Table of Contents

Solid Waste Future

Current placement of waste July 2020

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Solid Waste

Background material has been provided including:

- Copy of Power Point with Notes section
- Landfill
  - Current Landfill Lifespan estimate (as of 6/1/2020)
  - Master Plan Update with Technical Fatal Flaw Analysis
  - NCNHP Review
- NCDEQ
  - Chart of Landfill receipts FY1993-FY2020
  - NCDEQ – Public and Private MSW Fees FY2019
  - NCDEQ – Public and Private MSW Landfills including Receipts from FY2015-FY2019

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Solid Waste

Cont'd Background material has been provided including:

- Options
  - NCDEQ Transfer Stations (WNC facilities highlighted)
  - Cost comparison LF vs TS
  - Other Technologies
    - Anaerobic Digestion
    - Composting
    - Landfill Mining
    - Waste to Energy (WTE) - Incineration

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Solid Waste

Cont'd Background material has been provided including:

- LF vs TS
  - LaBella Cost Comparison of LF Expansion to Transfer Station for period through 2052
- Western Expansion LF - Endangered Species/Wetlands Reports
- Eastern Expansion LF - Endangered Species/Wetlands Reports
- Summary
  - Comparison of Western and Eastern expansions, capacity, advantages and disadvantages
  - Figures and Drawings

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Solid Waste

Key Acronyms:

- MSW = Municipal Solid Waste
- LCID = Land Clearing and Inert Debris
- C&D = Construction and Demolition (Debris)
- NCDEQ = NC Dept of Environmental Quality
- LF = Landfill, Sub-Title D Landfill
- TS = Transfer Station
- T&D = Transportation and Disposal
- NCNHP = NC Natural Heritage Program

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Solid Waste

How long do we have in current landfill?

- Landfill Lifespan is effected by several factors of which compaction and landfill receipts are primary

Date	Estimated Years	Estimated Lifespan
June 2020	7 years	May 2027
July 2019	8.7 years	February 2028
November 2018	8.7 years	August 2027
July 2018	9.3 years	October 2027
June 2017	10.3 years	September 2027

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Solid Waste

What is Technical Fatal Flaw Analysis?

- As a part of the Master Plan for Landfill, this analysis determines major faults to expansion including, but not limited to:
  - Seismic Faults
  - Watersheds
  - Flood Plain
  - Archaeological or Historically significant resources
  - Rare species (NCNHP)

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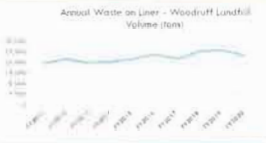
Solid Waste

The Trend

- Slight trend upwards
- Covid-19 effect unknown
- Major impact on lifespan
- Average 2% increase since FY2011
- Have not returned to pre-recession volumes
  FY2008 = 28,912 tons



Period	Waste Placed on Liner (tons)
FY2020	23,160
FY2019	25,770
FY2018	25,196
FY2017	21,793
FY2016	23,738
FY2015	21,739

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Solid Waste

What are the options?

- Landfilling remains an option with expansion area adjacent to Woodruff Landfill on current County property
- Transfer Station provides an option for shipment of solid waste from Transylvania County to another landfill (typically this utilizes private landfills in a competitive marketplace)

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Solid Waste

What are the options?

- There are other technologies
  - Anaerobic Digestion (organics)
  - Composting (organics)
  - Landfill Mining (combine with combustion)
  - Waste to Energy (incineration)

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Solid Waste

Other technologies - Anaerobic Digestion

- Convert methane gas to natural gas
  - Works with organics including wood waste
  - Need customer for Natural Gas or turbine to convert
  - Proximity to natural gas pipeline a plus
  - By products high grade compost and liquid fertilizer
  - Also works with WWTP sludge and cow manure
  - Budgets vary from $5M to $50M+

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Solid Waste

Other technologies – Composting

- Break down organics into topsoil
  - Organics – food scraps, no oils, no fats, no meats
  - Not as forgiving as Anaerobic Digestion
  - By product is good cover soil for landfill closure
  - Requires public to separate suitable organics
  - Collection and transport of organics can be a challenge
  - Recognizable technology
  - Typically not the only Solid Waste technology

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Solid Waste

Other technologies – Landfill Mining

- Excavate – Sieve - Sort
  - Organics disposal via combustion
  - Except for metals, recycle market currently not an option
  - Soil can be recovered (assuming DEQ OK)
  - Space is recovered for further landfilling
  - Maintain current landfill cell
  - Not a recognizable technology in North America
  - Typically not the only Solid Waste technology

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Solid Waste

Other technologies – Waste to Energy (WTE)

- Incinerate trash to produce energy
  - Organics reduction via combustion
  - Inorganics remain in ash (requires landfilling)
  - Highly technical facilities
  - Shutdowns for 1-2 weeks x 2 times/year typical
  - Breakdowns also common
  - Large Capital expense and large ongoing cost to run
  - Would need backup plan when shutdown

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Solid Waste

What are the options?

- Economics of small landfill <500 tons per day is challenging due to high capital cost of labor and equipment necessary
- Woodruff Landfill currently receives approximately <u>75 tons per day</u>

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Solid Waste

Whatever option chosen, wood waste remains

* LCID: Land Clearing & Inert Debris
* Wood grinding mulch currently being used for supplement to soil and erosion control

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Solid Waste

Landfill Expansion Option

- An Options Evaluation has been provided with further details
- Presented by LaBella (formerly Joyce Engineering) working with Transylvania County since 2000
- LaBella specializes in Solid Waste Engineering and Consulting

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Solid Waste

Landfill Expansion Option

- Timeline is critical with several permit requirements that are difficult to estimate turnaround. This option does require a decision by December 1, 2020 to assure construction is completed prior to reaching landfill capacity
- Permitting with NCDEQ must start in FY2022 to allow for construction completed by end of 2026 to allow for no interruption in Solid Waste services

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Solid Waste

Landfill Expansion Option

- Two areas of potential expansion (A & B) – see map
- Comparisons of 25-year period 2027-2052 Landfill to Transfer Station
- Review for endangered species and wetlands completed in landfill expansion areas

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Solid Waste

Landfill Expansion Option

- Relatively long period remains for expansion (92 acres) if A&B combined…current footprint ~20 acres
- This option keeps County in better control of costs
- Sensitive land acquisition for solid waste facility is avoided (i.e. Transfer Facility)

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Solid Waste

Landfill Expansion Option

- Piggybacking onto existing landfill greatly benefits capacity of expansion
- Initial estimate by engineer shows $10M savings over initial 25 years to Transylvania County by expanding landfill compared to construction of Transfer Facility (note: this was adjusted to $7M savings after wetlands review for Western LF expansion)

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Solid Waste

Landfill Expansion Option

- With greater capacity, the landfill could be a benefit for recruitment of industry with landfill needs (this potential benefit does not come into play with a Transfer Station)
- Long term decision for County Solid Waste

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Solid Waste

Transfer Station Option

- Land acquisition would be required in this option by FY2025 suitable for construction of a Solid Waste Transfer Facility (proximity to Highway 64) and located centrally in County
- Timeline on this option would require permitting to start in FY2025 to allow for completion of construction by end of 2026
- Preferred site should have a change in elevation to allow for tipping floor to drop into walking floor trailer

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Solid Waste

Transfer Station Option – Henderson County, example

Driving off the scale heading to the two-bay transfer station. Current volume is 300-600 tons/day.

Haulers dump single-stream recycling on the left, MSW from all customers to the right.

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Solid Waste

Transfer Station Option

Tipping floor has open pit at the rear, machinery pushes MSW into the opening that falls into a walking floor trailer. Yard dogs move these trailers to staging area for contractor to haul off site.

Walking floor trailer is staged in Bay 2

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Solid Waste

Other key notes from Henderson County TS

Cost basis for T&D is ~$40/ton with current tipping fee at $60/ton this leaves $20/ton for SW operations

$20/ton x ~115,000 tons/year = $2,300,000 to run program

One collection center on same property as the Transfer Station

Compare to volume from TCSW at 30,000 tons/year or $600,000 to run program (assuming same deal on T&D)

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Solid Waste

Transfer Station Option

Site should be large enough for wood waste and wood grinding (contract) with mulch sale or removal

Likely inclusion of "Super-Center" Collection Facility for recycling and household bags (e.g. bag stickers)

Additional room for expansion into Organics (trending Nationwide) such as Compost, engineer suggests 10-acre site, but I would expect closer to 15-20 would be better near highway

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Solid Waste

Transfer Station Option

Initial estimate by engineer shows $7M more over initial 25 years to Transylvania County by constructing Transfer Facility compared to expanding landfill

Still responsible for closed landfills (Woodruff and Calvert)

- Environmental monitoring
- If necessary, remediation
- Slope repairs, erosion control
- General maintenance (mowing, etc.)

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Solid Waste

Transfer Station Option

Due to third party involvement, there is less control on this option over time:

- Contracted landfilling at third party site
- Contracted hauling by third party effected by fuel costs, etc.
- Landfill capacity is based on available space
- Supply and demand effects price

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Solid Waste

Transfer Station Option

- For Comparison to Landfill Option
  - $21/ton hauling fee to out of county landfill
  - $20/ton disposal fee at out of county landfill
- Often Local and State Governments that host landfills add taxes to the above fees to generate revenue and/or discourage out of county waste from entering

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Solid Waste

Recommendation for Landfill Expansion

- Cost control
- Cheapest alternative
- Proven technology
- Long-term capacity can become County Asset

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Solid Waste

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June 23, 2020

Kenn Webb, Director

Solid Waste Department
Transylvania County
500 Howell Road
Brevard, North Carolina 28712

RE: WOODRUFF LANDFILL
CAPACITY REPORT
Project No. 2192544

Dear Kenn:

This letter and attachments provides the results of LaBella Associates (LaBella) evaluation of the compaction efficiency achieved between the two most recent topographic surveys of the active landfill.

The most recent two surveys were completed on May 31, 2019 and June 1, 2020. During this period the County placed 26,215 tons of waste in the landfill, as well as an unquantified amount of daily cover soil. Based on the aerial survey by Spatial Data, Inc. and using AutoCAD Civil 3D software, LaBella calculated the change in volume between the survey dates, and determined that the placed waste and daily cover soil consumed 54,200 cubic yards (CY) of airspace. The resulting compaction efficiency is 967 lbs. of waste placed per cubic yard of airspace consumed or 0.48 tons of waste per cubic yard of consumed airspace.

Table 1. "Woodruff Landfill Capacity Study History" tracks waste disposal, consumed airspace data, and life of the landfill projections, on an annual basis since 2008. For purposes of this capacity study, areas of fill that appeared in Phases 1, 2, and 3, when comparing the May 2019 and June 2020 surveys are included in the airspace consumed volume and the airspace utilization factor calculations, while great majority of waste disposal operations occurred in Phases 4 and 5 as shown in Drawing CS-01. Settlement is factored into the capacity calculations.

We evaluated the remaining volume of the landfill by comparing the most recently mapped surface to the permitted 3:1 grades of the final cover. The remaining volume as of June 1, 2020 is 475,000 CY of which 82,098 CY is required for the final cover. On the Phase 3 south facing slope, 30,400 CY of waste has been placed over the permitted cap grade; see Drawings CS-02 and CS-03. As a result, the County has 362,502 CY remaining for waste disposal and daily/intermediate cover soil. Beginning with a monthly intake rate of 2,185

tons/month and assuming a 2% annual growth rate, with a compaction efficiency of 967 pounds per cubic yard, the remaining life of the landfill is approximately 7 years. Please note, the remaining life should only be used for planning purposes, as any variation in the future tonnage, Airspace Utilization Factor or volume of cover soil used would affect the remaining life of the landfill.

The attached calculation sheets, summary table and drawings provide additional details. If you have any questions about this report, please give me a call my cell number 336-209-7156.

Respectfully submitted,

LaBella Associates

Hannu Kemppinen
Senior Project Consultant

Attachments:

Calculation Sheets (2)

Summary Table

Drawings (CS-01, CS-02, CS-03)

Job:	Woodruff Landfill		
Job Number:	2192544.01		
Calculated By:	HMK	Date:	6/18/2020
Checked By:	LB	Date:	6/22/2020
Revised	HMK	Date:	6/23/2020
Subject:	Capacity Study 2020		
Sheet:	1 of 2		

Determine the airspace utilization factor between 05-31-19 and 06-01-20

Airspace consumed by waste and cover soil between the two mapping dates :	=	54,200 cy	volume from AutoCADD
Total waste placed in the landfill between the two mapping dates:	=	26,215 tons	scalehouse records
Calculated Airspace Utilization Factor: (not including settlement)	=	**Waste Tonnage / Landfill Airspace Utilized** ***967*** **lbs waste/cy airspace used**	

Determine the amount of airspace gained in the landfill due to settlement between 05-31-19 and 06-01-20

Total volume of airspace gained from settlement	=	5,400 cy	

Determine the current average monthly waste acceptance rate and remaining volume for estimation of remaining landfill life:

Current monthly waste acceptance rate	=	2,185 tons/month	
Remaining total airspace as of 06-01-20	=	475,000 cy	
Cap volume	=	82,098 cy	
Overfill (Phase 3)	=	30,400 cy	
Remaining airspace (waste, daily and intermediate cover soil).	=	362,502 cy	

Projected Remaining Life for Waste as of 06-01-20 with a 2% Growth Rate

= **7.0 years** (see Note 2)

May 2027

Note:

1. LF compaction & utilization factor calculations include entire landfill where waste was placed during this study interval May 2019 to June 2020. Total consumed airspace is calculated for remaining life.

