302

Ⓦ
GARLAND, JR. &
VICKIE LEE ISOM,
PARCEL ID: 45-1-34
INST. 20150846

Ⓧ
THIS MANAGE, LLC
PARCEL ID: 45-1-16-A
INST. 20150688

Ⓨ
THIS MANAGE, LLC
PARCEL ID: 45-1-16
INST. 20150688

Ⓩ
N/F BLANCHE K MILLER
PARCEL ID: UNKNOWN
D.B. 57 PG 490
PB. 4 PG. 31

EXTERIOR BOUNDARY SURVEY
OF FIFTEEN PARCELS OF LAND CONTAINING ±1177.63 ACRES

HAMILTON DISTRICT * CUMBERLAND COUNTY, VIRGINIA
DATE: APRIL 17, 2019 SCALE: 1" = 500'

HIGHMARK ENGINEERING
ENGINEERING EXCELLENCE.

13281 RIVERS BEND BLVD., SUITE 201 CHESTER, VA 23836
P (804)-895-2875 BGAMMON@HIGHMARKENG.COM F(804)-530-3964

LINE TABLE

LINE	LENGTH	BEARING
L1	385.35	N19°35'50"E
L2	1937.45	S56°25'26"E
L3	595.36	S58°25'22"E
L4	309.62	S41°12'28"E
L5	763.34	S00°37'00"W
L6	764.88	S26°44'27"W
L7	218.55	S74°30'35"W
L8	620.87	S31°27'47"W
L9	1469.41	S13°30'22"E
L10	1795.34	S76°29'02"W
L11	1019.98	N05°22'07"E
L12	626.60	N54°01'07"E
L13	900.50	N31°25'07"E
L14	562.26	N12°19'07"E
L15	35.97	N00°23'36"W
L16	268.49	N13°03'26"E
L17	231.47	N27°01'16"W
L18	292.39	N06°16'38"E
L19	2529.31	N53°49'23"W
L20	254.60	N31°15'29"E
L21	59.56	N23°55'11"E
L22	541.07	S55°51'56"E
L23	30.60	N54°45'31"W
L24	65.57	S23°55'09"W
L25	252.02	S31°15'29"W
L26	40.29	N53°49'23"W
L27	0.42	S26°14'11"W
L28	454.32	S26°14'11"W
L29	285.93	S31°04'56"W
L30	118.38	N44°23'36"W
L31	44.69	S51°36'34"W
L32	33.57	S32°46'24"W
L33	28.80	S18°40'58"E
L34	194.33	S60°03'44"W
L35	125.08	S63°25'14"W
L36	90.36	S66°42'28"W
L37	393.10	N00°42'17"W
L38	109.87	N69°04'52"W
L39	345.57	N47°09'43"W
L40	612.99	N55°59'35"W
L41	261.09	N39°29'21"W
L42	0.94	N79°37'24"E
L43	801.08	N01°20'33"E
L44	339.57	N28°33'06"E
L45	732.15	N36°12'46"E
L46	328.56	N56°48'05"W
L47	123.75	N68°48'05"W
L48	292.88	N82°48'05"W
L49	61.98	N84°25'32"W
L50	319.99±	N07°56'08"W
L51	1532.15	N52°45'23"E
L52	250.00	N20°48'05"W
L53	908.73±	N19°36'48"W
L54	1876.11	N20°10'30"W
L55	10.35±	N20°10'30"W
L56	3592.70	S66°54'50"E
L57	514.15±	S62°08'21"E
L58	2216.24	N13°18'24"E
L59	1636.78	S77°51'06"E
L60	75.92	N19°53'40"E
L61	316.13	S63°46'30"E
L62	220.64	S65°33'39"E
L63	620.40	S63°58'26"E
L64	56.53	S44°35'18"W
L65	128.14	S23°56'23"W
L66	58.71	S03°32'52"E
L67	68.38	S34°04'11"W
L68	113.65	S18°15'29"W
L69	120.70	S28°59'33"W
L70	135.59	S34°09'02"W
L71	116.17	S25°43'40"W
L72	149.26	S28°06'03"W
L73	81.90	S16°03'34"W
L74	281.89	S16°02'26"W
L75	117.47	S03°40'31"W
L76	1099.43	S10°57'50"W
L77	88.55	S28°53'50"E
L78	263.11	S12°42'38"W
L79	648.19	S12°53'59"W
L80	898.91	S27°58'06"W
L81	195.23	S27°31'32"W
L82	814.25	S28°12'54"W
L83	22.45	S24°08'33"W
L84	840.56	S27°28'44"W
L85	369.46	S25°58'56"W
L86	516.17	S26°14'11"W
L87	32.28	S33°09'57"E
L88	37.80	S31°15'29"W
L89	70.18	S26°14'11"W
L90	2331.37	S27°11'10"W
L91	339.87	S31°18'50"W
L92	546.44	N33°34'50"W
L93	315.65	N03°52'09"W
L94	211.29	N20°02'45"E
L95	146.08	N12°05'16"E
L96	147.34	N66°42'28"E
L97	126.82	N63°25'14"E
L98	195.21	N60°03'44"E
L99	28.80	N18°40'58"W
L100	33.57	N32°46'24"E
L101	44.69	N51°36'34"E
L102	118.38	S44°23'36"E
L103	172.36	N17°17'19"W
L104	100.00	N35°51'08"W
L105	99.87	S03°52'09"E
L106	285.18	N35°51'08"W
L107	279.81	N38°24'23"W
L108	2110.87	S85°02'47"W
L109	462.84	S55°15'39"W
L110	129.67	N55°00'15"W
L111	964.98	N00°14'00"E
L112	1023.00	N00°14'00"E
L113	833.96	N46°20'56"E
L114	1512.28±	N85°26'19"W
L115	434.22	N16°29'57"E
L116	1870.00±	N86°49'28"E
L117	410.59	N08°48'18"E
L118	10.49	N86°27'36"E
L119	264.71	S39°29'21"E
L120	612.99	S55°59'35"E
L121	345.57	S47°09'43"E
L122	109.87	S69°04'52"E
L123	393.10	S00°42'17"E
L124	5.00	S80°38'34"E
L125	146.08	S12°05'16"W
L126	211.29	S20°02'45"W
L127	148.00	S03°52'09"E

CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA	CHD DIRECTION	CHORD
C1	201.65	1574.41	7°20'18"	N27°35'20"E	201.51
C2	197.80	1544.41	7°20'17"	N27°35'20"E	197.66
C3	7.53	89.00	4°50'45"	N28°39'34"E	7.52
C4	139.32	76.37	104°31'27"	N83°20'40"E	120.79
C5	152.00	204.98	42°29'08"	N65°38'04"W	148.54
C6	202.37	830.00	13°58'11"	S86°11'02"W	201.87
C7	231.13	480.00	27°35'23"	S65°24'15"W	228.91
C8	64.11	195.00	18°50'10"	S42°11'29"W	63.82
C9	184.11	205.00	51°27'22"	S07°02'43"W	177.98
C10	247.39	180.00	78°44'43"	N20°41'23"E	228.37
C11	52.54	25.00	120°24'43"	S53°05'11"E	43.39
C12	220.82	1617.00	7°49'28"	N03°12'27"E	220.65
C13	250.21	1125.00	12°44'36"	N07°04'35"W	249.70
C14	342.67	352.91	55°37'59"	N41°15'52"W	329.36
C15	45.18	1236.90	2°05'35"	S68°02'05"E	45.18
C16	428.01	1236.90	19°49'35"	S57°04'30"E	425.88
C17	189.50	1229.40	8°49'53"	N51°34'39"W	189.31
C18	279.59	970.60	16°30'15"	S47°44'28"E	278.62
C19	65.69	182.29	20°38'50"	S34°15'53"W	65.34
C20	171.22	356.90	27°29'14"	S10°11'46"W	169.58
C21	381.35	1450.00	15°04'08"	N20°26'03"E	380.25
C22	239.48	573.74	23°54'54"	S08°05'18"W	237.74
C23	355.84	2562.00	7°57'29"	N16°04'01"E	355.56
C24	43.81	1612.00	1°33'25"	N11°18'34"E	43.80
C25	24.51	25.00	56°10'37"	S38°37'09"W	23.54
C26	288.62	210.00	78°44'43"	N20°41'23"E	266.43
C27	157.16	175.00	51°27'22"	S07°02'43"W	151.94
C28	54.24	165.00	18°50'10"	S42°11'29"W	54.00
C29	216.69	450.00	27°35'23"	S65°24'15"W	214.60
C30	195.05	800.00	13°58'11"	S86°11'02"W	194.57
C31	129.78	175.01	42°29'08"	N65°38'18"W	126.82
C32	179.99	106.37	96°56'54"	N87°07'56"E	159.27
C33	293.99	1020.60	16°30'15"	S47°44'28"E	292.97
C34	181.79	1179.40	8°49'53"	N51°34'39"W	181.61
C35	492.32	1286.90	21°55'10"	S58°07'17"E	489.33
C36	294.12	302.91	55°37'59"	N41°15'52"W	282.70
C37	239.09	1075.00	12°44'36"	N07°04'35"W	238.60
C38	275.19	1567.00	10°03'43"	N04°19'34"E	274.83
C39	74.92	1572.00	2°43'50"	N10°43'21"E	74.91
C40	350.29	2522.00	7°57'29"	N16°04'01"E	350.01
C41	256.17	613.74	23°54'54"	S08°05'18"W	254.32