2. Remaining life projections are based on average Airspace Utilization Factor of 967 lbs/cy from this study period.

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Job:	Woodruff Landfill		
Job Number:	2192544.01		
Calculated By:	HMK	Date:	6/18/2020
Checked By:	LB	Date:	6/22/2020
Revised	HMK	Date:	6/23/2020
Subject:	Capacity Study 2020		
Sheet:	2 of 2		

Determine the remaining life with 2% long term waste stream growth rate:

Fiscal Year	Projected Waste Received (ton)[1]	Projected Air Space Used (cy)3	Projected Cumulative Waste Received (ton)	Projected Cumulative Air Space Used (cy)
2020	2,185	4,005	2,185	4,005
2021	26,739	49,018	28,924	53,023
2022	27,274	49,998	56,198	103,021
2023	27,820	50,998	84,018	154,019
2024	28,376	52,018	112,393	206,038
2025	28,943	53,059	141,337	259,096
2026	29,522	54,120	170,859	313,216
2027	30,113	55,202	200,972	368,418
2028	30,715	56,306	231,687	424,724
2029	31,329	57,432	263,017	482,157
2030	31,956	58,581	294,972	540,738
2031	32,595	59,753	327,568	600,490
2032	33,247	60,948	360,814	661,438

Landfill reaches permitted capacity

Notes:

1. Current monthly waste acceptance rate used: 2,185 tons/month
2. Current Airspace Utilization Factor is 967 lbs/cy
3. Projections of airspace use are based on current Utilization Factor of 967 lbs/cy
4. 2019-2020 waste stream is from 06-01-20 to 06-30-19, or
   1.0 remaining months in the fiscal year

Table 1. Woodruff Landfill Capacity Study History

Interval Between Survey Dates										
	March 13, 2008 - Feb 2, 2009	Feb 2, 2009 - Apr 10, 2010	Apr 10, 2010 - May 2, 2011	May 2, 2011 April 28, 2012	April 28, 2012 - April 6, 2013	April 6, 2013 April 23, 2014	April 23, 2014 April 30, 2015	April 30, 2015 May 28, 2016	May 28, 2016 May 17, 2017	May 17,2017 Nov 19, 2018
MSW Placed In Landfill (tons)	23,588	25,005	22,383	21,711	18,314	21,124	23,115.00	27,368	25,310	39,123
Airspace Consumed (cy)	42,066	45,315	35,133	33,238	31,432	32,278	43,045	49,000	45,517	63,000
In-Place Density (lbs/cy)	1,121	1,104	1,274	1,306	1,165	1,309	1,074	1,117	1,112	1242[4]
Avg. tons/month MSW Acceptance	1,986	1,749	1,729	1,820	1,625	1,681	1,884	2,121	2,173	2,169
End of Interval Total Remaining Airspace	743,824 cy	701,801 cy	670,875 cy	643,416 cy	610,870 cy	588,199 cy	699,882 cy [2]	636,000 cy[2]	606,000 cy[2]	544,000 cy[2]
End of Interval Remaining Waste Airspace[1]	653,153 cy	611,130 cy	580,204 cy	552,745 cy	520,199 cy	497,528 cy	617,784 cy [2]	573,902 cy[2]	523,902 cy[2]	431,902 cy[2]
End of Interval Remaining Waste Life Span	13 years 0 months	13 years 5 months	14 years 10 months	13 years 11 months	13 years 6 months	13 years	14 years 3 months	11 years 11 months[3]	10 years 4 months [3]	8 years 9 months [3]

(1) Remaining airspace for waste, daily and intermediate cover soil.

(2) The capacity includes entire landfill permitted 3:1 final grades.

(3) Projections of airspace use are based on average Airspace Utilization Factor of 1,153 lbs/cy since April 6, 2013

(4) Because the November 2017 ground survey did not include the northeast corner of the landfill (eastern half of Phase 5), that area was not included when comparing to the November 2018 survey. Therefore the airspace consumed in that area was not included in the airspace utilization factor (compaction) calculation – likely resulting in a higher compaction. Prior to the November 2018 ground survey, the previous aerial or ground survey of the eastern half of Phase 5 was April 2014.

Table 1. Woodruff Landfill Capacity Study History

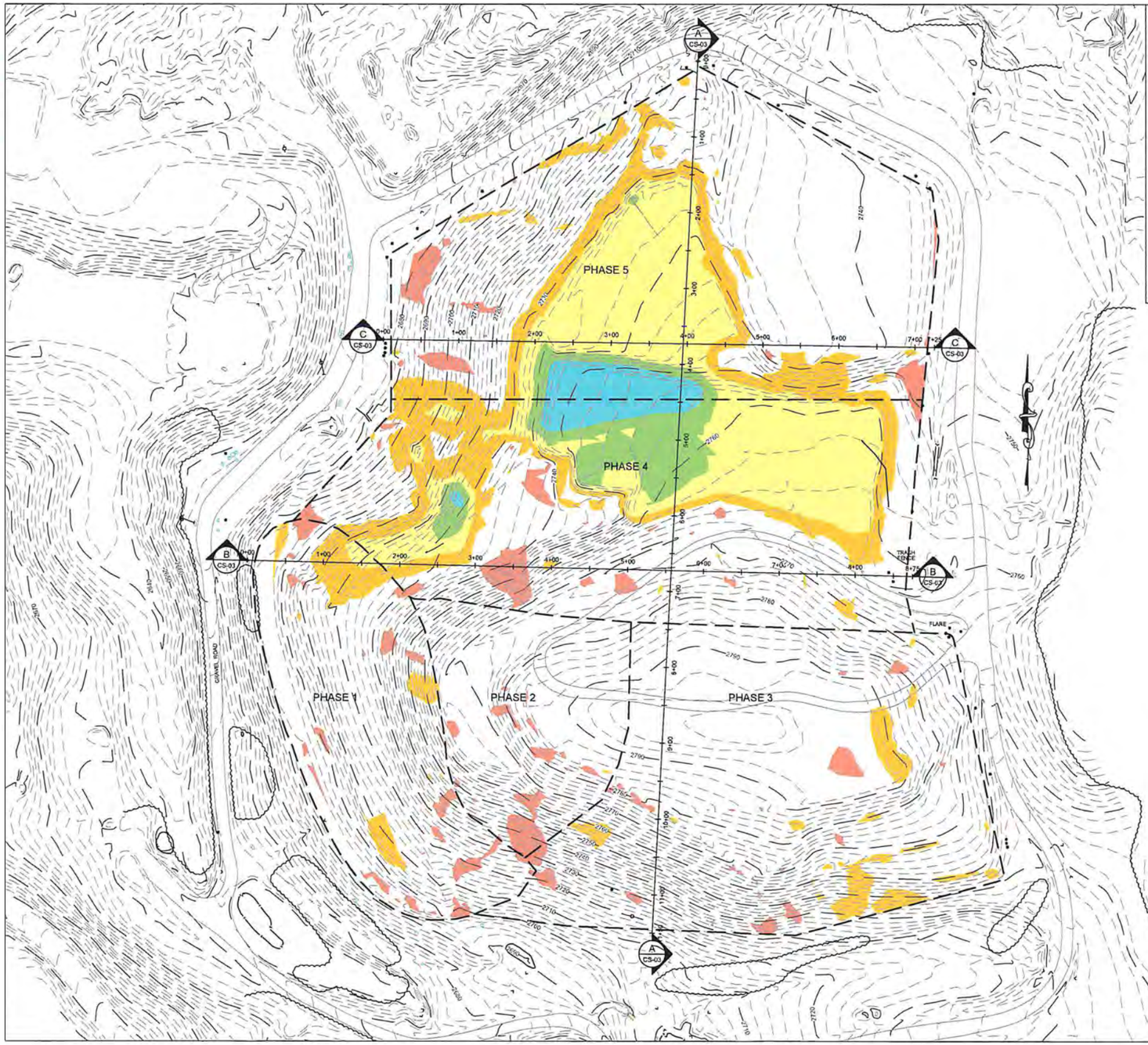
Interval Between Survey Dates										
	Nov 19, 2018 May 31,2019	May 31,2019 Jun 1,2020								
MSW Placed In Landfill (tons)	11,095	26,215								
Airspace Consumed (cy)	24,300	54,200								
In-Place Density (lbs/cy)	913 (3)(4)	967 (3)(4)								
Avg. tons month MSW Acceptance	1,752	2,185								
End of Interval Total Remaining Airspace (cy)	522,500	475,000								
End of Interval Remaining Waste Airspace (cy)(1)	409,602	362,502								
End of Interval Remaining Waste Life Span	8 years 7 months (3)	7 years (3)								

(1) Remaining airspace for waste, daily and intermediate cover soil.

(2) The capacity includes entire landfill permitted 3:1 final grades.

(3) Projections of airspace use are based on current Utilization Factor of 967 lbs/cy.

(4) In-Place density (lbs./cy) is calculated for the landfilled areas shown on Drawing Number CS-01.



Elevations Table	
FILL / SETTLMENT	Color
1'-5' SETTLEMENT	
1'-5' FILL	
5'-10' FILL	
10'-15' FILL	
15'-21' FILL	

AIRSPACE CONSUMED = 54,200 CY
SETTLEMENT = 5,400 CY

* COMPARISON BETWEEN GROUND SURVEY DATED MAY 31, 2019 COMPLETED BY JASON SPENCER, PLS. AND JUNE 1, 2020 AERIAL SURVEY COMPLETED BY SPATIAL DATA, INC.

NOTES:
1. CONTOURS SHOWN REPRESENT JUNE 2020 SURVEY.

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PHONE (704) 376-6423
labellapc.com

NOT FOR CONSTRUCTION

WOODRUFF LANDFILL
2020 CAPACITY STUDY
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

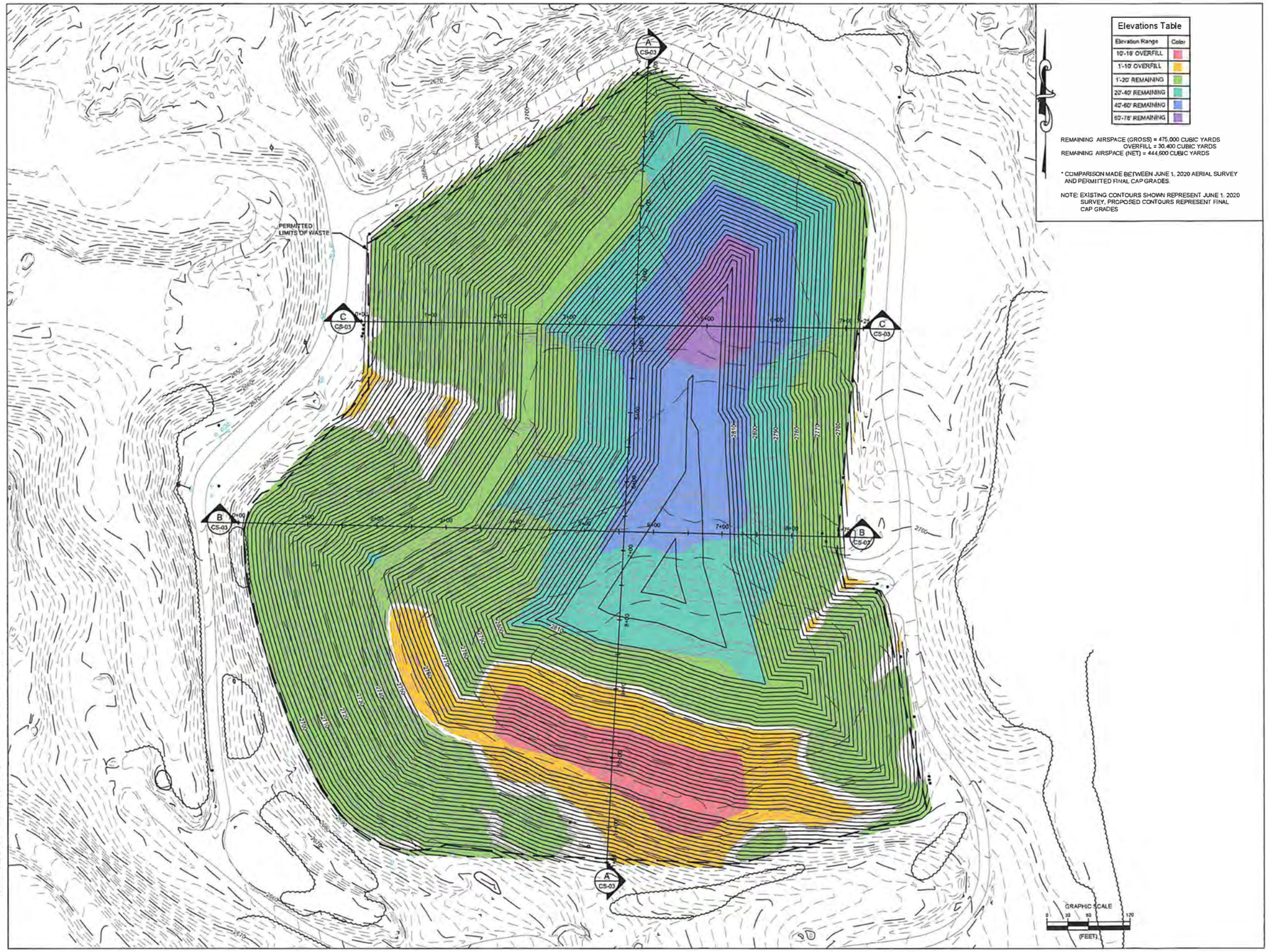
PROJECT NUMBER: 2192544.00
DRAWN BY: RH
REVIEWED BY: HK
ISSUED FOR: CAPACITY REPORT
DATE: 06/01/2020
DRAWING NAME:

2020 CAPACITY STUDY:
MAY 31, 2019 VS
JUNE 1, 2020
WASTE PLACEMENT

DRAWING NUMBER:

CS-01

L:\Transylvania\dwg\CAPACITY 2020\CS-01 CONSUMED AIRSPACE.dwg Layout=CS-01



Elevations Table	
Elevation Range	Color
10'-15' OVERFILL	
1'-10' OVERFILL	
1'-20' REMAINING	
20'-40' REMAINING	
40'-60' REMAINING	
60'-78' REMAINING	

REMAINING AIRSPACE (GROSS) = 475,000 CUBIC YARDS
OVERFILL = 30,400 CUBIC YARDS
REMAINING AIRSPACE (NET) = 444,600 CUBIC YARDS

* COMPARISON MADE BETWEEN JUNE 1, 2020 AERIAL SURVEY AND PERMITTED FINAL CAP GRADES.

NOTE: EXISTING CONTOURS SHOWN REPRESENT JUNE 1, 2020 SURVEY. PROPOSED CONTOURS REPRESENT FINAL CAP GRADES

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WOODRUFF LANDFILL
2020 CAPACITY STUDY

TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER: 2192544.00
DRAWN BY: RH
REVIEWED BY: HK
ISSUED FOR: CAPACITY REPORT
DATE: 06/15/2020
DRAWING NAME:

2020 CAPACITY STUDY: LANDFILL REMAINING AIRSPACE

DRAWING NUMBER:

CS-02

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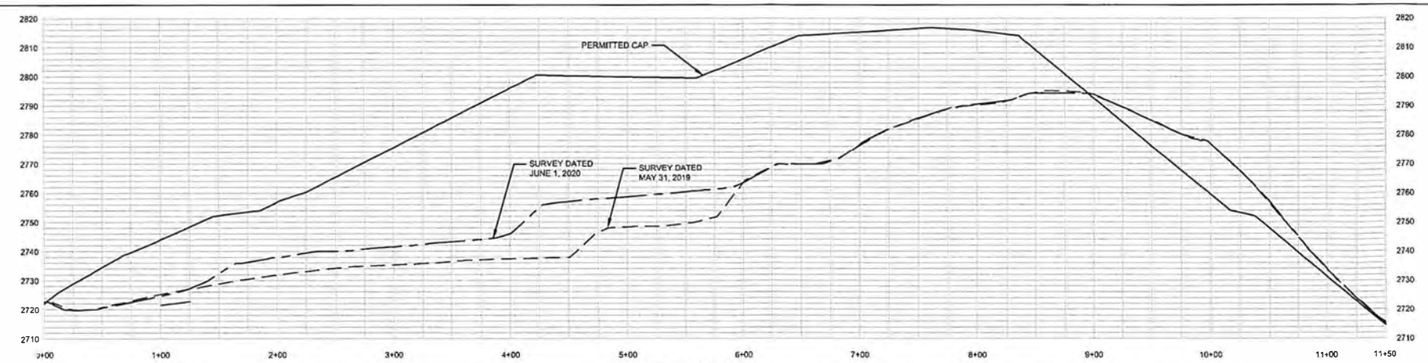
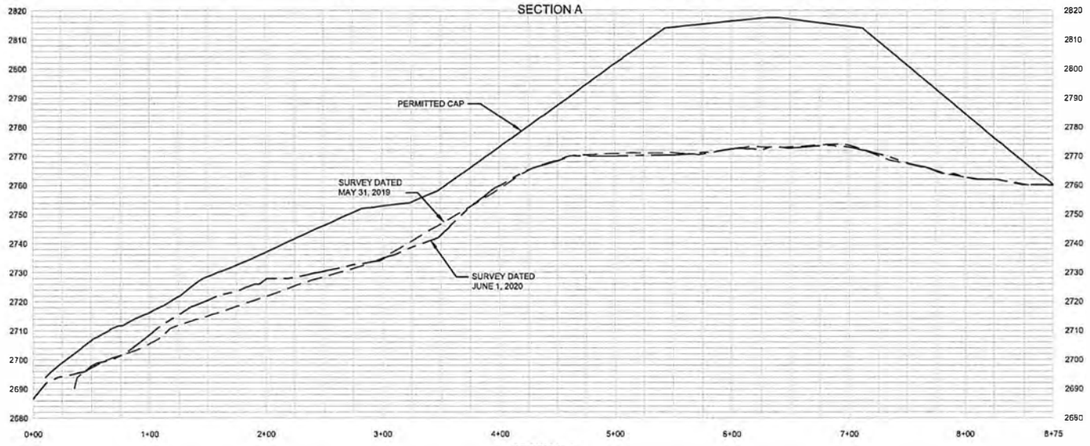


SECTION A



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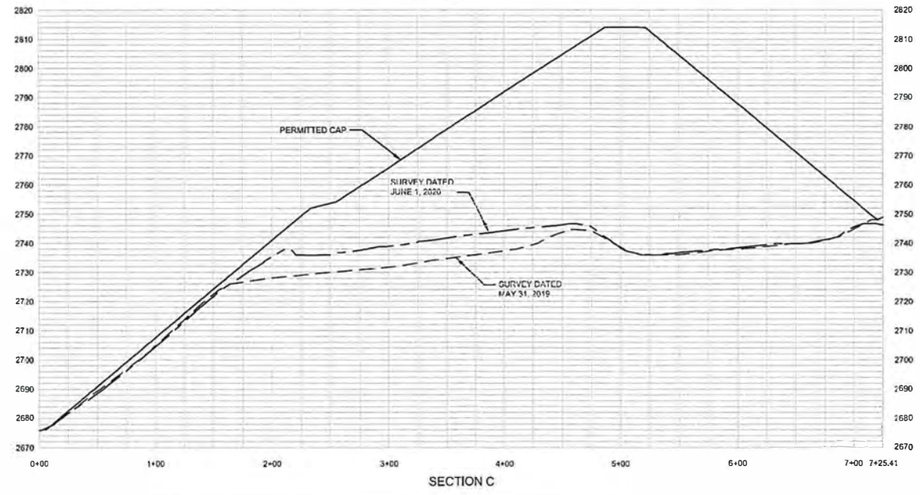

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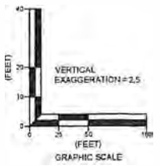

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NOT FOR CONSTRUCTION

WOODRUFF LANDFILL
2020 CAPACITY STUDY
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO.	DATE	DESCRIPTION

PROJECT NUMBER: 2192544.00
DRAWN BY: RH
REVIEWED BY: HK
ISSUED FOR: CAPACITY REPORT
DATE: 06/15/2020
DRAWING NAME:

2020 CAPACITY STUDY:
MAY 31, 2019 VS
JUNE 1, 2020
CROSS SECTIONS

DRAWING NUMBER:

CS-03

March 3, 2020

Mr. Kenneth Webb
Director of Solid Waste
Transylvania County
500 Howell Rd.
Brevard, NC 28712

Re: Master Plan Update - Letter Report
Transylvania County Woodruff Landfill, Permit No. 88-07
Project No. 22200543/Phase No. 02

Dear Mr. Webb:

Joyce Engineering, Inc. (now Labella Associates, P.C.) prepared a Master Plan in 2006 for Transylvania County. The 2006 Master Plan evaluated the long-term disposal potential of the existing landfill property and identified potential expansion areas for disposal of both municipal solid waste (MSW) and construction and demolition waste (C&D).

In January 2020, at the request of Transylvania County (County), LaBella proposed to revisit the 2006 Master Plan to update and validate the previous assumptions, recommendations and schedule. In addition, LaBella also proposed to evaluate the following:

- Remaining capacity and life in Phases 1 thru 5 with the 3:1 permitted grades; and
- Impact of lost capacity if existing slopes are not reworked to the 3:1 grades.

Waste disposal in the current Subtitle D landfill began in May 1992 in Phase 1, and progressed east into Phases 2 and 3. Phase 4 construction was completed north of Phases 1-3 in fall 2003. The Phase 4 expansion included replacement of the existing leachate lagoon with a leachate storage tank. Phases 5 and 6 were combined in 2007 into Phase 5, approximately 5.5 acres, with the issuance of the Phase 5 Permit to Construct. Phase 5 was constructed in 2007. The existing Phases 1-5 footprint is approximately 18.8 acres.

Remaining Airspace in Phases 1 – 5

Based on the July 29, 2019 Capacity Report, Phases 1 -5 had approximately 409,600 cubic yards of airspace remaining for waste disposal and daily/intermediate cover soils as of May 31, 2019.
This equated to a remaining life of the landfill of approximately 8 years 7 months, using the monthly intake rate of 1,752 tons/month, a 2% annual growth rate, and a compaction efficiency of 1,091 lbs/cy, per the 2019 Capacity Report.

Based on the County's records, 25,770 tons of waste was placed in the landfill in Calendar Year 2019. Assuming the intake rate was uniform during each month, approximately 15,000 tons of waste (7 months) was placed in the landfill during the months of June thru December 2019, thereby reducing the remaining airspace to 382,100 cy and remaining life to approximately 7 years 6 months (or July 2027), as of December 31, 2019.

Impacts to Remaining Airspace

Currently portions of the western slopes of Phases 1, 4 & 5 have been filled at slopes flatter than 3:1 (3 horizontal to every 1 vertical). In order to take full advantage of the remaining airspace in the landfill, these areas would need to be filled to the permitted 3:1 grades. As this would present operational difficulties and inefficiencies, the impact to the remaining airspace if these slopes were not reworked to 3:1 grades was evaluated and determined to reduce the remaining airspace to approximately 361,500 cy – a 20,600 cy airspace loss or a reduction of approximately 5 months of remaining life (February 2027).

Master Plan Update

For the purposes of the update, it is our understanding that the County is not interested in developing Option 3 nor diverting construction and demolition (C&D) waste to a dedicated C&D disposal area (Option 1).

In accordance with our January 2020 proposal, LaBella first performed a technical fatal flaw analysis on the approximate 167-acre tract located north of the Woodruff Landfill's existing Phase 5 (limits of Options 2 and 3 in the 2006 Master Plan). For our analysis, we reviewed regulations used by the North Carolina Department of Environmental Quality (NCDEQ) for Site Study (15A NCAC 13B .1618) and Location Restrictions (15A NCAC 13B .1622). Our analysis did not identify restrictions that would render the tract unusable for landfill expansion, subject to the conclusions presented in our February 18, 2020 letter, or that would alter the Option 2 footprint previously established. For reference, a copy of our February 18, 2020 letter and findings is included as a attachment to this letter report.

Unchanged from the 2006 Master Plan, Option 2 is approximately a 56-acre expansion with 4.3 million cubic yards of capacity. Final grades are shown on Drawing No. 2. Cross-sections illustrating existing natural ground contours and final grade contours for the proposed landfill are included in Drawing No.3. Due to lack of hydrogeologic information, existing ground and proposed base grades are assumed to be the same. Assuming an annual growth rate at 2% for waste disposal (similar to the 2019 Capacity Study), this development option provides approximately 47 years of capacity (approximately 2027 to 2074) for Transylvania County waste disposal after Phases 1-5 reach capacity. The estimated life of Option 2 assumes that C&D waste will not be diverted.

Using the average cost per acre from the Phase 5 construction, approximately $375,000, and adjusting for inflation at 2% annually, the cost per acre of new cell construction is approximately $490,000 in 2020 dollars. Including engineering and CQA fees, the estimated cost per acre (in present day dollars) is estimated to be approximately $500,000. Similar to the 2006 Master Plan, the estimated cost to construct the 56-acre Option 2 is $28 million dollars. Total cost for closure of the Option 2 footprint, assuming $275,000/acre including engineering and CQA fees, would be $15.4 million. Using the $1.4 million budgeted for 2020 operations and personnel, the total operating cost over the estimated 47 year life of Option 2, is estimated to be $65.8 million.

Revenue from Option 2, using the current tipping fee of $60/ton (equivalent to $32.73/cy), is estimated to be $140,739,000.

The proposed area identified for Option 2 is preliminary and requires site characterization studies to confirm local geology and site-specific suitability for design and construction. Even though the remaining life of Phases 1-5 is estimated to be approximately 7 years, it is recommended that the County consider performing the site characterization for Option 2 and beginning the permitting process, rather sooner than later in order to provide continued solid waste services to the County's residents, commerce and industry.

If you have any questions or require additional information, please contact me at (804) 355-4520 (lbertolet@labellapc.com).

Respectfully submitted,
LaBella Associates, P.C.

Larry Bertolet, P.E.
Senior Technical Consultant

Attachments:
Technical Fatal Flaw Analysis, dated February 18, 2020
Drawing No. 1 – Boundaries and Buffers
Drawing No. 2 – Conceptual Master Plan
Drawing No. 3 – Sections A & B

cc: Hannu Kemppinen – LaBella Associates
Jenny Johnson – LaBella Associates

LaBella
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February 18, 2020

Mr. Kenneth Webb
Director of Solid Waste
Transylvania County
500 Howell Rd.
Brevard, NC 28712

Re: Technical Fatal Flaw Analysis
Transylvania County Woodruff Landfill, Permit No. 88-07
Project No. 22200543/Phase No. 01

Dear Mr. Webb:

LaBella Associates, P.C. (LaBella) conducted a technical fatal flaw analysis on an approximate 167-acre tract located north of the Woodruff Landfill's Phase 5 (see attached Drawing 1) We evaluated the parcel of land for use as an expansion of the existing landfill.

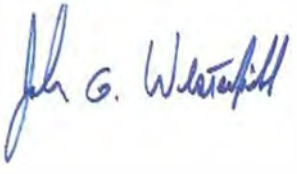
Our analysis did not identify restrictions that would render the tract unusable for landfill expansion, subject to the conclusions presented below. For our analysis, we reviewed regulations used by the North Carolina Department of Environmental Quality (NCDEQ) for Site Study (15A NCAC 13B .1618) and Location Restrictions (15A NCAC 13B .1622). A brief summary of the Information reviewed with the resulting findings is provided below:

- Distances to all public-use airport runways within 5 miles.
  - None within 5 miles.
- Location of the 100-year floodplain within the expansion footprint.
  - None.
- Location of wetlands based on National Wetland Inventory (NWI) maps.
  - No mapped wetlands within the expansion footprint.
- Distances to nearest fault with displacement in Holocene time.
  - None within 250 miles.
- Location of seismic impact zones within the expansion footprint.
  - None.
- Location of unstable areas (i.e., karst) within the expansion footprint.
  - None.
- Location of archaeological or historical resources within the expansion footprint based on publically-available information.
  - None.
- Location of lands within the expansion footprint that are included in the State Nature and Historic Preserve.
  - None.
- Location of water supply watersheds with respect to the expansion footprint.
  - None of the proposed expansion footprint includes water supply water sheds.

- Existence of endangered and threatened species in the vicinity of the expansion.
    - None documented within the expansion footprint. However, the report provided by the North Carolina Natural Heritage Program (NCNHP) (see attached) indicates documented rare species within one mile of the proposed expansion. The NCHNP report states "the proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists." A site-specific survey would be necessary in order to definitively determine whether rare species exist within the proposed expansion area. This survey should be considered early in the permitting process.

If you have any questions or require additional information, please contact me at (804) 355-4520 (jwesterfield@labellapc.com).

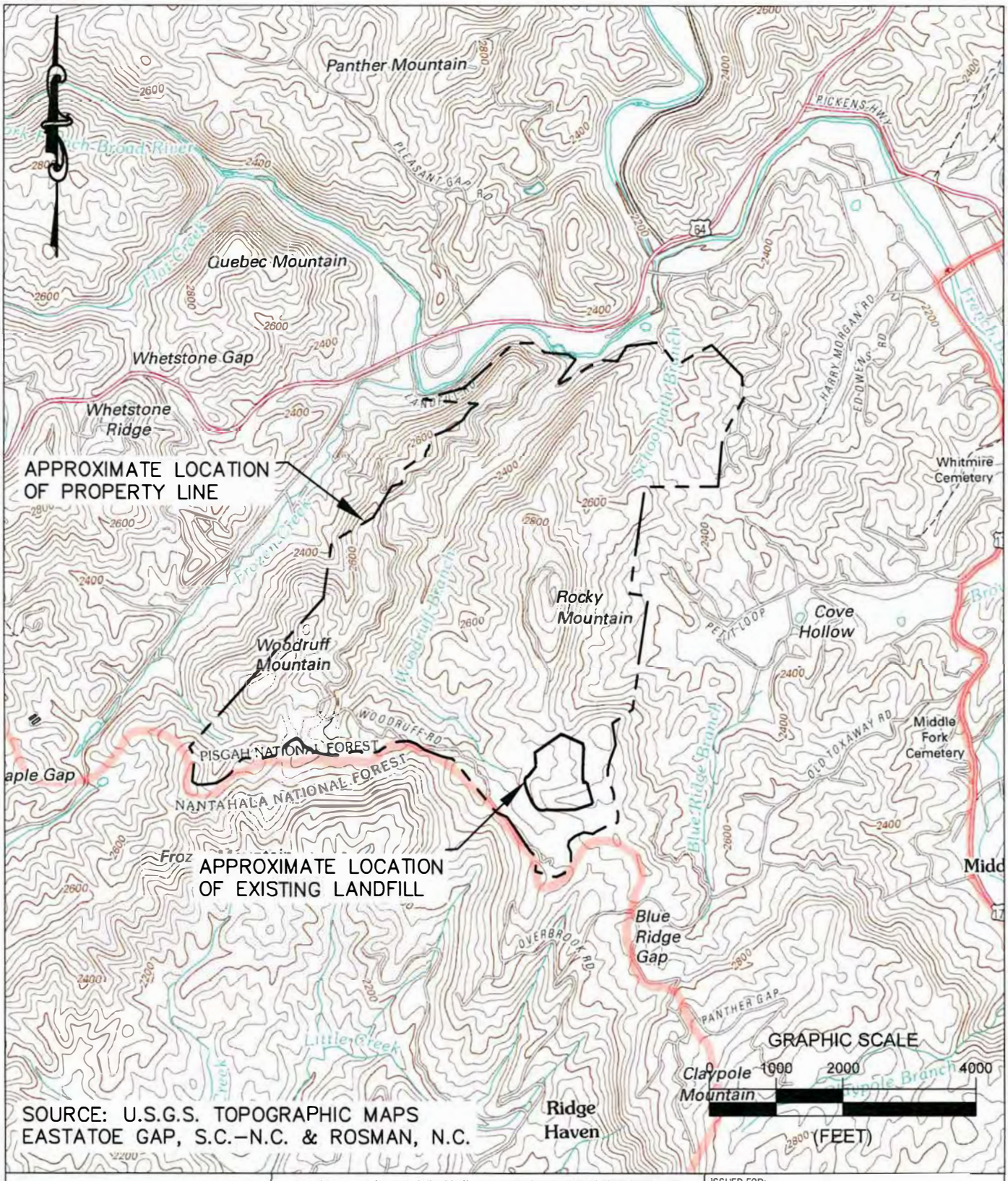
Respectfully submitted,
LABELLA ASSOCIATES