COMMONWEALTH OF VIRGINIA
George W. Robertson
4-17-19
#LS 1411 B
LAND SURVEYOR

LEGEND

- BOUNDARY LINE
- CENTERLINE OF CREEK ALONG BOUNDARY
- ADJACENT BOUNDARY LINE
- SURVEY TIE LINE
- BOUNDARY LINES TO BE VACATED
- EXISTING STREAM
- EXISTING WATER
- CENTERLINE OF CREEK ALONG ADJACENT BOUNDARY
- EXISTING FENCE LINE
- FEMA FLOOD PLAIN LINE
- DIRT ROAD
- EDGE OF PAVEMENT
- EXISTING TRAIL
- OVERHEAD POWER LINE

EXTERIOR BOUNDARY SURVEY
OF FIFTEEN PARCELS OF LAND CONTAINING ±1177.63 ACRES

HAMILTON DISTRICT * CUMBERLAND COUNTY, VIRGINIA
DATE: APRIL 17, 2019 SCALE: N/A

HIGHMARK ENGINEERING
ENGINEERING EXCELLENCE.
13281 RIVERS BEND BLVD., SUITE 201 CHESTER, VA 23836
P (804)-895-2875 BGAMMON@HIGHMARKENG.COM F(804)-530-3964

ATTACHMENT PTA-XI - HYDROGEOLOGIC AND GEOTECHNICAL REPORT

As required by VAC 20-81-100, et seq., a Hydrogeologic and Geotechnical Report for the Facility has been prepared following the outline referenced in Submission Instruction No. 1 (rev. 01/2012). The report is intended to define the geology beneath the site, and the groundwater flow path and rates of the uppermost aquifer.

The Hydrogeologic and Geotechnical Report was originally submitted to DEQ on January 22, 2020. It was reviewed by DEQ and Technical Review No. 1 (TR 1) issued on April 8, 2021. Responses on TR 1 were provided to DEQ on October 1, 2021 (Comments 1 – 10, 12 -13 and 17 - 22) with a TR 1 Supplement submitted on April 13, 2022 (Comments 11, and 14-16). Subsequently, DEQ issued Technical Review No. 2 (TR 2) on June 16, 2022 with a supplement to TR 2 issued on October 25, 2022. The report included herein, updates the document to incorporate TR 1 and TR 1 Supplement information as appropriate. It is submitted as the final response to TR 2.

The following is a list of the documents associated with this section:

PTA Attachment XI – Hydro Geotech Report, Green Ridge Recycling and Disposal Facility, Permit No. 626, Cumberland County, Virginia

PTA Attachment XI
Hydro Geotech Report
Green Ridge Recycling and Disposal Facility
Permit No. 626
Cumberland County, Virginia

Prepared For:
Green Ridge Recycling
and Disposal Facility, LLC
12230 Deer Grove Road
Midlothian, Virginia 23112

Prepared By:
TRC Companies, Inc.
(formerly Draper Aden Associates)
1030 Wilmer Avenue, Suite 100
Richmond, Virginia 23227

December 9, 2019
TR 2 Response - DRAFT
May 12, 2023

SIGNATURE/CERTIFICATION

Qualified Groundwater Scientist:

I certify that I have prepared or supervised preparation of the attached report, that it has been prepared in accordance with industry standards and practices, and that the information contained herein is truthful and accurate to the best of my knowledge.

Certified this ___12th___ day of ___May________, 2023

Prepared by:

Name: Deborah A. Coakley, PG

Signature:

Company: TRC Engineers, Inc.

Address: 1030 Wilmer Avenue, Suite 100

City/State/Zip: Richmond, Virginia 23227

Reviewed by:

Name: Mike D. Lawless, CPG

Signature:

Professional Certification Type and Number: Professional Geologist, Virginia, 832

Company: TRC Engineers, Inc.

Address: 1030 Wilmer Avenue, Suite 100

City/State/Zip: Richmond, Virginia 23227

Seal:

TABLE OF CONTENTS

1.0 INTRODUCTION/BACKGROUND

On behalf of Green Ridge Recycling and Disposal, LLC (GRRD), Draper Aden Associates (DAA) (now TRC) prepared this Hydrogeologic and Geotechnical Report for a proposed solid waste disposal Facility (sanitary landfill) located in Cumberland County, Virginia (Facility). This report ~~is being~~was originally submitted to the Virginia Department of Environmental Quality – Piedmont Regional Office (DEQ) on January 22, 2020 and follows the outline requirements referenced in the DEQ's Solid Waste Permitting Submission Instruction No. 1 (rev. 01/2012). DEQ issued Technical Review 1 (TR 1) on April 8, 2021 with subsequent response submitted by DAA on October 1, 2021 and April 13, 2022. DEQ issued Technical Review 2 (TR 2) on June 16, 2022 and an addendum to TR 2 on October 25, 2022. The purpose of this document update is to incorporate (as appropriate) the TR 1 responses, to reference the TR 1 supplement response and to address TR 2.

The proposed Facility comprises 1,177.63 acres of timbered lands located in eastern Cumberland County, north of U.S. Route 60 (Anderson Highway), in the vicinity of Route 654 (Pinegrove Road) and Route 685 (Miller Lane). **PTA Attachment IX-Figure 1-Key Map** shows the location of the Facility, its boundary, and surrounding geographic features.

~~The proposed waste disposal unit, and other waste management infrastructure, are located on the portion of the Facility bounded on the east by Miller Lane and on the north by Muddy Creek.~~ **PTA Attachment IX-Figure 2-Near Vicinity Map (revised)** shows t~~T~~he Waste Management Boundary (WMB), ~~that encloses the~~ which defines the location of future disposal areas and ~~other waste management infrastructure~~leachate storage facilities, and which is~~all~~ located west of Miller Lane. Several unnamed tributaries that bisect this portion of the Facility eventually feed into Muddy Creek.

The portion of the Facility property located east of Miller Lane will not contain any waste disposal units or leachate storage units. ~~, nor other activities that would be considered part of the waste management unit (such as leachate storage). This eastern portion of the Facility is crossed by Maple Swamp Creek, a tributary to Muddy Creek, and will comprise an office building, access road, scalehouse, and other ancillary operations. Accordingly, hydrogelogic and geotechnical studies described in this report focused on the proposed waste disposal area west of Miller Lane.~~

In preparation of this work, the following activities were performed:

- 2018 - KBJW subsurface investigation in support of preliminary consideration of the site
- 2019 - DAA hydrogeologic study in support of the original Part A
- 2021 – DAA additional boring and CPT investigation in support of TR 1 and TR 1 supplement responses

The work completed under these investigations is discussed below.

1.1 Purpose and Methods

The purpose of this Hydrogeologic and Geotechnical Report is to characterize the hydrogeology and groundwater flow regime underlying the proposed Facility, assess the availability and suitability of on-site soils for use in constructing the landfill, and assess subsurface foundation characteristics.

Prior to the 2019 DAA hydrogeologic study, Koontz Bryant Johnson Williams (KBJW) had completed a study of the Facility location: *Preliminary Subsurface Exploration, Soil and Groundwater Study, Cumberland County, Virginia, March 12, 2018*. That report is included ~~as an appendix~~in Appendix 2 to this document, including its boring logs, cross sections and a potentiometric surface map. Boring logs from the KBJW report are not repeated in **PTA Attachment XII – Location of Borings and Boring Logs**, where the more recent logs for the 2019 and 2021 DAA hydrogeologic studies~~y~~ can be found. Similarly, the cross sections from the KBJW report are not repeated in **PTA Attachment XV,** which contains only potentiometric maps and cross sections from the DAA 2019 and 2021 hydrogeologic studies~~y~~.

A variety of investigative techniques and methods were used to collect information and data as discussed under each of the following sections. The discussion that follows centers on the DAA site characterization work, with mention of how the KBJW results are utilized. For further information on methods and techniques used in the KBJW study, the reader is referred to that document, in Appendix 2.