John G. Westerfield, P.G.
Senior Technical Consultant

Attachments: Drawing 1
NC Natural Heritage Program Report

cc: Hannu Kemppinen – LaBella Associates
Larry Bertolet – LaBella Associates
Jenny Johnson – LaBella Associates



LaBella
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2211 WEST MEADOWVIEW ROAD
GREENSBORO, N.C. 27407
PHONE: (336) 323-0092
labellapc.com

ISSUED FOR: GROUNDWATER MONITORING REPORT

DRAWING NAME: SITE LOCATION MAP

DRAWN BY: RWH | DATE: 08/02/19 | PROJECT NO.: 2181835.01

PROJECT NAME: **WOODRUFF LANDFILL**
TRANSYLVANIA COUNTY, NORTH CAROLINA

DRAWING NUMBER: 1

L:\Transylvania\Woodruff Landfill Site Location Maps.dwg

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, Governor
Susi Hamilton, Secretary
Walter Clark, Director, Land and Water Stewardship

NCNHDE-11097

January 14, 2020

John Westerfield
LaBella Associates
1604 Ownby Ln.
Richmond, VA 23220
RE: Woodruff landfill Expansion

Dear John Westerfield:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

Based on the project area mapped with your request, a query of the NCNHP database indicates that there are no records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. Please note that although there may be no documentation of natural heritage elements within the project boundary, it does not imply or confirm their absence; the area may not have been surveyed. The results of this query should not be substituted for field surveys where suitable habitat exists. In the event that rare species are found within the project area, please contact the NCNHP so that we may update our records.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is found within the project area or is indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

The NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Clean Water Management Trust Fund easement, or Federally-listed species are documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Woodruff landfill Expansion
January 14, 2020
NCNHDE-11097

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Amphibian	12608	Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	2019-09-08	B	3-Medium	---	Special Concern	G3T2	S3
Crustacean	372	Cambarus reburrus	French Broad River Crayfish	2018-07-10	E	3-Medium	---	Significantly Rare	G3	S2
Freshwater Fish	11061	Polyodon spathula	Paddlefish	1983	H	4-Low	---	Endangered	G4	SH
Mayfly	38244	Heterocloeon berneri	Berner's Two-winged Mayfly	2017-08-29	E	2-High	---	Significantly Rare	G2G3	S1
Natural Community	5335	Rich Cove Forest (Montane Intermediate Subtype)	---	2010	C	3-Medium	---	---	G4	S4
Stonefly	7716	Bolotoperla rossi	Smoky Willowfly	1992-02-11	H?	3-Medium	---	Significantly Rare	G4	S3
Vascular Plant	25167	Dendrolycopodium dendroideum	Prickly Ground-pine	1958-07-16	H	5-Very Low	---	Significantly Rare Peripheral	G5	S2
Vascular Plant	23223	Hexastylis rhombiformis	French Broad Heartleaf	2006-04-11	D	2-High	---	Significantly Rare Limited	G3	S3

Natural Areas Documented Within a One-mile Radius of the Project Area

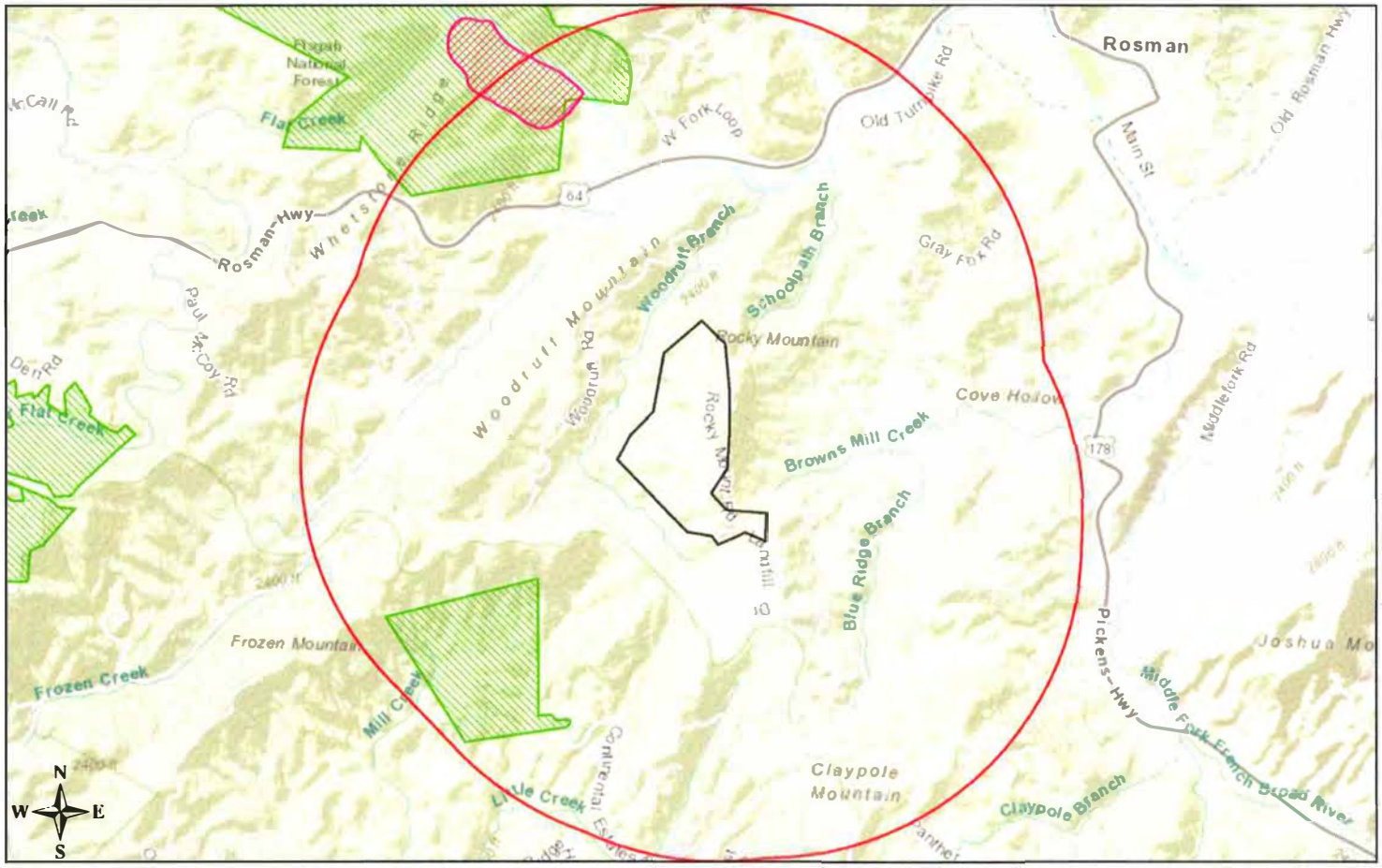
Site Name	Representational Rating	Collective Rating
Quebec Mountain Slope	R5 (General)	C5 (General)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
Pisgah National Forest - Pisgah Ranger District	US Forest Service	Federal
Carolina Mountain Land Conservancy Easement	Carolina Mountain Land Conservancy	Private
NC Clean Water Management Trust Fund Funded Project	NC DNCR, Clean Water Management Trust Fund	State

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on January 14, 2020; source: NCNHP, Q1 Jan 2020. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-11097: Woodruff landfill Expansion



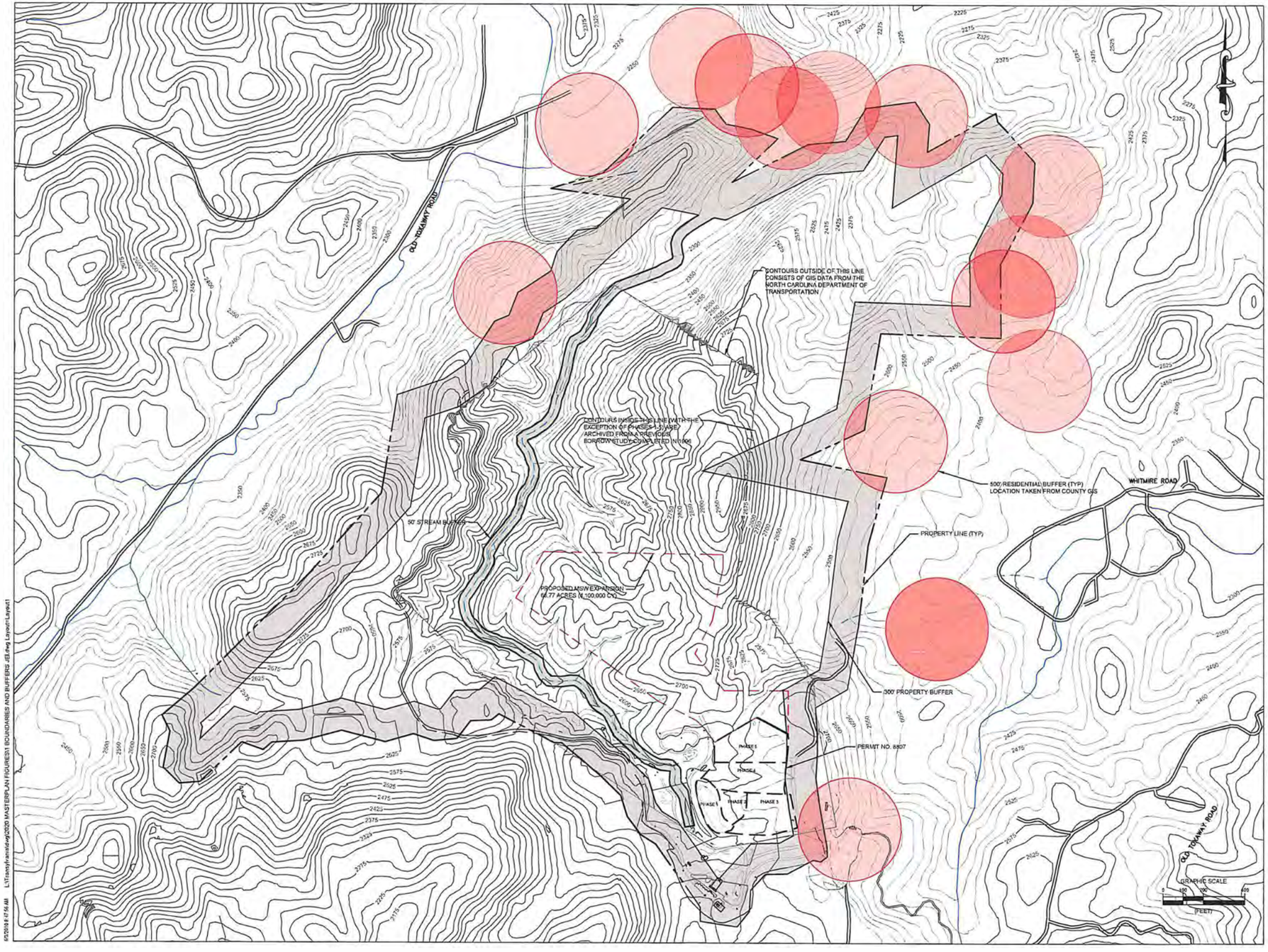
January 14, 2020

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)
- Managed Area (MAREA)

1:27,414

0 0.225 0.45 0.9 mi

0 0.375 0.75 1.5 km



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Richmond, VA 23220
804-355-4520
labellapc.com

WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER:
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 02/24/20
DRAWING NAME:

BOUNDARIES AND BUFFERS

DRAWING NUMBER:

1

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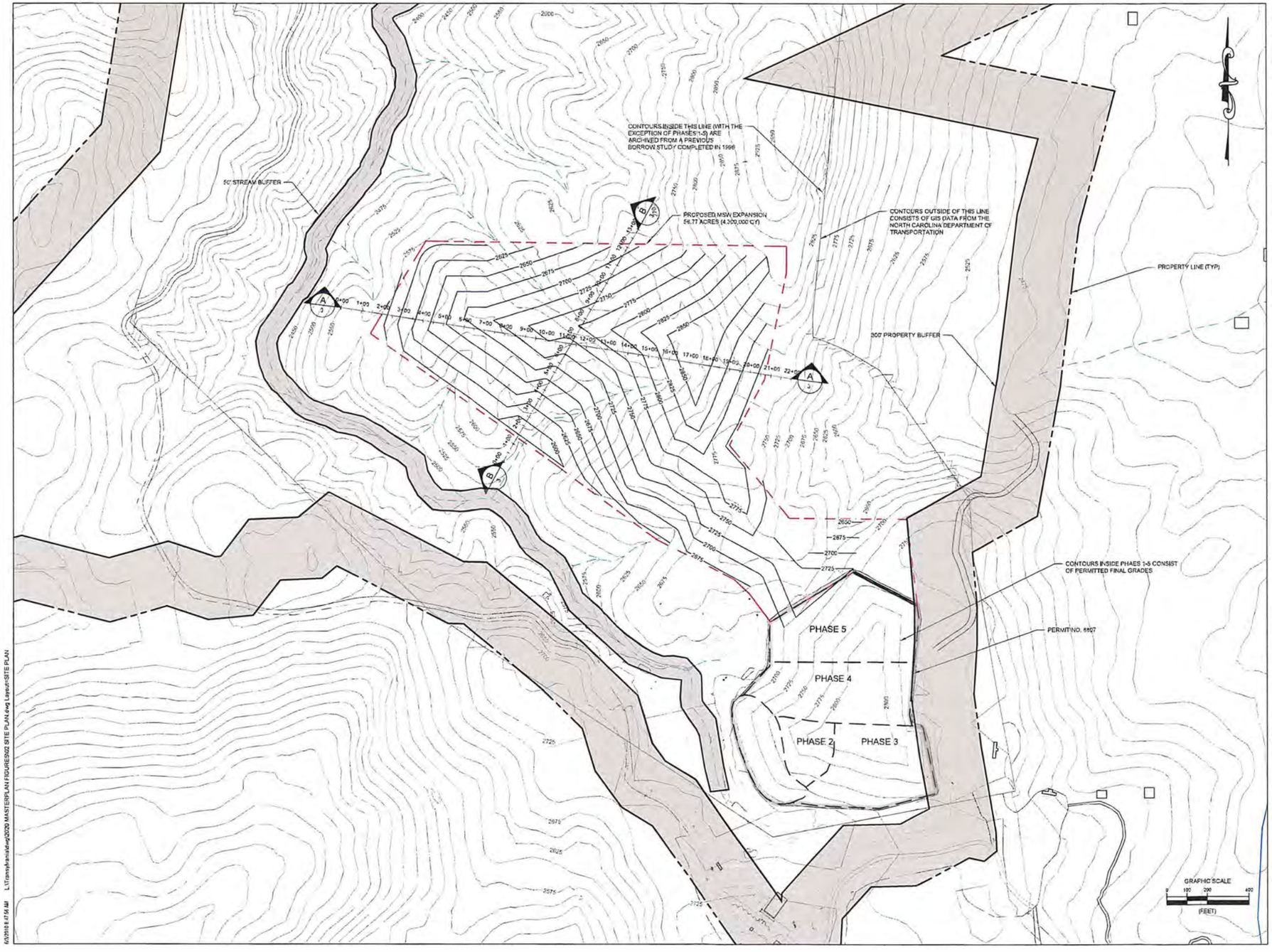

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WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER:
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 02/24/20
DRAWING NAME:

CONCEPTUAL MASTER PLAN
FINAL GRADE
AIRSPACE AVAILABLE
4,300,000 CY

DRAWING NUMBER:

2

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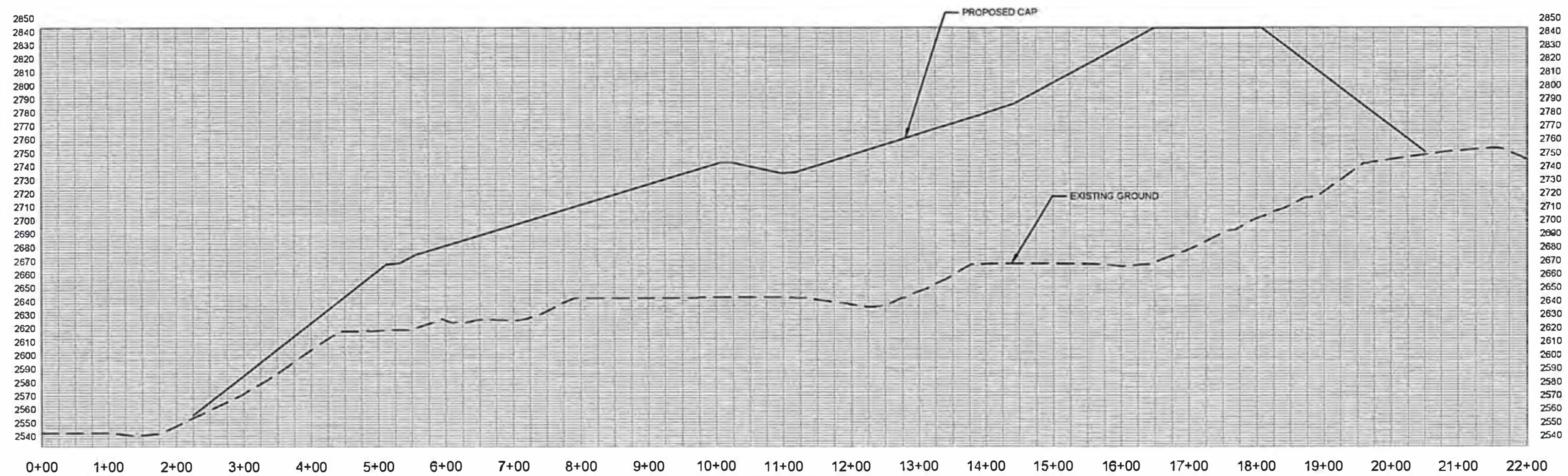
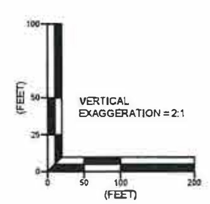


SECTION A



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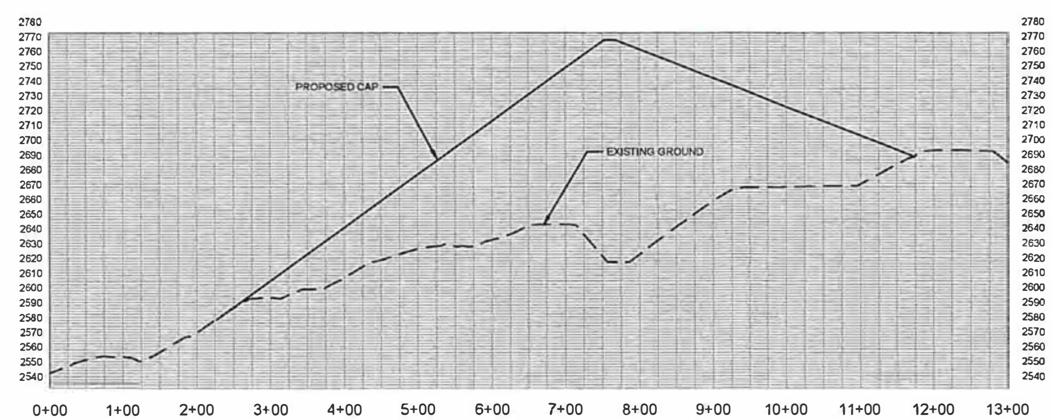

SECTION B

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labellapc.com

WOODRUFF LANDFILL

TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION

Revisions

PROJECT NUMBER: ----------

DRAWN BY: RH

REVIEWED BY: LB

ISSUED FOR: REVIEW

DATE: 02/24/20

DRAWING NAME:

SECTIONS A AND B

DRAWING NUMBER:

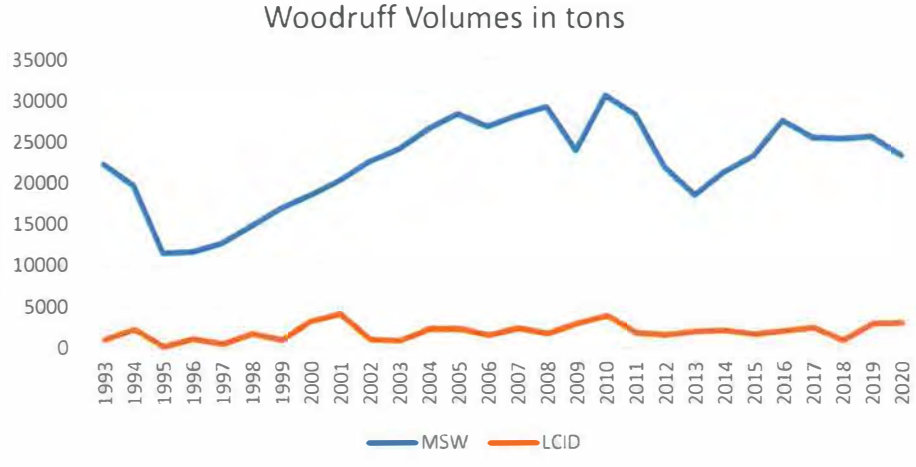
3

Woodruff Landfill
Annual Disposal Volume (tons)

Fiscal Year (FY)	MSW	LCID
1993	22231	1086
1994	19625	2304
1995	11498	172
1996	11623	1133
1997	12640	508
1998	14705	1730
1999	16845	946
2000	18405	3211
2001	20186	4082
2002	22495	1059
2003	24034	866
2004	26496	2271
2005	28303	2277
2006	26732	1530
2007	28090	2333
2008	29117	1704
2009	23828	2860
2010	30460	3790
2011	28174	1704
2012	21711	1483
2013	18314	1876
2014	21124	1982
2015	23115	1514
2016	27368	1900
2017	25310	2300
2018	25196	728
2019	25385	2704
2020	23160	2808

MSW Average
22363 tons/year

LCID Average
1888 tons/year



North Carolina Department of Environmental Quality

Division of Waste Management

Public and Private Tipping Fees FY 2018-2019

PermitID	Permit_Name	PermitStatus	Type	Operation	County	Tip Fee	Incl Tax
0104-CDLF-1993	Austin Quarter C&D Unit	Active	CD	LF	Alamance	$32.00	Yes
0104-MSWLF-1994	Austin Quarter SWM Facility	Active	MSW	LF	Alamance	$38.00	Yes
0105-CDLF-1998	Cobles C&D Landfill	Active	CD	LF	Alamance	$33.00	No
0201-CDLF-1997	Alexander County CDLF	Active	CD	LF	Alexander	$50.00	Yes
0202T-TRANSFER-1998	Alexander Co. Transfer Station	Active	MSW	Trans	Alexander	$60.00	Yes
0303T-TRANSFER-1994	Alleghany County Transfer Facility	Active	MSW	Trans	Alleghany	$70.00	Yes
0403-MSWLF-2010	Chambers Development MSWLF	Active	MSW	LF	Anson	$43.08	Yes
0501-MSWLF-1993	Ashe County Landfill	Active	MSW	LF	Ashe	$62.00	Yes
0603-CDLF-1996	Avery County C&D Landfill	Active	CD	LF	Avery	$55.00	Yes
0603-TRANSFER-	Avery County Transfer Station	Active	MSW	Trans	Avery	$55.00	Yes
0703T-TRANSFER-2012	Beaufort Transfer Station	Active	MSW	Trans	Beaufort	$66.20	No
0803-MSWLF-1993	East Carolina Reg Landfill	Active	MSW	LF	Bertie	$79.59*	Yes
0904T-TRANSFER-1995	Bladen County Transfer Station	Active	MSW	Trans	Bladen	$45.00	Yes
10003T-TRANSFER-1995	Yancey-Mitchell Transfer Station	Active	MSW	Trans	Yancey	$57.62	No
1007-CDLF-1997	Brunswick County CDLF	Active	CD	LF	Brunswick	$59.00	Yes
1010T-TRANSFER-1997	Brunswick County Transfer Station	Active	MSW	Trans	Brunswick	$59.00	Yes
1104-TRANSFER-1993	Waste Management Of Asheville	Active	MSW	Trans	Buncombe	$41.75	Yes
1107-CDLF-1998	Buncombe County C&D Unit	Active	CD	LF	Buncombe	$43.00	Yes
1107-MSWLF-1996	Buncombe County MSW Landfill	Active	MSW	LF	Buncombe	$43.00	Yes
1108T-TRANSFER-1996	Buncombe County Transfer Station	Active	MSW	Trans	Buncombe	$47.00	Yes
1114-TRANSFER-2009	Handle Safe Systems Transfer Facility	Active	MatRecovery	Trans	Buncombe	$50.00	No
1203-CDLF-2014	Burke County Johns River Waste Management	Active	CD	LF	Burke	$66.15	Yes
1205T-TRANSFER-1998	Burke County Transfer Facility	Active	MSW	Trans	Burke	$66.15	Yes
1302-CDLF-2006	Cabarrus County CDLF	Active	CD	LF	Cabarrus	$39.00	Yes
1304-MSWLF-1992	BFI-Charlotte Mtr Speedway Landfill V	Active	MSW	LF	Cabarrus	$64.75	Yes
1306-CDLF-2000	Highway 49 C&D Landfill And Recycling Greenway Waste	Active	CD	LF	Cabarrus	$41.75	Yes
1403-MSWLF-1998	Foothills Environmental Landfill	Active	MSW	LF	Caldwell	$44.03	No
1604-TRANSFER-1993	Carteret County Transfer Station	Active	MSW	Trans	Carteret	$52.50	Yes
1803-CDLF-	Blackburn Resource Recovery Facility	Active	CD	LF	Catawba	$23.00	Yes
1803-MSWLF-1997	Blackburn Resource Recovery Facility	Active	MSW	LF	Catawba	$33.00	Yes
1805-TRANSFER-2001	GDS Recycling Services	Active	MSW	Trans	Catawba	$35.00	Yes
1808T-TRANSFER-	Hickory, City of Transfer Station	Active	MSW	Trans	Catawba	$0.00	No
1903T-TRANSFER-1993	Waste Man. - Chatham Co Transfer Station	Active	MSW	Trans	Chatham	$58.71	Yes
2002-MSWLF-1998	Cherokee County MSW Facility	Active	MSW	LF	Cherokee	$57.00	Yes
2101T-TRANSFER-2001	Edenton, Town of Transfer Station	Active	MSW	Trans	Chowan	$44.64	Yes
2202T-TRANSFER-1997	Clay County Transfer Station	Active	MSW	Trans	Clay	$80.00	Yes
2301-CDLF-1997	Cleveland County CDLF	Active	CD	LF	Cleveland	$24.48	Yes
2301-MSWLF-2009	Cleveland County Landfill Self-McNeilly	Active	MSW	LF	Cleveland	$43.00	Yes
2403T-TRANSFER-1997	Columbus County Transfer Station	Active	MSW	Trans	Columbus	$58.93	Yes
2509-MSWLF-1999	CRSWMA - Long Term Regional Landfill	Active	MSW	LF	Craven	$40.00	Yes