The TR 1 supplement submittal which provided additional information for discussions on seismicity and liquefaction is referenced in Section 5.0 below with the detailed documents and discussion included in **PTA Attachment XXIII.**

This report was compiled and formatted in general accordance with the requirements of *Virginia Solid Waste Management Regulations* (*VSWMR*) and DEQ's Submission Instruction No. 1 *Procedural Requirements for a New or Modified Solid Waste Management Facility (SWMF) Permit Application* (Revised January 2012).

2.0 BORING RECORDS

The boring records, including number of borings, location of borings, depths of borings, sampling, boring logs, observation wells, in-situ hydraulic conductivity, and sealing of borings are presented in this section and the referenced attachments.

PTA Attachment XII-Figure BOR (TR 1 Supplement) is a 1 inch = 500 feet scale plan view of the Facility showing the Facility boundary, waste management boundary (WMB), ~~disposal unit boundary (DUB)~~ and boring locations. **Table 1 (TR 1 Supplement) (Appendix 1)** is a summary table showing the depth, completion status, construction details and survey results for each of the borings advanced within the Facility and WMB, including those installed by KBJW. DAA

Boring/Well Logs for each boring are also included in **PTA Attachment XII – Location of Borings and Boring Logs (TR 1 Supplement)**.

2.1 Number of Borings

Following initial site reconnaissance, and two meetings with the DEQ to obtain their input on the planned site characterization studies, an initial boring plan was developed. The number and layout of borings were planned to investigate a site that included two proposed disposal units totaling approximately 500 acres, bisected by a tributary to Muddy Creek. Based on the anticipated WMB, the number of borings planned across the waste management unit was consistent with Table 5.1 of 9VAC 20-81-460.E.1.a. Including the KBJW borings, a total of seventy-two (72) borings were advanced across the Facility as then planned. All borings were conducted in the ~~planned~~ conceptual disposal area~~ of the site~~, west of Miller Lane (versus along the access road portion of the site east of Miller Lane where there will be no disposal). The initial DAA field investigation concluded in May 2019~~7~~.

In response to the DEQ TR 1 comments, two additional borings were completed in 2021 by DAA. These were identified as DAA-101pz and DAA-112pz. The location of the 74 borings and their boring logs are now incorporated into this report and included in Table 1.

Following the 2019~~7~~ field investigation, the WMB (prior to the submittal of the original Part A) was modified for several reasons, including the avoidance of wetlands and streams, avoidance of cultural resources and~~,~~ adjustments of ~~-~~planned road relocations. The adjustment eliminated~~, and ultimately the elimination of an~~ the approximate~~ly~~ 200-acre eastern disposal area. ~~This site redesign created a larger 'non-disposal' portion of the WMB in the eastern section of the Facility that lies west of Miller Lane, and one 238.1-acre disposal area on the western portion of the Facility.~~

In 2021, the Waste Management Boundary was again modified in the response to TR 1.

The total acreage within the revised WMB (TR 1) is approximately 428 acres. Per Table 5.1 of §9 VAC 20-81-460.E.1.a, for a WMB greater than 200 acres, the required number of borings is 24 plus 1 boring for each additional 10 acres beyond 200 (or an additional ~~22.8~~23 borings for this WMB). Thus, forty-seven (47) borings are required to characterize the area within the WMB. Of the 74~~2~~ borings installed, 51~~5~~ of these borings are either within or immediately adjacent to the WMB or are integral to the characterization of the area within the WMB. The immediately adjacent borings include: B-6, B-17, B-20, DAA-7sb, DAA-8pz, DAA-37sb, DAA-41pz, DAA-46-pz and DAA-47-pz. The remaining 23~~16~~ borings are no longer considered "Table 5.1" borings as they are no longer within or adjacent to the WMB, nor needed to characterize the area within the WMB. However, these 23~~16~~ borings still provide useful information in terms of assessing groundwater flow across the Facility, and assessing the relationship of the Facility to nearby private water wells along Miller Lane.

It should be noted that due to the adjustment of the WMB prior to submittal of the original Part A, some borings that were originally inside the WMB boundary proper, are now outside, but adjacent (e.g.~~,~~ ~~DAA-11pz,~~ DAA-37pz, B-6).

Other borings associated with characterizing the area within the WMB were specifically sited so as to provide useful geological information and a wider field of study to better characterize conditions within the WMB. This would include for example the wells just outside the southern edge of the WMB (e.g., B-17, DAA-8pz, DAA-7sb and B-20). Had these borings been sited further to the north and inside the current ~~(rather than planned)~~ WMB, the information they would provide would be of lesser value and duplicative of other borings in that area, such as DAA-5pz, DAA-6pz, DAA1sb, DAA-4sb.

The line of borings near the southeastern corner of the WMB, (DAA-42pz, DAA-47pz, DAA-46pz and DAA-44 pz) were needed at these specific locations (and not within the current WMB) to better evaluate groundwater flow directions beneath the areas within and adjacent the WMB, and in this area of a groundwater divide.

Borings along the northeast corner of the WMB outside of this boundary (DAA-18pz, B-10, ~~DAA-41pz,~~ DAA-17sb, DAA-16pz and B-11) are essential for evaluating the groundwater flow characteristics along the northern portion of the area within the WMB. They help to evaluate how the unnamed tributary immediately to the north of the WMB may play a role in intercepting groundwater flowing north from this portion of the Facility and directing it westward toward the larger tributary bisecting the Facility.

Additional borings will be advanced around the WMB and completed as permanent monitoring wells. ~~during Facility construction.~~ The location of these additional borings/wells will be identified during the Part B application process.

2.2 Location of Borings

As shown on **PTA Attachment XII-Figure BOR (TR 1 Supplement)** the boring locations targeted the major geomorphic features within the WMB~~, specifically in and around the proposed DUB.~~. ~~The proposed DUB encompasses approximately 238.1 acres.~~ The boring distribution reflects a pattern within the WMB designed to characterize the geology and hydrogeology of the area within and adjacent the WMB. Field adjustments to the boring locations were made to target various geomorphic features, to address accessibility issues, and to avoid wetlands, streams, and potential cultural resource areas. Subsurface information from both the borings and piezometers was used to prepare ~~five~~ four geologic cross-sections within the Facility (**PTA Attachment XV-Figures Cross-1 (TR-1 Supplement)~~1 and Cross 2~~**).

2.3 Depth of Borings

All borings were advanced using hollow-stem augers. Rock cores were also collected from several of the borings using Wireline NQ2" (NQTK) rock coring equipment with a diamond tooth bit. Boring logs and a summary table (**Table 1**) are included in **Appendix 1**.

Borings are identified using the following nomenclature, which denote the completion status:

- **DAA-2sb:** Advanced by Blue Ridge Drilling during February through March 2019, under the supervision of DAA. Boring was advanced until auger refusal or 60 to 65 feet below ground surface (bgs), whichever came first. Upon completion of drilling, borings were sealed/abandoned using hydrated bentonite pellets.
- **DAA-5pz:** Advanced by Blue Ridge Drilling during February through March 2019 and Jetco Drilling during May 2019, under the supervision of DAA. Boring was advanced until auger refusal or 55 to 60 feet bgs, whichever came first. Upon completion of drilling, 2-inch piezometers were installed by Blue Ridge Drilling and 1-inch piezometers were installed by Jetco.
- **DAA-15pz-s and DAA-15pz-d:** Boring Pairs advanced by Blue Ridge Drilling during February through March 2019, under the supervision of DAA. One boring was advanced until auger refusal and completed as a 2-inch piezometer (shallow). The second boring was advanced until auger refusal then cored an additional ten feet and completed as a 2-inch piezometer (deep).
- **B-1:** Advanced by Blue Ridge Drilling in December 2017, under the supervision of Koontz Bryant Johnson Williams (KBJW). Boring was advanced until auger refusal. Upon completion of drilling the boring was:
    - Sealed with bentonite or,
    - completed as a 1-inch piezometer or,
    - cored an additional ten feet deep and sealed with bentonite

2.4 Sampling

Samples were logged and collected at each of the DAA borings using the following methods, frequency and rationale:

Auger Cuttings:

Auger cuttings generated during drilling were used to log and collect bulk samples at depths ranging from 0 to 6 feet below ground surface. Auger cuttings were collected from the 0 to 5-foot interval and composited as bulk samples for geotechnical analysis.

Split Spoons:

Continuous split spoon samples (per ASTM D1586-99 *Standard Method for Penetration Test and Split-Barrel Sampling of Soils)* were collected and logged beginning at depths ranging from 2 feet to 6 feet bgs in each of the borings. A depth of 6 feet bgs was used as a conservative estimate for the proposed base grade of the disposal unit (proposed lowest elevation of solid waste disposal). Continuous split spoon samples were collected until:

- blow counts exceeded 50+/6 inches, at which time the boring was advanced at 5-foot intervals between split spoon samples until auger refusal; or
- auger refusal

Shelby Tubes:

Shelby tube samples were also collected in accordance with ASTM D1587 *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*. Shelby tube samples collected from several of the borings advanced within the WMB targeted depths ranging from 5 to 25 feet bgs. These target depths were selected to evaluate engineering properties such as strength and compressibility for the eventual submittal of the Part B permit application. The depths of the Shelby tube samples are shown on the boring logs.

Rock Coring:

Rock cores were collected from eleven~~ten~~ borings. Upon auger refusal, Wireline NQ2" (NQTK) rock coring equipment with a diamond tooth bit was used to core:

- ~~-~~ten (10) feet into bedrock at B-2, B-3, B-6, B-18, B-20, DAA-1sb, DAA-15pz-d, DAA-19pz-d, DAA-23pz-d, and DAA-25pz-d, and
- Forty (40) feet into bedrock at DAA-101pz.

The rock core samples were logged in the field and assigned a rock quality designation (RQD) value as shown on the boring logs.

All borings were logged from the surface to the termination depth as shown on the boring logs in **PTA Attachment XII**. Field classifications of the subsurface soil and rock were determined by a geologist at the time of drilling and confirmed by geotechnical laboratory testing. Results of the geotechnical laboratory testing used to confirm the field classification of the soil and rock are included in **PTA Attachment XIII – Laboratory and Field Data.**

2.5 Observation Wells

Forty-seven~~five~~ of the 74~~2~~ borings were completed as 1-inch or 2-inch piezometers as shown on **PTA Attachment XII-Figure BOR**, and **Table 1 (Appendix 1)**. This includes four paired piezometers, which are designated as DAA-19pz-s, DAA-19pz-d, DAA-23pz-s, DAA-23pz-d, DAA-25pz-s, DAA-25pz-d, DAA-15pz-s, and DAA-15pz-d.

Potentiometric and slug test data collected from several piezometers were used to determine the rate and direction of groundwater flow across the Facility.

2.6 In-Situ Hydraulic Conductivity

In-situ single-well aquifer tests (slug tests) were performed at seven of the 2-inch piezometers. These piezometers include DAA-22pz, DAA-25pz-s, DAA-25pz-d, DAA-5pz, DAA-8pz, DAA-26pz, and DAA-29pz. DAA-25pz-d is screened in bedrock and the remaining piezometers that were slug tested are screened in overlying unconsolidated materials. Both slug-in and slug-out tests were performed on all seven piezometers. Slug test data was analyzed to determine hydraulic conductivity (K) using the Bouwer and Rice (1976) or Bouwer (1989) methods of analysis. Aqtesolv computer software was used to facilitate the calculations. Test results from the piezometers screened in unconsolidated material indicated hydraulic conductivity values ranging from 1.20 x 10^{-1} feet per day (ft/day) to 3.82 x 10^{-1} ft/day, with an average value of 2.45 x 10^{-1} ft/day. Based on the test results performed on DAA-25pz-d (screened in bedrock), the hydraulic conductivity value was 1.36 x 10^{-1} ft/day. Test data and calculations are included in **PTA Attachment XIII**.

2.7 Sealing of Borings/Well Abandonment

Boreholes that were not converted to piezometers were abandoned upon completion of drilling using hydrated bentonite pellets. Piezometers located within the proposed ~~DUB and/or~~ WMB that will not be converted to a permanent monitoring well will be abandoned prior to construction of the Facility. The abandonment procedures will follow then-current written DEQ guidance. Currently acceptable monitoring well abandonment procedures include:

1. DEQ will be notified of any monitoring well, observation well or piezometer abandonment activities.
2. The ground surface completion will be removed.
3. The entire well bore will be over drilled to remove all casing, sand filter pack material and grout. Additionally, the resulting open borehole will be backfilled using a tremie pipe with a type I Portland cement and bentonite grout containing 5% by volume bentonite.
4. The monitoring well will be filled with a type 1 Portland cement grout and bentonite containing 5% by volume bentonite from the bottom of the well using a tremie pipe. The bentonite prevents the grout mixture from shrinking while curing, thus providing a good seal in the abandoned borehole to minimize formation of preferential flow paths.

3.0 GEOTECHNICAL REPORT

3.1 Description of Soil Units

PTA Attachment XII (and KBJW report in Appendix 2) contain the boring logs that represent the subsurface conditions encountered during the subsurface investigation conducted at the Facility. Soil strata inferences, discussed below and indicated on the boring logs, represent an estimate of the subsurface conditions based on visual classifications of soils and laboratory classification test results. Note that the transitions between soil strata are generally less distinct than shown on the boring logs and are interpolated between the boring locations. For specific subsurface soil information refer to the boring logs.

The following overall soil strata were observed during the DAA subsurface drilling investigation:

Stratum S1: Stratum S1 material consisted of fine-to coarse-grained Clayey SAND (SC), fine-grained Elastic SILT (MH), and Clayey fine SAND (ML). The Stratum S1 material extended to depths ranging from 2 to 63.5-feet below existing grade, was observed to be light brown to reddish-brown in color, damp to wet, and exhibited N-values ranging from 4 to 25 blows per foot (bpf).

Stratum S2: Stratum S2 material consisted of fine- to coarse-grained Silty SAND (SM) with varying degrees of plasticity. The material extended to a depth ranging from 2 to 48 feet below existing grade, was observed to be light brown and reddish-brown to brownish-gray in color, damp to moist, and exhibiting N-values ranging from 2 to 66 bpf.

Stratum S3: Stratum S3 material consisted of saprolite (partially weathered rock). Saprolite is a transitional material between soil and rock, with hard to very dense relative densities. The material extended to boring termination at depths ranging from 2 to 55 feet below grade, was observed to be light brown to gray in color, damp to wet, and exhibiting N-values ranging from 48 to greater than 100 bpf.

3.2 Laboratory Results

The soil samples obtained during the field investigation were placed in labeled sample containers that were sealed to reduce moisture loss. The rock core samples were stored in core boxes. Field samples were transported to DAA's U.S. Army Corps of Engineers Qualified Materials Testing Laboratory for further testing. The testing items and related ASTM standards are listed below:

Test Item	Standard Name
Soil Natural Moisture Contents	ASTM D2216
Atterberg Limits	ASTM D4318
Soil Classification	ASTM D2487
Standard Proctor Test	ASTM D698
Hydraulic Conductivity	ASTM D5084

A table summarizing the testing results listed above and detailed laboratory reports are presented in **PTA Attachment XIII** of this report.

3.2 Remolded Hydraulic Conductivity

Although it is not intended to use the onsite soil material for a drainage layer, impermeable cap or an impermeable liner, remolded hydraulic conductivity testing was performed on composite bulk samples collected from the upper 0 to 5 feet at various locations across the Facility. The test samples were prepared according to ASTM D698, Standard Proctor, and ASTM D5084. The results of the remolded hydraulic conductivity tests ranged from 1.0 X 10^{-7} to 7.6 X 10^{-8} cm/sec.

3.3 Volume of Materials

As required by §9 VAC 20-81-460.E.2.b.(3), calculations supporting the estimate of soil materials required for development and operation of the landfill are provided in **PTA Attachment XIV – Material Volume Calculations (TR 2)**. On-site soil materials will be used for structural fill, bedding layers, upper layers of closure cap, intermediate cover and limited operations. On-site soils will not be used for liner or the infiltration layer component of the cap. A geosynthetic clay liner will be used in lieu of clay soil materials. Green Ridge will use alternate daily covers in lieu of the 6" soil for daily cover where appropriate.

Based on preliminary calculations as provided in the referenced attachment, approximately 9.2M cubic yards (cy) will be needed for construction and operations. Significant soil material will be generated from excavation ~~to the base grade of the western disposal area~~during landfill development. (estimated to be 4.8~~9~~M cy) In addition, it is estimated that significant soils can be borrowed from on-site borrow areas primarily in the eastern side of the property (estimated to be 4.4M cy)

Note that the calculations indicate a slight deficit of 84,000 cubic yards. This would be equivalent to approximately 10 additional acres of borrow at an average depth of 5' of excavation. Given the additional acreage on site and the adjacent properties owned by Green Ridge this deficit should be readily addressed within the Facility Boundary or from other properties under control of the applicant.