North Carolina Department of Environmental Quality

Division of Waste Management

Public and Private Tipping Fees FY 2018-2019

PermitID	Permit_Name	PermitStatus	Type	Operation	County	Tip Fee	Incl Tax
2510T-TRANSFER-1997	Cherry Point Transfer Station	Active	MSW	Trans	Craven	$0.00	No
2601-CDLF-1997	Cumberland County C&D Unit	Active	CD	LF	Cumberland	$36.00	No
2601-MSWLF-1997	Cumberland County Landfill	Active	MSW	LF	Cumberland	$38.00	No
2606T-TRANSFER-1998	Fort Bragg Transfer Station	Active	MSW	Trans	Cumberland	$0.00	No
2608-CDLF-1998	Fort Bragg C&D Landfill	Active	CD	LF	Cumberland	$0.00	N/a
2609-TRANSFER-	Fayetteville, City of Waste Industries Transfer Station	Active	MSW	Trans	Cumberland	$46.16	Yes
2613-TRANSFER-2010	AAA Hauling Of NC Inc	Active	CD	Trans	Cumberland	$43.00	No
2703T-TRANSFER-1996	Currituck Transfer Station	Active	MSW	Trans	Currituck	$73.00	Yes
2705T-TRANSFER-2011	Soundside C&D Waste Transfer & Recycling Center	Active	CD	Trans	Currituck	$72.00	Yes
2706-TRANSFER-2013	Bay Disposal Inc. Currituck Transfer & Recovery Facility	Active	CD	Trans	Currituck	$65.00	No
2803-CDLF-1995	Dare County C&D Landfill	Active	CD	LF	Dare	$65.00	Yes
2805T-TRANSFER-	Dare County Transfer Station	Active	MSW	Trans	Dare	$73.15	Yes
2906-MSWLF-2008	Davidson County MSW Lined Landfill	Active	MSW	LF	Davidson	$36.00	Yes
2906-TRANSFER-2013	Davidson County Transfer Facility	Active	MSW	Trans	Davidson	$36.00	No
2908-TRANSFER-2013	Todco, Inc. - C&D Transfer	Active	CD	Trans	Davidson	$31.00	No
3103T-TRANSFER-	Duplin County Transfer Station	Active	MSW	Trans	Duplin	$42.00	Yes
3212T-TRANSFER-1999	Durham, City of Transfer Station	Active	MSW	Trans	Durham	$44.50	Yes
3214T-TRANSFER-2001	Stone Park Court Transfer Station	Active	MSW	Trans	Durham	$44.50	Yes
3301-CDLF-1997	Edgecombe County CDLF	Active	CD	LF	Edgecombe	$43.50	Yes
3302T-TRANSFER-1998	Edgecombe County Transfer Station	Active	MSW	Trans	Edgecombe	$51.00	Yes
3402-MSWLF-1997	Hanes Mill Road Landfill	Active	MSW	LF	Forsyth	$34.00	No
3412-CDLF-1995	Winston-Salem, City of Old Salisbury Road CDLF	Active	CD	LF	Forsyth	$32.00	No
3416T-TRANSFER-	Overdale Road Transfer Station	Active	MSW	Trans	Forsyth	$47.00	Yes
3424-TRANSFER-2010	Abbey Green, Inc	Active	CD	Trans	Forsyth	$41.00	No
3503-TRANSFER-	Franklin County Transfer Station	Active	MSW	Trans	Franklin	$60.00	Yes
3505-MWP-2017	Capital Materials and Recycling	Active	MSW	Trans	Franklin	$50.00	Yes
3606-CDLF-1995	Gaston County C&D Landfill	Active	CD	LF	Gaston	$28.00	Yes
3606-MSWLF-1997	Gaston County Landfill	Active	MSW	LF	Gaston	$38.00	Yes
3608-TRANSFER-1993	Waste Management Of Carolinas	Active	MSW	Trans	Gaston	$49.98	Yes
3616-TRANSFER-2013	Recycle Carolina	Active	CD	Trans	Gaston	Not Rec'd	
3803-TRANSFER-	Graham County Transfer Station	Active	MSW	Trans	Graham	$60.00	Yes
3901-CDLF-1997	Granville County CDLF	Active	CD	LF	Granville	$40.00	Yes
3901-MSWLF-2012	Oxford Subtitle D MSWLF	Active	MSW	LF	Granville	$40.00	Yes
4002-CDLF-1997	Greene County CDLF	Active	CD	LF	Greene	$46.00	Yes
4103-CDLF-1998	Greensboro, City Of -White Street Landfill	Active	CD	LF	Guilford	$31.00	Yes
4104-MSWLF-1991	High Point City Of - Landfill	Active	MSW	LF	Guilford	$38.00	Yes
4112-MSWLF-1997	Greensboro, City Of	Active	MSW	LF	Guilford	$41.00	Yes
4116-CDLF-2012	High Point C&D Debris Landfill	Active	CD	LF	Guilford	$37.00	Yes
4117-CDLF-2008	A-1 Sandrock C&D Landfill	Active	CD	LF	Guilford	$36.00	Yes
4118T-TRANSFER-	Bishop Road Transfer Station	Active	MSW	Trans	Guilford	$47.00	Yes

North Carolina Department of Environmental Quality

Division of Waste Management

Public and Private Tipping Fees FY 2018-2019

PermitID	Permit_Name	PermitStatus	Type	Operation	County	Tip Fee	Incl Tax
4120T-TRANSFER-	Greensboro, City of Transfer Station	Active	MSW	Trans	Guilford	$44.00	Yes
4122T-TRANSFER-2012	WI Burnt Poplar Transfer LLC	Active	CD	Trans	Guilford	$44.00	Yes
4204-CDLF-2013	Halifax County Landfill	Active	CD	LF	Halifax	$52.00	Yes
4204-TRANSFER-2013	Halifax County Landfill	Active	MSW	Trans	Halifax	$63.60	Yes
4205T-TRANSFER-1997	Weldon, Town of Transfer Facility	Active	MSW	Trans	Halifax	$62.50	Yes
4302-CDLF-1998	Harnett County CDLF	Active	CD	LF	Harnett	$40.00	Yes
4303-CDLF-1997	Harnett Co Anderson Crk C&D Landfill	Active	CD	LF	Harnett	$40.00	Yes
4307T-TRANSFER-1997	Harnett Cnty-Dunn/Erwin Transfer Station	Active	MSW	Trans	Harnett	$40.00	Yes
4309T-TRANSFER-	Anderson Creek Landfill Transfer Station	Active	MSW	Trans	Harnett	$40.00	Yes
4407-MSWLF-1993	Haywood Co White Oak Landfill	Active	MSW	LF	Haywood	$22.45	Yes
4504T-TRANSFER-1998	Henderson County Transfer Facility	Active	MSW	Trans	Henderson	$60.00	Yes
4602T-TRANSFER-1995	Hertford County Transfer Station	Active	MSW	Trans	Hertford	$66.00	No
4702-TRANSFER-1994	Hoke County Transfer Station	Active	MSW	Trans	Hoke	$50.75	Yes
4903-MSWLF-1993	Iredell County Sanitary LF	Active	MSW	LF	Iredell	$35.00	No
4904T-TRANSFER-1998	Iredell County Transfer Station	Active	MSW	Trans	Iredell	$45.00	No
5003T-TRANSFER-	Jackson County Scott Creek Transfer Station	Active	MSW	Trans	Jackson	$64.00	Yes
5103-CDLF-	Johnston County C&D Landfill	Active	CD	LF	Johnston	$27.00	Yes
5103-MSWLF-	Johnston County Landfill	Active	MSW	LF	Johnston	$35.00	Yes
5103-MSWLF-1997	Johnston County Landfill	Active	MSW	LF	Johnston	$35.00	Yes
5203-CDLF-2013	Maysville C & D	Active	CD	LF	Jones	$44.20	No
5304T-TRANSFER-1993	Waste Man. - Lee Co. Transfer Station	Active	MSW	Trans	Lee	$44.87	Yes
5305-TRANSFER-2013	Sanford Transfer Station	Active	MSW	Trans	Lee	$60.75	Yes
5403-CDLF-1997	Lenoir County CDLF	Active	CD	LF	Lenoir	$39.00	Yes
5405T-TRANSFER-1998	Lenoir County Transfer Facility	Active	MSW	Trans	Lenoir	$44.00	Yes
5408-TRANSFER-2014	Deep Run Transfer Station	Active	MSW	Trans	Lenoir	$54.06	Yes
5409-MSWLF-	Lenoir County MSW Landfill	Active	MSW	LF	Lenoir	$44.00	Yes
5503-CDLF-1999	Lincoln County C&D Unit	Active	CD	LF	Lincoln	$32.00	Yes
5503-MSWLF-1986	Lincoln County Landfill	Active	MSW	LF	Lincoln	$41.00	Yes
5504-CDLF-1999	Lake Norman Landfill	Active	CD	LF	Lincoln	$47.75	Yes
5602T-TRANSFER-1995	McDowell Co Transfer Facility	Active	MSW	Trans	McDowell	$48.00	No
5703-MSWLF-1992	Macon County Landfill Open	Active	MSW	LF	Macon	$66.00	Yes
5704T-TRANSFER-2008	Highlands Transfer Station	Active	MSW	Trans	Macon	$66.00	Yes
5803-CDLF-1995	Madison County C&D Unit	Active	CD	LF	Madison	$37.00	Yes
5803T-TRANSFER-2002	Madison County Transfer	Active	MSW	Trans	Madison	$47.00	Yes
5901-CDLF-1995	Martin County C&D Landfill	Active	CD	LF	Martin	$40.00	Yes
6013-CDLF-1993	Greenway Waste Solutions at North Meck	Active	CD	LF	Mecklenburg	$50.75	Yes
6014-TRANSFER-2009	Queen City Transfer Station	Active	MSW	Trans	Mecklenburg	$60.00	Yes
6019-MSWLF-2000	Mecklenburg County Landfill	Active	MSW	LF	Mecklenburg	$46.00	Yes
6029-TRANSFER-2012	O'Leary Resource Recovery Center	Active	MSW	Trans	Mecklenburg	$0.00	No
6204-MSWLF-1995	Uwharrie Env. Reg. Landfill	Active	MSW	LF	Montgomery	$43.00	Yes

North Carolina Department of Environmental Quality

Division of Waste Management

Public and Private Tipping Fees FY 2018-2019

PermitID	Permit_Name	PermitStatus	Type	Operation	County	Tip Fee	Incl Tax
6301-CDLF-1992	Moore County C&D Landfill	Active	CD	LF	Moore	$46.79	Yes
6302-TRANSFER-1994	Uwharrie Env Inc/Moore Cty Transfer Station	Active	MSW	Trans	Moore	$43.00	Yes
6403-CDLF-2000	Nash County C&D Landfill	Active	CD	LF	Nash	$48.00	Yes
6405T-TRANSFER-2001	Rocky Mount, City of Transfer Station #2	Active	MSW	Trans	Nash	$58.50	No
6504-MSWLF-1981	New Hanover County Landfill	Active	MSW	LF	New Hanover	$48.00	Yes
6508T-TRANSFER-1993	Waste Management Of Wilmington Transfer	Active	MSW	Trans	New Hanover	$0.00	No
6708-MSWLF-1997	Camp Lejeune MSW Landfill	Active	MSW	LF	Onslow	$26.33	No
6709-MSWLF-1997	Onslow County Subtitle D Landfill	Active	MSW	LF	Onslow	$49.00	Yes
6804-CDLF-2005	Orange County C&D Landfill	Active	CD	LF	Orange	$40.00	Yes
6903T-TRANSFER-1993	Pamlico County Transfer Station	Active	MSW	Trans	Pamlico	$52.50	Yes
7002-CDLF-1996	Pasquotank County C&D Landfill	Active	CD	LF	Pasquotank	$50.00	Yes
7003T-TRANSFER-1994	Pasquotank County Transfer Station	Active	MSW	Trans	Pasquotank	$69.00	Yes
7103T-TRANSFER-1990	Pender Co Transfer Station	Active	MSW	Trans	Pender	$78.00	Yes
7202T-TRANSFER-1995	Perquimans-Chowan-Gates Transfer	Active	MSW	Trans	Perquimans	$68.00	Yes
7304-MSWLF-1997	Upper Piedmont Reg Landfill	Active	MSW	LF	Person	$39.42	No
7406T-TRANSFER-2001	EJE Recycling Transfer Station	Active	MSW	Trans	Pitt	$50.25	Yes
7407-CDLF-2009	C & D Landfill Inc	Active	CD	LF	Pitt	$43.00	Yes
7504T-TRANSFER-2005	Polk County Transfer Station	Active	MSW	Trans	Polk	$47.00	Yes
7603T-TRANSFER-1997	Randolph County Transfer Facility	Active	MSW	Trans	Randolph	$41.31	Yes
7605T-TRANSFER-2002	Asheboro, City of Recycling/SW Transfer Station	Active	MSW	Trans	Randolph	$48.00	Yes
7606-CDLF-2001	Gold Hill Road C&D Debris Landfill	Active	CD	LF	Randolph	$38.00	Yes
7607-MSWLF-2015	Great Oak Landfill	Active	MSW	LF	Randolph	$33.09	No
7703T-TRANSFER-1994	Richmond County Transfer Facility	Active	MSW	Trans	Richmond	$60.25	Yes
7803-CDLF-1997	Robeson County CDLF	Active	CD	LF	Robeson	$32.50	Yes
7803-MSWLF-1997	Robeson County Landfill	Active	MSW	LF	Robeson	$39.50	Yes
7902T-TRANSFER-1991	Reidsville, City Of Transfer Facility	Active	MSW	Trans	Rockingham	$36.00	No
7903T-TRANSFER-1991	Eden, City Of Transfer Station	Active	MSW	Trans	Rockingham	$0.00	No
7904-MSWLF-1995	Rockingham County Landfill	Active	MSW	LF	Rockingham	$38.00	Yes
8003-MSWLF-1988	Rowan County Landfill	Active	MSW	LF	Rowan	$41.00	Yes
8004T-TRANSFER-1995	East Spencer Waste Transfer Facility	Active	MSW	Trans	Rowan	$46.00	Yes
8103-CDLF-2002	Rutherford County C&D	Active	CD	LF	Rutherford	$42.00	Yes
8104T-TRANSFER-1998	Rutherford County Transfer Facility	Active	MSW	Trans	Rutherford	$62.00	Yes
8202-CDLF-1996	Sampson County Disposal, LLC	Active	CD	LF	Sampson	$43.28	Yes
8202-MSWLF-2000	Sampson County Disposal, LLC	Active	MSW	LF	Sampson	$43.28	Yes
8301-CDLF-1997	Scotland County CDLF	Active	CD	LF	Scotland	$45.25	Yes
8302T-TRANSFER-1997	Scotland County Transfer Station	Active	MSW	Trans	Scotland	$55.75	Yes
8401-CDLF-1997	Albemarle, City Of, CDLF	Active	CD	LF	Stanly	$40.00	No
8401-MSWLF-1999	Albemarle, City of Landfill	Active	MSW	LF	Stanly	$40.00	No
8606-MSWLF-1998	Surry County MSWLF	Active	MSW	LF	Surry	$45.00	Yes
8702T-TRANSFER-	Swain County Transfer Facility	Active	MSW	Trans	Swain	$62.00	Yes