~~Note that the calculations indicate a slight excess. Should additional soil be needed in the future, it could come from borrowing soil from properties adjacent to the site currently owned by Green Ridge but not within the facility boundary.~~

4.0 HYDROGEOLOGIC REPORT

4.1 Water Table Information

Forty-seven~~five~~ (47~~5~~) of the seventy-four~~two~~ (74~~2~~) borings were completed as piezometers. The top of casing elevation for each piezometer (both DAA and KBJW piezometers) was surveyed to within 0.10 feet by a licensed surveyor. Construction details for the piezometers are shown on the boring logs in **PTA Attachment XII,** in the **KBJW Report (Appendix 2),** and in **Table 1 (Appendix 1).**

4.2 Groundwater Level Measurements

DAA collected g~~G~~roundwater level measurements ~~were collected~~ from the piezometers in~~on~~ April ~~5,~~ 2019, May ~~31,~~ 2019, ~~and~~ October ~~29,~~ 2019, January 2020, March 2020, June 2020, July 2020, August 2020, October 2020, January 2021, March 2021, December 2021, March 2022, and June 2022.~~.~~ ~~Because additional piezometers were installed after the April measurements, and the fact that they reflect a seasonal picture of groundwater elevation similar to the May 31st data, only one springtime potentiometric map was constructed (in addition to the one constructed from the October 29th data).~~ No purging or sampling activities were conducted within the 24 hours preceding the measuring activities, so that measured water levels would be representative of actual field conditions. Static water levels were measured with an electronic water level indicator, accurate to 0.01 feet. These measurements were obtained from a surveyed mark on top of each casing to ensure consistency. The results of these measurements are shown on ~~in~~ **Table 1A (Appendix 1).** ~~As shown in the Table 1A attachment, the highest water table elevations were observed in the spring months, specifically May 2019 and~~Based on the numerous events, the May 2019 event is most representative of the site and groundwater level measurements.

Potentiometric maps for the May 2019 and October 2019 are included in this report.

4.3 Vertical Flow Components

May 31, 2019 - As discussed in section 2.5 of this report, four pairs of piezometers were installed during the hydrogeologic study. As shown in **Table 1 (Appendix 1)**, groundwater elevations observed on May 31, 2019 in the four pairs of piezometers were:

- 308.26 DAA-19pz-s
- 308.29 DAA-19pz-d
- 294.27 DAA-23pz-s
- 292.41 DAA-23pz-d
- 304.90 DAA-25pz-s
- 305.75 DAA-25pz-d
- 307.07 DAA-15pz-s
- 307.09 DAA-15pz-d

Vertical gradient was calculated for each pair by dividing the difference in groundwater elevation between the shallow piezometer and the deep piezometer by the vertical difference between the midpoint of the relative screens, or:

$$\frac{\textit{(Groundwater Elevation Shallow Piezometer)} - \textit{(Groundwater Elevation Deep Piezometer)}}{\textit{Difference of mid-screen depths between Shallow and Deep Piezometers}}$$

Results showed an overall upward gradient in all the piezometer pairs except the DAA-23pz location. The DAA-23pz pair showed a minimal downward hydraulic gradient.

October 29, 2019 - As shown on **Table 1**, groundwater elevations observed on October 29, 2019 in the four pairs of piezometers were:

- 305.54 DAA-19pz-s
- 291.41 DAA-23pz-s
- 302.45 DAA-25pz-s
- 305.95 DAA-15pz-s
- 304.89 DAA-19pz-d
- 294.85 DAA-23pz-d
- 302.65 DAA-25pz-d
- 306.04 DAA-15pz-d

Vertical gradient was calculated for each pair by dividing the difference in groundwater elevation between the shallow piezometer and the deep piezometer by the vertical difference between the midpoint of the relative screens, or:

$$\frac{\textit{(Groundwater Elevation Shallow Piezometer) – (Groundwater Elevation Deep Piezometer)}}{\textit{Difference of mid-screen depths between Shallow and Deep Piezometers}}$$

Results showed an overall upward gradient in the piezometer pairs of DAA-23pz and DAA-25pz. The DAA-15pz and DAA-19pz pairs showed a downward hydraulic gradient.

4.4 Seasonal and Temporal Factors

Infiltration from precipitation as a factor of seasonal fluctuations in total rainfall and rainfall intensity, likely affect the static groundwater elevations in the uppermost aquifer at the site. Monthly precipitation data from July 2018 through June 2019 is presented on **Table 2 (Appendix 1)**. Limited data exists at this time regarding the response of groundwater elevations at the Facility to precipitation. Additional data ~~will~~ may be collected during future monitoring events until such time that a correlation may be established.

It should be noted that ~~Facility design, and~~ base grades as shown in the cross sections contained in **PTA Attachment XV**, utilize the highest groundwater elevations~~levels~~ beneath the proposed disposal area as observed during the ~~in the~~ May 2019 gauging event. As shown on Table 1A, seasonal water table fluctuations beneath the disposal area range from approximately 3 to 6 feet. ~~The October 29, 2019 water levels were generally around two to three feet lower than those observed in May, with the greatest drop being nearly five feet in DAA-29pz.~~

Currently, no apparent temporal or anthropogenic factors that could affect groundwater levels at the Facility are occurring. Such factors might include on-site pumping of wells or pumping of high-yielding offsite wells.

4.5 Field Procedures and Results

As stated in the previous section describing hydraulic conductivity testing, in-situ single-well aquifer tests (slug tests) were performed at seven of the 2-inch piezometers. These piezometers include DAA-22pz, DAA-25pz-s and DAA-25pz-d, DAA-5pz, DAA-8pz, DAA-26pz and DAA-29pz. DAA-25pz-d is screened in bedrock and the remaining piezometers that were slug tested are screened in overlying unconsolidated materials. Both slug-in and slug-out tests were performed on all seven piezometers. Slug test data was analyzed to determine hydraulic conductivity (K) using the Bouwer and Rice (1976) or Bouwer (1989) methods of analysis. Aqtesolv computer software was used to facilitate the calculations. Test results from the piezometers screened in unconsolidated material indicated hydraulic conductivity values ranging from 1.20×10^{-1} feet per day (ft/day) to 3.82×10^{-1} ft/day, with an average value of 2.45×10^{-1} ft/day. Based on the test results performed on DAA-25pz-d (screened in bedrock), the hydraulic conductivity value was 1.36×10^{-1} ft/day. Test data and calculations are presented in **PTA Attachment XIII**.

4.6 Description of Site Geology

The Facility is located within the Piedmont province, which is the largest physiographic province in Virginia. Virginia's Piedmont province is characterized by gently rolling topography and extends from the Blue Ridge Mountains on the west to the Coastal Plain Province on the east. Bedrock within the Piedmont province generally consists of hard, resistant igneous rock and metamorphosed igneous and sedimentary rock, although minor sedimentary basin deposit formations are also present. Bedrock within the Piedmont province is typically overlain by unconsolidated regolith. A significant portion of the regolith is typically comprised of saprolite, which is a soft, decomposed rock created by chemical weathering of the uppermost bedrock surface. Saprolite within the Piedmont province is variably thick and can exceed 60 feet in thickness. Outcrops are commonly restricted to stream valleys where saprolite has been removed by erosion.

Based on a review of the *Geologic Map of Virginia* prepared by the United States Geologic Survey (USGS, 1993), the Facility is underlain by Proterozoic light gray segregation-layered gneiss containing prominent potassium feldspar porphyroblasts (see **PTA Attachment XV-Geologic Map)**. Typical mineralogy is quartzite, biotite, plagioclase, potassium feldspar, muscovite and hornblende. Bedrock outcrops are visible in stream beds at various locations across the Facility and observations of these outcrops confirm the site is in fact underlain by fractured gneiss.

During drilling activities at the Facility, bedrock was encountered at depths ranging from 8 feet bgs in DAA-45pz to depths of greater than 60 feet in DAA-4sb and DAA-7b. A bedrock surface contour map is included in **PTA Attachment XV as Figure BED (TR 1 Supplement)**. As shown on **Table 1 (TR 1 Supplement)** and the boring logs in **Attachment XII,** eleven~~ten~~ rock core samples were collected. Ten (10) feet of cored rock (two 5-foot runs) were collected from each of the following boring locations: B-2, B-3, B-6, B-18, B-20, DAA-1sb, DAA-15pz-d, DAA-19pz-d, DAA-23pz-d and DAA-25pz-d. The Rock Quality Designation (RQD) results ranged from 13% (highly weathered) in the upper 5-foot run in B-18 to 98% (competent) in the lower 5-foot run in B-2.

Forty (40) feet of cored rock (eight 5-foot runs) were collected from DAA-101pz installed in response to TR 1 comments. RQD results ranged from 27% (highly weathered) in the upper 10 feet of rock core in DAA-101pz, to 92% (competent) in the lower 10 feet of rock core in DAA-101pz.

Consistent with the regional geology literature for the Piedmont province in this area of Virginia, the core samples indicate the Facility is predominantly underlain by a biotite rich gneiss with intermittent quartz seams/intrusions. This type of rock is typically not conducive to solution activity, although it is likely to contain fractures and fracture zones, which have contributed to the formation of existing depressions and stream channels across the site.

The Part A subsurface investigation indicated geology beneath the Facility is generally consistent with characteristics typical of the Piedmont province (rolling topography, weathered bedrock underlying a blanket of unconsolidated and saprolitic materials, and shallower depths to bedrock in stream valleys where overlying material has been removed by erosion). Site soils are predominantly composed of unconsolidated sands and silts, with lesser deposits of silty clays. Saprolites and remnant rock fabric were typically observed in unconsolidated soils throughout the site. Soils are typically thicker on the topographically elevated areas, and thinner in the stream valleys. Observed thickness ranged from greater than 60 feet thick in DAA-7sb, which is located at the southern (upgradient) portion of the Facility, to 8 feet thick in DAA-45pz, which is located at the northern (downgradient) portion of the Facility near Muddy Creek. Cross-sections are presented in **PTA Attachment XV**.

The uppermost aquifer zone is predominantly located in the materials overlying the bedrock. However, as discussed in more detail in the following section, the water table extends to below the bedrock surface at the downgradient portion of the Facility where unconsolidated soils thin toward Muddy Creek. Flow of groundwater in bedrock primarily occurs in the upper weathered portions, and not the underlying, less weathered and more competent portions. No structural discontinuities that would affect groundwater flow were noted during the subsurface investigation.

4.7 Description of Aquifer

The findings of the Part A subsurface investigation have characterized the directions of groundwater flow within the uppermost aquifer. As stated above, and as presented in **PTA Attachment XV-Cross-Sections**, the uppermost aquifer is predominantly located in the pore space available in the soils and saprolite materials overlying the bedrock. These materials are predominantly granular permeable materials including fine to medium sands and silts, with lesser amounts of silty clays.

Recharge areas on the Facility coincide with most topographically elevated areas where permeable granular materials are exposed at the surface. In these areas, infiltrated precipitation is the primary source of recharge.

Potentiometric surface maps prepared from groundwater elevation data collected in May and October 2019 are shown in **PTA Attachment XV-Figures GW-1 and GW-2**. A potentiometric surface map from groundwater elevation data collected in May 2019 (highest observed groundwater elevations) is also shown in **PTA Attachment XV-Figures GW-3.** Groundwater flow direction is presumed to be perpendicular to the interpolated groundwater elevation contours. As shown on the potentiometric surface maps, groundwater flow across the Facility is generally north-northwest toward Muddy Creek. This flow pattern is likely caused by the effect of the topography, the geometry of the underlying bedrock, and localized stream beds which, dissect the Facility. The majority of groundwater flow occurs in the unconsolidated materials overlying the bedrock. Comparison of potentiometric elevations to bedrock elevations indicate that the water table appears to extend below the bedrock surface at the north-northeast portion of the Facility closer to Muddy Creek.

Potentiometric gradients (i) range from approximately 7.94×10^{-3} in the southern most upgradient section of the Facility to 2.92×10^{-2} in the central downgradient portion of the Facility. As previously discussed, in-situ single-well aquifer tests (slug tests) were performed on selected piezometers. Based on the slug tests, the average hydraulic conductivity (K) of the unconsolidated materials was 0.245 ft/day. Assuming an effective porosity (n) of 0.30, (McWorter and Sunada, 1977) the average seepage velocity for the upgradient portion of the Facility, where the shallower gradient was estimated, is calculated is follows:

$V = Ki/n$

$V = (0.245 \text{ ft/day}) (7.94 \times 10^{-3}) / 0.30$

$V = 6.48 \times 10^{-3} \text{ ft/day}$

The average linear velocity for the downgradient portion of the Facility, where the steepest gradient was estimated, is calculated as follows:

$V = Ki/n$

$V = (0.245 \text{ ft/day}) (2.92 \times 10^{-2}) / 0.30$

$V = 2.38 \times 10^{-2} \text{ ft/day}$

As previously discussed, paired piezometers were installed in the overburden and bedrock material. Comparison of these observed elevations indicates that the uppermost aquifer comprises both the shallow unconsolidated materials and the deeper, weathered upper portions of bedrock.

Summary of Findings: To summarize the site geology and hydrogeology at the proposed Facility as it pertains to groundwater monitoring and conduciveness to corrective actions, if warranted, the findings of the Part A subsurface investigation indicated the following:

- Most of the uppermost aquifer occupies the pore space within the saprolite material overlying bedrock at the Facility. These materials are predominantly fine to medium sands and silts, with lesser amounts of silty clays.
- Some portions of the uppermost aquifer are located at or below the bedrock surface at topographically elevated areas immediately upgradient of Muddy Creek.
- Flow of groundwater in bedrock primarily occurs in the upper weathered rock, however deeper groundwater flow in bedrock is likely occurring as well (below the elevation of the investigation) with this deeper flow controlled by fracture zones in the bedrock. These fracture zones often correlate with stream valleys. Permanent monitoring wells will be installed to monitor this deeper flow system as well as the shallower bedrock (saprolite) and overburden flow systems.
- No faults or other structural discontinuities that would complicate groundwater flow or monitoring were noted during the investigation.
- The soil and rock types, as well as groundwater flow patterns observed during the investigation indicate the site geology and hydrogeology are conducive for the uppermost aquifer to be characterized and effectively monitored.
- Site conditions indicate that a monitoring well network can be designed and installed to monitor the landfill.

5.0 TR 1 SUPPLEMENT – ADDITIONAL ACTIVITIES AND SCHNABEL REPORT

5.1 Background

The Part A Application was originally submitted to DEQ on January 22, 2020. It was reviewed by DEQ and Technical Review No. 1 (TR 1) issued by DEQ on April 8, 2021. TR 1 had 22 comments.

One comment (Comment 11) required additional response on bedrock. Comment as follows:

11.) *The proposed base grades depicted in Attachment XV of the Part A Permit Application show the base grades constructed 10 to 25 feet into the bedrock in some areas (e.g., South of B-5, and near DAA-27sb). However, it appears that none of the borings performed for the Part A Permit Application were installed more than 10 feet into bedrock at the site. In accordance with 9 VAC 20-81-460.E.1.e., at least one deep boring should be installed into bedrock where the deepest base grades are proposed. The bedrock should be cored continuously for the first 20 feet below the proposed base grade. This will provide necessary information in accordance with 9 VAC 20-81-120.D.1 regarding the rate and direction of groundwater flow in the bedrock, ability to monitor groundwater in bedrock, the need for blasting or adjustment of base grades, potential hydraulic inter-connection with other regional groundwater wells, etc.*

Three of the comments (Comments 14, 15 and 16) specifically related to seismic zones and design (i.e., Ground Shaking Hazard Levels and Landfill Containment Structure Design Considerations). Comments as follows:

14.) The proposed landfill is located within the Central Virginia Seismic Zone. 9 VAC 20-81-120.C.3.b.(1) restricts siting of a landfill within a seismic impact zone unless the owner or operator demonstrates that all containment structures are designed to resist the maximum horizontal acceleration in lithified earth material for the site. Attachment XXIII indicates that the peak ground acceleration may be as much as 20% gravity for the landfill site. However, according to the USGS Unified Hazard Tool, the peak ground acceleration to be used for design purposes at this site location is 22.5% gravity, or 0.225g. Please note that the USGS updated the U.S. Seismic Hazard Long-Term Model in 2018. The applicant should use the updated data as appropriate in the Part A Permit Application.

15.) The proposed base grades depicted in Attachment XV of the Part A Permit Application are shown constructed into the bedrock in some areas, and atop as much as 35 feet of silts and sands in other areas of the site. Attachment XXIII indicates that the proposed landfill will incorporate a design seismic coefficient of 0.10g, or one-half the peak ground acceleration. However, it is not appropriate to set the seismic coefficient as one-half the peak bedrock acceleration at this stage, since the seismic coefficient is related to the peak acceleration at the ground surface, which may be amplified by the overlying soils and be different than the peak acceleration in bedrock.

16.) An assessment of the Liquefaction Potential should be performed based upon the geotechnical and hydrogeological data gathered from the site investigations (in particular in those areas with more extensive silts and sands, e.g., DAA-4sb and DAA-36pz). In addition, a preliminary seismic stability analysis should be performed for both conditions that may be present (i.e., landfill constructed into bedrock, and landfill constructed atop 35 feet or more of silts and sands), in order to demonstrate that the landfill can be designed to resist the maximum horizontal acceleration in bedrock, as required by 9 VAC 20-81-120.C.3.b.(2). Guidance for performing these assessments can be found in document EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities.

Green Ridge's responses to the TR 1 comments were addressed in two phases:

- Phase 1 was a response to all comments although the responses to Comment 11 (deep boring into bedrock), and Comments 14, 15, and 16 indicated that additional field work with technical evaluation was necessary to provide the requested information. In support of this effort, the response indicated that Schnabel Engineering had been retained by Green Ridge to address Comments 14 through 16. The Phase 1 response was submitted to DEQ on October 1, 2021 and included Letter Attachment 12 which contained a preliminary memorandum from Schnabel Engineering dated August 26, 2021

- Phase 2 was submitted on April 13, 2022 as a supplement to the October 1, 2021 submittal and provided the results of the required additional field investigations and technical evaluation. This submittal is termed TR 1 Supplement response. Key to this submittal was a final report by Schnabel Engineering dated April 8, 2022 which fully addressed responses to Comments 14 through 16.