North Carolina Department of Environmental Quality

Division of Waste Management

Public and Private Tipping Fees FY 2018-2019

PermitID	Permit_Name	PermitStatus	Type	Operation	County	Tip Fee	Incl Tax
8807-MSWLF-1990	Transylvania County Landfill	Active	MSW	LF	Transylvania	$60.00	Yes
9001-CDLF-1998	Union County C&D	Active	CD	LF	Union	$36.00	Yes
9005T-TRANSFER-1999	Union County Transfer Station	Active	MSW	Trans	Union	$42.00	No
9014-TRANSFER-2014	God Bless the USA Transfer Station	Active	MSW	Trans	Union	$59.00	Yes
9102T-TRANSFER-1997	Waste Industries-Vance County	Active	MSW	Trans	Vance	$66.00	Yes
9211T-TRANSFER-1990	Cary, Town of -Transfer Station	Active	MSW	Trans	Wake	$0.00	No
9215T-TRANSFER-1994	Waste Management Of Raleigh/Durham Transfer Station	Active	MSW	Trans	Wake	$46.00	No
9217-TRANSFER-1994	Waste Industries Garner Transfer Station	Active	MSW	Trans	Wake	$40.14	Yes
9222-MSWLF-2008	Wake County South Wake MSWLF	Active	MSW	LF	Wake	$32.00	Yes
9226-CDLF-2001	Shotwell Landfill Inc.	Active	CD	LF	Wake	$44.00	Yes
9227T-TRANSFER-2012	Raleigh Transfer Station	Active	CD	Trans	Wake	M:46.73/CD50.73	Yes
9228-CDLF-2001	Red Rock Disposal, LLC	Active	CD	LF	Wake	$34.88	No
9229T-TRANSFER-2009	Apex C&D Waste Transfer Facility	Active	CD	Trans	Wake	$48.00	Yes
9230-CDLF-2014	Greenway Waste Solutions of Apex, LLC	Active	CD	LF	Wake	$42.00	Yes
9231-CDLF-2012	Wake Reclamation, LLC	Active	CD	LF	Wake	$42.27	No
9233T-TRANSFER-	Raleigh, City of East Wake Transfer Station	Active	MSW	Trans	Wake	$41.00	Yes
9234T-TRANSFER-2012	Waste Industries, LLC	Active	CD	Trans	Wake	$55.47	Yes
9237T-TRANSFER-2010	Capitol Waste C&D Transfer Station	Active	CD	Trans	Wake	$49.50	Yes
9302T-TRANSFER-1995	Warren County Transfer Station	Active	MSW	Trans	Warren	$67.00	Yes
9404-CDLF-1996	Washington County C&D Landfill	Active	CD	LF	Washington	$52.00	Yes
9503T-TRANSFER-1996	Watauga Co Transfer Facility	Active	MSW	Trans	Watauga	$53.00	Yes
9601-CDLF-1997	Wayne County CDLF	Active	CD	LF	Wayne	$31.50	No
9606-MSWLF-1998	Wayne County Landfill	Active	MSW	LF	Wayne	$31.50	No
9607T-TRANSFER-1997	Goldsboro, City of Transfer Station	Active	MSW	Trans	Wayne	$31.50	Yes
9704-MSWLF-1993	Wilkes County MSWLF	Active	MSW	LF	Wilkes	$43.00	Yes
9806T-TRANSFER-1997	Waste Industries Wilson Transfer St.	Active	MSW	Trans	Wilson	$62.50	Yes
9808T-TRANSFER-2000	Waste Industries- Blk. Crk. Rd. Transfer	Active	MSW	Trans	Wilson	$62.50	Yes
9809-CDLF-	Wilson County Westside C&D Landfill	Active	CD	LF	Wilson	$40.00	Yes
9903T-TRANSFER-1994	Yadkin County Transfer Facility	Active	MSW	Trans	Yadkin	$70.00	No

North Carolina Department of Environmental Quality
Division of Waste Management

Public and Private Municipal Solid Waste, FY 2018-2019

Permit #	Facility	Tons 2018-2019	2017-2018	2016-2017	2015-2016	2014-2015
0104-MSWLF-1994	Austin Quarter SWM Facility	118,863	93,543	75,201	78,511	84,359
0403-MSWLF-2010	Chambers Development MSWLF (Anson Landfill)	797,245	688,282	655,449	492,911	479,184
0501-MSWLF-1993	Ashe County Landfill	22,353	18,712	22,832	17,963	17,357
0803-MSWLF-1993	East Carolina Environmental Regional Landfill	495,068	493,364	511,552	591,859	476,493
1107-MSWLF-1996	Buncombe County MSW Landfill	158,150	139,886	104,034	112,883	108,388
1304-MSWLF-1992	BFI-Charlotte Mtr Speedway Landfill V	1,253,897	880,863	921,315	1,085,646	815,471
1403-MSWLF-1998	Foothills Environmental Landfill	383,003	384,722	378,138	356,457	353,687
1803-MSWLF-1997	Blackburn Resource Recovery Facility	157,455	153,207	139,638	133,843	123,325
2002-MSWLF-1998	Cherokee County MSW Facility	20,491	17,941	17,159	16,800	13,913
2301-MSWLF-2009	Cleveland County Landfill Self-McNeilly	113,580	91,867	89,801	84,191	88,908
2509-MSWLF-1999	CRSWMA - Long Term Regional Landfill	326,054	199,102	197,820	192,944	184,420
2601-MSWLF-1997	Cumberland County Landfill	134,999	144,366	150,233	141,252	140,371
2906-MSWLF-2008	Davidson County MSW Lined Landfill	149,294	137,226	127,119	107,357	102,439
3402-MSWLF-1997	Hanes Mill Road Landfill	283,949	259,420	249,304	252,744	233,786
3606-MSWLF-1997	Gaston County Landfill	188,991	181,347	205,018	174,595	165,173
3901-MSWLF-2012	Oxford Subtitle D MSWLF	47,597	41,326	43,902	29,130	13,471
4104-MSWLF-1991	High Point, City of MSW Landfill	135,807	116,024	111,373	106,695	110,550
4112-MSWLF-1997	Greensboro, City of White Street Landfill	7,533	6,663	32,741	47,142	6,545
4407-MSWLF-1993	Haywood Co White Oak Landfill	143,683	160,479	160,471	160,500	160,566
4903-MSWLF-1993	Iredell County Sanitary LF	237,964	194,480	193,062	189,861	170,073
5103-MSWLF-	Johnston County Landfill	106,880	89,595	103,601	133,829	133,311
5503-MSWLF-1986	Lincoln County Landfill	41,173	33,085	36,946	35,969	34,801
5703-MSWLF-1992	Macon County Landfill Open	40,135	40,779	34,668	32,231	30,226
6019-MSWLF-2000	Mecklenburg County Landfill	128,944	153,467	116,733	118,405	104,033
6204-MSWLF-1995	Uwharrie Env. Reg. Landfill	464,672	461,928	621,378	729,759	665,505
6504-MSWLF-1981	New Hanover County Landfill	286,808	296,861	282,751	253,322	233,414
6504-MSWLF-2017	New Hanover County Landfill	164,634				
6708-MSWLF-1997	Camp Lejeune MSW Landfill	26,694	23,308	26,837	29,271	31,167

Public and Private Municipal Solid Waste, FY 2018-2019

Permit #	Facility	Tons 2018-2019	2017-2018	2016-2017	2015-2016	2014-2015
6709-MSWLF-1997	Onslow County Subtitle-D Landfill	175,750	117,400	119,877	113,277	115,010
7304-MSWLF-1997	Upper Piedmont Reg Landfill	243,291	248,368	246,056	252,684	263,397
7607-MSWLF-2015	Great Oak Landfill	556,126	401,733	157,446		
7803-MSWLF-1997	Robeson County Landfill	115,689	96,403	100,518	83,888	76,889
7904-MSWLF-1995	Rockingham County Landfill	137,337	99,783	101,496	86,132	79,298
8003-MSWLF-1988	Rowan County Landfill	142,631	138,284	143,490	137,876	123,633
8202-MSWLF-2000	Sampson County Disposal, LLC	1,767,087	1,656,397	1,547,245	1,530,860	1,392,914
8401-MSWLF-1999	Albemarle, City of Landfill	54,137	50,670	51,331	53,039	45,768
8606-MSWLF-1998	Surry County MSWLF	59,413	55,706	53,150	57,267	50,935
8807-MSWLF-1990	Transylvania County Landfill	25,385	25,551	21,793	26,003	21,739
9222-MSWLF-2008	Wake County South Wake MSWLF	506,581	463,683	442,659	436,632	418,546
9606-MSWLF-1998	Wayne County Landfill	82,807	75,429	77,780	67,175	70,312
9704-MSWLF-1993	Wilkes County MSWLF	61,061	57,243	54,837	53,327	54,058
U0024-MSWLF-	Brunswick Waste Management Facility	145,418	122,188	94,140	87,603	85,651
U0033-MSWLF-	Pine Bluff Landfill	5,676	11,513	11,083	10,823	10,163
U0035-MSWLF-	Bristol Landfill VA #588	14,823			12,983	13,049
U0038-MSWLF-	R & B Landfill	838,469	720,501	623,923	431,507	90,992
U0039-MSWLF-	Atlantic Waste Disposal, Inc. VA #562	48,232	28,518	27,247	38,136	40,132
U0047-MSWLF-	Eagle Point MSWLF GA #058-012D	6,500				
U0048-MSWLF-	Union County (SC) Landfill SC #442441-1101	191,489	146,521	143,012	202,014	128,261
U0050-MSWLF-	Richland Landfill, Inc.	88,754	95,398	101,135	118,549	95,528
U0051-MSWLF-	Lakeway Recycling & Sanitation, Inc.TN #32-0280	10,501	9,992	9,968	10,582	8,904
U0111-MSWLF-	Waste Management-Hickory Hill Landfill #272401-110	976	480	556	352	479
U0120-MSWLF-	Twin Chimneys Landfill SC	37,975	40,421	28,815	28,364	7,766
Total	**All MSW Landfills**	**11,752,021**	**10,164,025**	**9,766,631**	**9,545,140**	**8,274,358**

Includes out-of-state landfills that received North Carolina waste.

Note: Great Oak Landfill began disposal operations in 2016-2017

NCDEQ Permitted MSW Transfer Stations - 8/24/2020

Western North Carolina Facilities Highlighted

County	Name
Buncombe	Handle Safe Systems Transfer Facility
Alexander	Alexander County Transfer Station
Alleghany	Alleghany County Transfer Facility
Avery	Avery County Transfer Station
Beaufort	Beaufort Transfer Station
Bladen	Bladen County Transfer Station
Yancey	Yancey-Mitchell Transfer Station
Brunswick	Brunswick County Transfer Station
Buncombe	Waste Management Of Asheville
Buncombe	Buncombe County Transfer Station
Burke	Burke County Transfer Facility
Carteret	CRSWMA-Carteret County Transfer Station
Catawba	GDS Recycling Services
Chatham	Waste Man. - Chatham Co Transfer Station
Chowan	Edenton, Town of Transfer Station
Clay	Clay County Transfer Station
Columbus	Columbus County Transfer Station
Craven	Cherry Point Transfer Station
Cumberland	Fort Bragg Transfer Station
Cumberland	Fayetteville, City of Transfer Station
Currituck	Currituck Transfer Station
Dare	Dare County Transfer Station
Davidson	Davidson County Transfer Facility
Duplin	Duplin County Transfer Station
Durham	Durham, City of Transfer Station
Durham	Stone Park Court Transfer Station
Edgecombe	Edgecombe County Transfer Station
Forsyth	Overdale Road Transfer Station
Gaston	Waste Management Of Carolinas
Graham	Graham County Transfer Station
Guilford	Bishop Road Transfer Station
Guilford	Greensboro, City of Transfer Station
Halifax	Halifax County Landfill
Halifax	Weldon, Town of Transfer Facility
Harnett	Harnett County Transfer Station
Harnett	Anderson Creek Landfill Transfer Station
Henderson	Henderson County Transfer Facility
Hertford	Hertford County Transfer Station
Hoke	Hoke County Transfer Station
Iredell	Iredell County Transfer Station
Jackson	Jackson County Scott Creek Transfer Station
Lee	Waste Man. - Lee Co. Transfer Station
Lee	Sanford Transfer Station
Lenoir	Lenoir County Transfer Facility
Lenoir	Deep Run Transfer Station
McDowell	McDowell Co Transfer Facility

NCDEQ Permitted MSW Transfer Stations - 8/24/2020

Western North Carolina Facilities Highlighted

County	Name
Macon	Highlands Transfer Station
Madison	Madison County Transfer
Mecklenburg	Queen City Transfer Station
Mecklenburg	O'Leary Resource Recovery Center
Moore	Uwharrie Env Inc/Moore Cty Transfer Station
Nash	Rocky Mount, City of Transfer Station #2
New Hanover	Waste Management Of Wilmington Transfer
Pamlico	Pamlico County Transfer Station
Pasquotank	Pasquotank County Transfer Station
Pender	Pender Co Transfer Station
Pitt	Pitt County Transfer Station
Pitt	EJE Recycling Transfer Station
Polk	Polk County Transfer Station
Randolph	Randolph County Transfer Facility
Randolph	Asheboro, City of Recycling/SW Transfer Station
Richmond	Richmond County Transfer Facility
Rockingham	Reidsville, City Of Transfer Facility
Rockingham	Eden, City of Transfer Station
Rowan	East Spencer Waste Transfer Facility
Rutherford	Rutherford County Transfer Facility
Scotland	Scotland County Transfer Station
Swain	Swain County Transfer Facility
Union	Union County Transfer Station
Union	God Bless the USA Transfer Station
Vance	Waste Industries-Vance County
Wake	Cary, Town of Transfer Station
Wake	Waste Management Of Raleigh/Durham Transfer Station
Wake	WI Garner Transfer Station
Wake	Raleigh, City of East Wake Transfer Station
Wake	Morrisville Transfer Station, LLC
Warren	Warren County Transfer Station
Watauga	Watauga Co Transfer Facility
Wayne	Goldsboro, City of Transfer Station
Wilson	Waste Industries Wilson Transfer St.
Wilson	Waste Industries- Blk. Crk. Rd. Transfer
Yadkin	Yadkin County Transfer Facility

Transylvania County, NC
Landfill -vs- Transfer Station Options Evaluation
Cumulative Cost Comparison

	Landfill Option		Transfer Station Option		Comparative Difference	
					Landfill	Transfer Station
	Total Cost	Cost/Ton	Current Cost	Cost/Ton		
Solid Waste Program Expenditures	$57,365,687	$48.28	$57,365,687	$48.28		
Professional Engineering Services	$5,286,000	$4.45	$4,621,000	$3.89	$665,000	
Capital Costs	$50,604,371	$42.59	$16,923,181	$14.24	$33,681,190	
Post Closure Care	$8,161,332	$6.87	$3,278,521	$2.76	$4,882,811	
Offsite Transportation & Disposal	$0	$0.00	$105,169,244	$88.50		$105,169,244
Total Expenditures	$121,417,390	$102.18	$187,357,633	$157.67		$65,940,243
Tons	1,188,295		1,188,295			
Total Revenue	$71,297,710		$71,297,710			

6/2/2020

Kenn Webb

From: Bertolet, Larry <LBertolet@LaBellaPC.com>
Sent: Wednesday, June 17, 2020 1:59 PM
To: Kenn Webb
Cc: Johnson, Jenny
Subject: RE: Transfer vs Landfill - Transylvania County

Kenn –

Below is a revised summary table that includes the estimated wetlands & stream mitigation cost. I included the mitigation costs in with "Capital Costs". The changes are highlighted from the previous summary table. I have projected the costs to occur in 2021 which result in 2% inflation to the unit costs (consistent with all other future costs) that we discussed earlier this week. Also, different from the quantities discussed, we included the entire length of stream between outside of the proposed footprint and stream along south and west side of expansion in case COE takes approach that impacts are more than just those being destroyed. This resulted in an increase to the mitigation costs of approx. $1.4 million over previously discussed.

The difference between the 2 options is now down to approx. $7.3 million, with the landfill still being the cheaper option of the two. All other assumptions remain the same.

Please don't hesitate to give me a call if you have any questions.