5.2 Overview of ~~a~~Activities

A brief description of the activities under Phase 2 follows. Detailed information can be found in **PTA Attachment XXIII.**

Relative to bedrock: On November 30, 2021, DAA supervised the drilling and installation of a deep boring/piezometer DAA-101pz. DAA-101pz was installed at the northern section of the disposal cell, adjacent to existing soil boring B-9. The north section of the disposal cell is where the deepest conceptual base grades were proposed. DAA-101pz was advanced by Blue Ridge Drilling using hollow stem augers. Upon auger refusal at approximately 15 feet below ground surface (bgs), Wireline NQ2 rock coring equipment was used to core bedrock continuously from 15 feet to 55 feet bgs. Rock core samples were logged in the field and assigned a rock quality designation (RQD) value. Upon completion of rock coring activities, DAA-101pz was completed as a 2-inch diameter piezometer.

Groundwater gauging data was collected from the piezometers at the facility in December 2021 and March 2022. As shown in Table 1, the groundwater elevation in DAA-101pz is 291 feet msl, which is just below the overburden/bedrock interface in this area of the disposal cell.

Based on the additional field work and analysis, the DEQ TR 1 Comment Number 11 was adequately addressed as there were no further comments relative to these comments included in TR 2.

Relative to seismicity and liquefaction: Cone penetration testing including seismic CPTs were needed to verify underlying conditions. The cone penetration test (CPT) is a method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy. In this test a cone penetrometer is pushed into the ground at a standard rate and data are recorded at regular intervals during penetration. A cone penetration test rig pushes the steel cone vertically into the ground. The cone penetrometer is instrumented to measure penetration resistance at the tip and friction in the shaft (friction sleeve) during penetration. It is standardized under ASTM standard D 3441 (2004). ConeTec completed this work during November 2021 and 11 CPT soundings were completed. DAA-112pz was also constructed in support of this activity. The information from this testing can be found in **PTA Attachment XXIII.**

Boring logs for DAA 101pz and DAA 112pz can be found in **PTA Attachment XII.**

Based on the additional field work and analysis, the DEQ TR 1 Comments 14 – 16 were adequately addressed as there were no further comments relative to these comments included in TR 2.

~~5.0~~6.0 REFERENCES

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VSWMR, 2012. *Virginia Solid Waste Management Regulations - Procedural Requirements for a New or Modified Solid Waste Management Facility Permit Application* (Revised January 2012).

APPENDIX HG-1

TABLES

TABLE 1A

Groundwater Elevation Data (April 2019 through June 2022)

Green Ridge Recycling and Disposal Facility

Cumberland, Virginia

	B-1	B-3	B-7	B-8	B-10	B-12	B-14	B-17	B-18	B-20
Elev-Ground	**374.63**	**347.83**	**352.33**	**330.26**	**341.19**	**335.89**	**290.50**	**381.37**	**365.42**	**349.15**
Elev-TOC	**375.59**	**348.89**	**353.71**	**331.21**	**342.16**	**337.01**	**291.89**	**383.46**	**366.17**	**349.61**
Apr-19	338.53	328.99	321.93	295.06	312.44	326.19	261.55	352.08	352.36	314.96
May-19	339.45	329.49	323.18	296.06	312.97	323.93	260.73	353.31	352.23	315.56
Oct-19	338.94	328.83	321.87	296.01	312.06	317.46	258.02	352.47	349.57	314.71
Jan-20	338.08	328.06	321.09	295.36	311.57	317.31	259.43	351.66	349.02	314.76
Mar-20	337.84	327.52	320.83	295.06	311.8	319.16	259.94	351.29	349.72	314.17
Jun-20	337.61	327.04	320.56	295.12	311.78	320.16	259.79	351.01	349.32	313.87
Jul-20	337.41	326.90	320.22	Dry	311.42	318.3	258.68	350.68	348.62	313.52
Aug-20	337.14	326.72	319.97	Dry	311.27	317.52	259.19	350.43	348.27	313.43
Oct-20	336.85	326.48	319.63	Dry	311.1	317.3	259.68	350.18	348.19	313.32
Jan-21	338.40	327.84	321.42	Dry	312.2	325.06	261.05	351.26	351.87	314.10
Mar-21	340.21	329.51	324.18	297.32	313.58	325.06	261.68	353.40	353.70	314.94
Dec-21	339.59	328.40	322.51	296.63	312.25	317.73	258.86	352.66	349.89	314.29
Mar-22	338.89	327.59	321.49	295.76	311.60	318.39	259.52	351.86	349.75	313.81
Jun-22	338.74	326.89	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	351.46	349.65	313.43
MIN	336.85	326.48	319.63	295.06	311.10	317.30	258.02	350.18	348.19	313.32
MAX	340.21	329.51	324.18	297.32	313.58	326.19	261.68	353.40	353.70	315.56
MEAN	338.41	327.88	321.45	295.82	312.00	320.27	259.86	351.70	350.15	314.21
MEDIAN	338	328	321	296	312	318	260	352	350	314
RANGE	3.36	3.03	4.55	2.26	2.48	8.89	3.66	3.22	5.51	2.24
STD	0.94	0.99	1.25	0.73	0.67	3.31	1.07	0.96	1.64	0.67

Piezometer located inside of disposal boundary

Highest Groundwater Elevations Used for POT Maps

TABLE 1A

Groundwater Elevation Data (April 2019 through June 2022)

Green Ridge Recycling and Disposal Facility

Cumberland, Virginia

	DAA-5pz	DAA-6pz	DAA-8pz	DAA-9pz	DAA-10pz	DAA-11pz	DAA-12pz	DAA-13pz	DAA-14pz	DAA-15pz-s
Elev-Ground	**356.49**	**332.92**	**364.19**	**365.25**	**339.45**	**335.07**	**330.07**	**357.96**	**380.13**	**329.98**
Elev-TOC	**356.50**	**335.19**	**365.46**	**365.68**	**341.55**	**336.30**	**331.20**	**359.36**	**381.44**	**331.15**
Apr-19	336.18	316.94	356.99	345.79	318.60	Dry	308.86	334.54	344.65	306.62
May-19	336.94	317.06	355.87	345.97	318.89	312.55	308.85	334.70	345.69	307.07
Oct-19	335.25	313.99	351.91	343.98	316.95	Dry	305.20	332.31	346.14	305.95
Jan-20	334.28	313.24	352.25	343.17	317.20	Dry	Dry	331.43	345.48	305.20
Mar-20	333.90	313.44	353.51	343.56	317.64	Dry	Dry	331.42	345.27	305.50
Jun-20	333.53	313.10	353.31	343.32	317.34	Dry	Dry	331.38	345.06	305.52
Jul-20	333.16	312.41	351.43	342.90	316.65	Dry	Dry	331.01	344.89	305.47
Aug-20	332.92	312.09	351.15	342.58	316.56	Dry	Dry	330.67	344.66	305.30
Oct-20	332.66	311.79	351.33	342.40	316.74	Dry	Dry	330.51	344.39	305.09
Jan-21	334.02	315.34	356.01	345.42	317.94	Dry	Dry	332.99	345.47	307.67
Mar-21	336.71	316.90	355.89	347.13	318.98	312.00	309.13	334.94	347.19	308.82
Dec-21	334.95	313.19	352.60	344.11	317.22	Dry	Dry	331.72	347.46	306.00
Mar-22	334.06	312.53	353.19	343.68	317.30	312.82	305.40	331.16	346.77	305.15
Jun-22	333.49	Not Measured	353.45	343.70	317.22	Not Measured	Not Measured	331.31	346.43	305.81
MIN	332.66	311.79	351.15	342.40	316.56	312.00	305.20	330.51	344.39	305.09
MAX	336.94	317.06	356.99	347.13	318.98	312.82	309.13	334.94	347.46	308.82
MEAN	334.43	314.00	353.49	344.12	317.52	312.46	307.49	332.15	345.68	306.08
MEDIAN	334	313	353	344	317	313	309	331	345	306
RANGE	4.28	5.27	5.84	4.73	2.42	0.82	3.93	4.43	3.07	3.73
STD	1.33	1.84	1.88	1.36	0.77	0.34	1.79	1.47	0.94	1.06

Piezometer located inside of disposal boundary

Highest Groundwater Elevations Used for POT Maps

TABLE 1A

Groundwater Elevation Data (April 2019 through June 2022)

Green Ridge Recycling and Disposal Facility

Cumberland, Virginia

	DAA-15pz-d	DAA-16pz	DAA-18pz	DAA-19pz-s	DAA-19pz-d	DAA-20pz	DAA-22pz	DAA-23pz-s	DAA-23pz-d	DAA-24pz
Elev-Ground	**329.71**	**323.02**	**342.12**	**325.34**	**325.18**	**312.39**	**323.33**	**318.63**	**317.94**	**289.87**
Elev-TOC	**331.34**	**324.60**	**343.46**	**325.94**	**327.09**	**313.62**	**324.70**	**320.61**	**318.67**	**291.19**
Apr-19	306.62	302.92	325.78	308.94	308.92	Dry	287.15	292.02	290.69	268.86
May-19	307.09	297.03	325.2	308.26	308.29	Dry	288.84	294.27	292.41	270.92
Oct-19	306.04	Dry	321.63	305.54	304.89	Dry	289.22	291.41	294.85	270.79
Jan-20	305.39	Dry	321.25	Dry	304.03	Dry	288.63	289.44	288.46	Dry
Mar-20	305.59	Dry	322.19	Dry	304.06	Dry	288.2	288.54	287.77	Dry
Jun-20	305.58	Dry	322.01	Dry	304.09	Dry	287.77	287.98	287.22	Dry
Jul-20	305.56	Dry	320.9	Dry	303.38	Dry	287.36	287.75	287.02	Dry
Aug-20	305.34	Dry	320.68	Dry	303.11	Dry	287.08	287.51	287.02	Dry
Oct-20	305.11	Dry	320.67	Dry	302.78	Dry	286.81	287.25	286.6	Dry
Jan-21	307.69	Dry	324.72	Dry	305.68	Dry	286.85	288.06	287.47	Dry
Mar-21	308.80	Dry	326.44	309.09	308.96	Dry	289.1	293.21	291.62	271.59
Dec-21	306.01	Dry	321.43	Dry	304.7	Dry	290.65	291.19	289.52	267.73
Mar-22	305.24	296.90	321.44	305.39	303.65	Dry	289.82	289.14	289.14	266.69
Jun-22	305.83	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
MIN	305.11	296.90	320.67	305.39	302.78	0.00	286.81	287.25	286.60	266.69
MAX	308.80	302.92	326.44	309.09	308.96	0.00	290.65	294.27	294.85	271.59
MEAN	306.14	298.95	322.64	307.44	305.12	#DIV/0!	288.27	289.83	289.21	269.43
MEDIAN	306	297	322	308	304	#NUM!	288	289	288	270
RANGE	3.69	6.02	5.77	3.70	6.18	0.00	3.84	7.02	8.25	4.90
STD	1.03	2.81	2.01	1.64	2.11	#DIV/0!	1.18	2.24	2.42	1.80

Piezometer located inside of disposal boundary

Highest Groundwater Elevations Used for POT Maps

TABLE 1A

Groundwater Elevation Data (April 2019 through June 2022)

Green Ridge Recycling and Disposal Facility

Cumberland, Virginia

	DAA-25pz-s	DAA-25pz-d	DAA-26pz	DAA-29pz	DAA-31pz	DAA-34pz	DAA-35pz	DAA-36pz	DAA-40pz	DAA-41pz
Elev-Ground	**326.38**	**326.58**	**304.20**	**347.84**	**348.57**	**354.70**	**365.58**	**340.15**	**325.93**	**306.52**
Elev-TOC	**328.45**	**327.70**	**305.08**	**349.41**	**349.92**	**355.38**	**367.36**	**340.83**	**327.50**	**307.99**
Apr-19	304.9	305.82	276.32	328.50	318.28	327.73	335.78	330.58	301.56	285.54
May-19	304.9	305.75	277.01	328.78	318.88	329.47	336.41	330.19	300.67	285.16
Oct-19	302.45	302.65	276.22	323.81	317.72	328.63	335.36	326.79	Dry	284.39
Jan-20	301.23	301.74	276.86	324.75	317.61	327.88	334.65	326.51	Dry	284.84
Mar-20	301.51	302.05	277.43	324.41	317.45	327.55	334.44	327.29	Dry	285.17
Jun-20	301.22	301.75	277.41	324.33	316.88	327.25	334.15	327.09	Dry	284.91
Jul-20	300.7	301.1	276.83	324.06	316.42	327.11	333.91	326.9	Dry	284.48
Aug-20	300.35	300.7	276.93	323.81	316.23	326.88	333.60	325.68	Dry	284.7
Oct-20	300.17	300.45	277.27	323.36	316.04	326.59	333.30	325.62	Dry	285.06
Jan-21	305.13	305.18	278.74	325.87	316.75	327.06	335.33	329.88	Dry	285.99
Mar-21	306.5	307.44	279.79	328.76	318.72	329.53	337.49	331.83	302.33	285.75
Dec-21	302.41	302.77	277.97	325.01	317.79	329.16	336.15	326.91	Dry	284.59
Mar-22	328.45	301.37	278.22	324.01	317.44	328.52	335.46	326.81	297.38	284.93
Jun-22	Not Measured	Not Measured	278.48	324.67	316.88	328.17	335.20	Not Measured	Not Measured	Not Measured
MIN	300.17	300.45	276.22	323.36	316.04	326.59	333.30	325.62	297.38	284.39
MAX	328.45	307.44	279.79	328.78	318.88	329.53	337.49	331.83	302.33	285.99
MEAN	304.61	302.98	277.53	325.30	317.36	327.97	335.09	327.85	300.49	285.04
MEDIAN	302	302	277	325	317	328	335	327	301	285
RANGE	28.28	6.99	3.57	5.42	2.84	2.94	4.19	6.21	4.95	1.60
STD	7.17	2.19	0.96	1.86	0.85	0.94	1.12	1.95	1.89	0.47

Piezometer located inside of disposal boundary

Highest Groundwater Elevations Used for POT Maps

TABLE 1A

Groundwater Elevation Data (April 2019 through June 2022)

Green Ridge Recycling and Disposal Facility

Cumberland, Virginia

	DAA-42pz	DAA-43pz	DAA-44pz	DAA-45pz	DAA-46pz	DAA-47pz	DAA-48pz	DAA-101pz	DAA-112pz
Elev-Ground	**363.99**	**309.00**	**379.96**	**269.06**	**360.77**	**359.19**	**315.50**	**310.55**	**351.20**
Elev-TOC	**366.57**	**309.32**	**382.98**	**271.24**	**364.16**	**360.91**	**317.84**	**313.00**	**353.49**
Apr-19	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
May-19	338.87	dry	346.079	Dry	337.38	331.64	Dry	Not Installed	Not Installed
Oct-19	336.32	dry	344.279	Dry	335.36	329.39	Dry	Not Installed	Not Installed
Jan-20	335.32	294.472	343.169	Dry	334.51	328.41	Dry	Not Installed	Not Installed
Mar-20	335.32	294.172	342.579	Dry	333.93	328.97	297.67	Not Installed	Not Installed
Jun-20	335.38	294.392	342.379	261.39	333.78	328.98	297.95	Not Installed	Not Installed
Jul-20	334.90	294.372	341.989	261.32	333.46	328.36	Dry	Not Installed	Not Installed
Aug-20	334.39	Dry	341.629	Dry	333.13	328.04	297.99	Not Installed	Not Installed
Oct-20	334.29	Dry	341.249	Dry	332.78	327.84	298.05	Not Installed	Not Installed
Jan-21	336.48	Dry	342.029	Dry	335.32	330.04	297.95	Not Installed	Not Installed
Mar-21	336.52	Dry	345.189	261.79	338.25	332.43	297.97	Not Installed	Not Installed
Dec-21	336.30	Dry	344.069	Dry	335.71	329.98	298.07	291.32	344.90
Mar-22	335.55	Dry	343.33	Dry	334.74	329.57	298.42	291.67	346.59
Jun-22	335.60	Not Measured	Not Measured	Not Measured	Not Measured	329.75	Not Measured	292.05	Not Measured
MIN	334.29	294.17	341.25	261.32	332.78	327.84	297.67	291.32	344.90
MAX	338.87	294.47	346.08	261.79	338.25	332.43	298.42	292.05	346.59
MEAN	335.79	294.35	343.16	261.50	334.86	329.49	298.00	291.68	345.75
MEDIAN	336	294	343	261	335	329	298	292	346
RANGE	4.58	0.30	4.83	0.47	5.47	4.59	0.76	0.73	1.69
STD	1.13	0.11	1.42	0.21	1.59	1.29	0.19	0.30	0.84

Piezometer located inside of disposal boundary

Highest Groundwater Elevations Used for POT Maps

APPENDIX HG-2

PRELIMINARY SUBSURFACE EXPLORATION, SOIL AND GROUNDWATER STUDY CUMBERLAND COUNTY, VIRGINIA

Koontz Bryant Johnson Williams
March 12, 2018