	Landfill Option		Transfer Station Option	
	Total Cost	Cost/Ton	Current Cost	Cost/Ton
Solid Waste Program Expenditures	$57,365,687	$49.35	$57,365,687	$49.35
Professional Engineering Services	$5,286,000	$4.55	$3,571,250	$3.07
Capital Costs	$63,268,201	$54.42	$16,463,706	$14.16
Post Closure Care	$8,161,332	$7.02	$3,278,521	$2.82
Offsite Transportation & Disposal	$0	$0.00	$60,731,535	$52.24
Total Expenditures	$134,081,220	$115.34	$141,410,700	$121.64
Tons	1,162,525		1,162,525	
Total Revenue	$69,751,510		$69,751,510	

Note: Waste stream assumed to increase at 2.0% annually. Costs adjusted 2% annually for inflation.

Larry Bertolet, PE
LaBella Associates | Engineering/QC Director

Waste Dive

Chicago anaerobic digester, urban farm project secures final funding for $32M campus

By
Katie Pyzyk @_PyintheSky
Published
Aug. 20, 2020

Dive Brief:

- A Chicago community group in the Auburn Gresham neighborhood recently received the funding commitments needed to move ahead with a project to transform a nine-acre brownfield site into an urban farm. Construction on the $32 million project, which will include an on-site anaerobic digester (AD), begins next month and is expected to be complete by spring 2022.
- Green Era Sustainability will manage the AD facility, which is expected to process 85,000 tons of food waste and organic matter each year. The facility will produce material that can be used as compost for the urban farm and renewable natural gas that will be sold through an agreement with BP.
- Following a $10 million award from the Pritzker Traubert Foundation, a final $3 million in state funding helped close the deal. This includes $2 million from Gov. J.B. Pritzker's Rebuild Illinois capital plan and a $1 million loan from the Illinois Environmental Protection Agency's Brownfield Redevelopment Loan Fund. Additional project financing comes from a range of other sources, including a U.S. EPA brownfield cleanup grant.

Dive Insight:

The urban farm will grow an estimated 26,000 pounds of food per year for distribution in the community, which is considered a food desert. It is described as an example of working toward environmental justice in a low-income area that sustained a disproportionate impact from decades of disinvestment and industrial pollution. The site will also have an educational element to teach community members about growing their own food, healthy eating and organics recycling.

"The potential to provide environmental justice is huge," said Patrick Serfass, executive director of the American Biogas Council. "Communities that have suffered from environmental justice issues don't have a lot of trust for industry coming in and providing solutions because they've been burned so many times. One of the starting points here is to help everyone — from community members to leaders — understand the benefits that biogas can provide... The opportunity is incredible but education needs to come first."

Green Era Sustainability Co-Founder and CEO Jason Feldman said the project was initiated with the nonprofit Urban Growers Collective, which does agricultural projects in disadvantaged neighborhoods and will oversee the urban farm portion of the site. When they couldn't get enough compost for their community food growing projects, they started examining AD technologies, and momentum grew due to support from neighborhood groups. This project is getting a lot of attention because it is an example of a multi-benefit circular economy project to improve a traditionally underserved neighborhood, Feldman said.

"We want to show folks in a tangible way that it's worth taking the extra step to separate food waste," Feldman said. "It will be recycled locally, which creates jobs, but then it also creates the great byproducts of renewable energy to strengthen infrastructure and nutrient-rich material we can use to grow more food... We're trying to connect some of those dots. The linear economy right now is pretty unsustainable."

While food waste generally makes up one-third of the average waste stream, said Serfass, most cities currently do not have robust organics recycling programs and that material is often disposed. Therefore, cities cannot truly advance sustainability goals without an organics program, he said.

"The need to recycle food waste in cities is enormous. It's proportionate to the number of people," Serfass said.

The Chicago project is on the medium-to-large scale compared with other AD projects, according to sources. It is non-traditional due to its location in an urban neighborhood. AD facilities tend to be located in more rural areas because the land is less expensive for these capital-intensive projects. Plus, people aren't living adjacent to rural plants

and thus aren't as bothered with odors. The Chicago facility will operate a depressurization system to mitigate odors.

Organizers and advocates believe the Chicago urban farm and AD project is one that other cities can and should replicate.

"If we can do this in Chicago — which is a tough way to do this — I can see it happening in many other Midwestern areas," said Feldman. "We've seen a lot of industry here leave and leave behind big, vacant brownfields, which we can use to create new, circular industry."

Waste 360

California: First State to Mandate Universal Composting

CalRecycle will be responsible for reducing organic waste disposal by 75 percent and recovering 20 percent of edible food that is thrown away by 2025.

Waste360 Staff | Jan 23, 2020

Three years after California's Short-Lived Climate Pollutant Reduction Strategy (SB 1383) was signed into law, formal regulations were adopted by the California Department of Resources Recycling and Recovery (CalRecycle) at a public meeting on January 21 and will be transmitted to the Office of Administrative Law for final codification.

As a part of a multipronged strategy, CalRecycle will be responsible for reducing organic waste disposal by 75 percent and recovering 20 percent of edible food that is currently thrown away by 2025.

"It is incredibly exciting to see California build on the proven successes of local composting and food waste reduction efforts around the state by finally expanding these programs to every resident and business," said Nick Lapis, director of advocacy for the environmental advocacy organization Californians Against Waste, in a statement. "This

program will provide meaningful greenhouse reductions while creating jobs and supporting the resiliency of the state's

agricultural system."

Under this measure, local governments and generators will be required to compost, anaerobically digest or otherwise recycle food scraps, yard trimmings and other organic waste by providing curbside compost collection services to residents and businesses, and to minimize food waste from businesses such as grocery stores, event venues and restaurants. They also will be required to procure organic waste products such as compost and mulch. The regulations go into effect by 2022.

The adoption of the regulations comes at a time when recycling rates have been dropping around the country due to China's National Sword policy and other market conditions. At the meeting, CalRecycle also announced that the state's recycling rate has hit a new low of 40 percent, far short of the 75 percent target the state has set. Organic waste accounts for two-thirds of the state's waste stream, so tackling this material is an inexorable part of putting the state back on track to reaching its recycling goals.

When landfilled, organic waste is one of the largest sources of methane pollution in California. Conversely, the use of this same material to make compost and other byproducts has been proven to not only prevent methane emissions but also to increase soil health and water retention and sequester carbon from the atmosphere. SB 1383 is a part of California's broader 2030 Climate Change Strategy to reduce greenhouse gas emissions by 40 percent below 1990 levels by 2030.

The adoption of these regulations also marks the first attempt by a state to require food waste generators to recover a large portion of their edible food and donate it to those in need. An increasing portion of California's population experiences food insecurity, while at the same time food continues to be the most prevalent item in the waste stream, with more than 5.5 million tons of food dumped in landfills every year. Getting food to people who need it and preventing food waste is the best use of food otherwise destined for the landfill. The regulations require large generators to donate the "maximum amount" of edible food that they generate and make it illegal to intentionally spoil food that would otherwise be edible.

With more than 4 million Californians facing insecurity, California food banks are also excited about the potential for the regulations to produce the win-win of diverting food from going to waste while reducing hunger.

"We applaud California for embracing a bold vision to prevent food from going to waste and support our mission to fight hunger by getting it to those in need," said Andrew Cheyne, director of government affairs for the California Association of Food Banks, in a statement. "We are especially excited that the regulations name food banks as key stakeholders [in] this process, and we look forward to working with local jurisdictions on the capacity, partnerships and other elements food banks and those donating food need to make this a success."

"Bold action like this could not have been possible without the tireless leadership of outgoing Director Scott Smithline and the unwavering support of three governors who have prioritized strong climate action," said Mark Murray, executive director of the environmental advocacy organization Californians Against Waste, in a statement.

Additionally, this strategy is projected to provide 11,700 permanent green jobs, as well as 4,500 temporary construction jobs to build the additional organic waste recycling facilities that will be needed to achieve these waste reduction goals.

https://www.waste360.com/legislation-regulation/california-first-state-mandate-universal-composting?fbclid=IwAR2XSogZ3w8HCWwuGtfSCH3TBVapzF8DvD9H2SeENvKDR8XKSNygNWpi3R4

recycling today

Of the material Ohio's Franklin County landfills, 76 percent can be composted or recycled

Food waste and cardboard present the biggest opportunities for increased diversion.

March 4, 2020

Posted by DeAnne Toto

The Solid Waste Authority of Southern Ohio (SWACO), Grove City, Ohio, has released a waste characterization study documenting that up to 76 percent of the material currently disposed of at the Franklin County Sanitary Landfill could be recycled or composted. The items offering the greatest opportunities for increased diversion are food scraps and old corrugated cardboard (OCC), the study notes.

The study was completed last year and conducted over the course of four seasons by Cascadia Consulting Group, Seattle, and MSW Consultants, Orlando, Florida.

During the study period, 180 commercial and residential trash samples, weighing 39,000 pounds in total, were collected and analyzed, SWACO says. The materials were sorted into 64 categories and evaluated based on their weight, material type and recyclability to determine what's being thrown away and how much of it has the potential to be diverted from the landfill.

The 10 items most commonly found in Franklin County's waste stream are:

1. food scraps at 15 percent;
2. corrugated cardboard at 10 percent;
3. other compostable items and fiber at 9 percent;
4. magazines, newspaper, office and other paper at 8 percent;
5. bulky and durable goods at 7 percent;
6. construction and demolition debris at 4 percent;
7. plastic containers at 4 percent;
8. wood pallets at 4 percent;
9. textiles at 4 percent; and
10. yard waste at 3 percent.

Combined, these items make up 68 percent, or 772,234 tons, of the material landfilled.

SWACO says the three most prevalent items in Franklin County's waste stream are food scraps, corrugated cardboard and compostable items and fiber, which can be recovered through currently offered programs or have the potential to be captured and diverted if new programs and services were established.

"While we weren't surprised to learn that so much food was coming to the landfill, we remain committed to decreasing landfill disposal of all types of materials, and we're already at work helping to support rescuing edible food and redirecting it to families and individuals in need," says Kyle O'Keefe, SWACO director of innovation and programs. "We're also working to increase opportunities for composting of inedible food and encouraging waste reduction practices to avoid the creation of waste in the first place."

When evaluating Franklin County's potential to increase diversion based on the waste stream, the study found that of the 76 percent of the material currently being sent to the landfill that could be recycled or composted, 41 percent could be diverted through existing programs and an additional 35 percent has the potential to be diverted with new programs and infrastructure.

In November 2019, SWACO reported that Franklin County had reached a 50 percent diversion rate, which is one of the highest rates in the Midwest and exceeds the national average. Yet, the county still landfills more than 1 million tons every year. SWACO says it has set a goal to help residents and businesses in Franklin County divert 75 percent of their waste from the landfill.

SWACO says it is using the data from the waste characterization study to make informed decisions regarding the creation of new programs aimed at increasing the diversion of a wide range of materials. In the last year, SWACO introduced Recycle Right, the Make a Difference campaign, the Residential Recycling Cart Initiative, SWACO's Community Consortium Program and the Central Ohio Food Waste Initiative. These programs are designed to help residents recycle more of the materials generated at home, facilitate reducing food waste occurring in school cafeterias and promote the composting of food scraps at home and at area businesses.

The study also assessed the value of the materials being landfilled and which are currently accepted for recycling through Franklin County's curbside, drop-off and other recycling programs (which include paper, cardboard, plastic bottles and jugs, glass bottles and metal cans). Those materials are estimated to have a market value of $23 million.

"It's easy to connect how reducing our waste and increasing our recycling is good for the environment, but what isn't always immediately obvious is the economic benefit of recycling too," says O'Keefe. "When we throw away items that have the potential to be recycled, we miss the opportunity to create the jobs needed to turn those materials into new products as well as the millions of dollars that could be reinvested right here in the central Ohio region."

Later this year, SWACO says it will launch new educational programs for capturing and recovering food waste, including funding drop-off composting sites in a number of Franklin County cities, and will unveil new resources to assist area businesses in starting and expanding recycling programs.

https://www.recyclingtoday.com/article/swaco-2019-solid-waste-characterization-study/

WasteAdvantage magazine
The Advantage in the Waste and Recycling Industry

$43 Million Organic Recycling Center Could Be Coming to Ramsey/Washington Solid Waste Facility in Minnesota

August 13, 2020

A garbage facility in Newport is about to take a $43 million dive into organic recycling. The addition to the Ramsey/Washington Recycling & Energy Center would enable it to pull food scraps out of the waste stream for the first time. According to a proposal, the project would increase recycling, decrease the amount of garbage being burned, and reduce material sent to landfills. "The purpose here is to get more value out of waste," said Zack Hansen, Ramsey County's Environmental Health director.

The plan was submitted to the Newport Planning Commission at its Aug. 13 meeting. It calls for a 40-foot-tall addition to the existing facility at Interstate 494 and U.S. Highway 61. The proposal would bring the public cost of the center to $82 million — $24 million to buy it in 2016, $15 million in improvement projects, and $43 million the new organic-waste expansion. The upgrade is necessary to handle the anticipated surge of organic waste, said Hansen.

Officials hope to kick off the Durable Compost Bag program, in which customers would put food scraps into plastic bags and toss them into the garbage. At the plant — in the new Durable Compost Bags Addition — those bags would be sorted out, and the organic material used to make mulch. The cost of that program and the expansion would cost an average of $10 per customer per year, said Hansen. The bags would be free, and participation voluntary.

To read the full story, visit https://www.twincities.com/2020/08/12/newport-to-add-43-million-organic-recycling-center-to-solid-waste-facility/.
Author: Bob Shaw, Twin Cities Pioneer Press

WasteAdvantage magazine
The Advantage in the Waste and Recycling Industry

Montreal, Canada Says City-Wide Composting Key Pillar in Plan to Become Zero Waste by 2030

August 21, 2020

On Wednesday, the City of Montreal's executive committee adopted the Plante administration's ambitious five-year plan to change the way the city manages garbage. "Everybody has a role to play," said Laurence Lavigne-Lalonde, the executive committee member responsible for the ecological transition. The COVID-19 crisis may have forced the city to put its plans to fight climate change on the back burner for a little while, but for the Plante administration, reducing waste has never stopped being a top priority. "Climate change and zero waste are not just words. We are really putting those words in action. Even though we are fighting different crises, we still work on those objectives," Lavigne-Lalonde explained.

The city said the new plan has been thoroughly studied since it was presented last year. Becoming a zero-waste city will not happen without a huge increase in composting. According to the city, only half a million households have access to composting right now. "What we know right now is that 55 percent of what we send to landfills can be composted, so this is the first thing," said Lavigne-Lalonde.

Right now, buildings with nine units or more are not composting, except for in a handful of boroughs where a pilot project is underway. The city wants that to change in the coming months. They are planning a door-to-door information campaign to explain the benefits of composting, but that's being delayed by the pandemic. "By 2025, every citizen of Montreal will be able to participate in the compost," claimed Lavigne-Lalonde.

https://wasteadvantagemag.com/montreal-canada-says-city-wide-composting-key-pillar-in-plan-to-become-zero-waste-by-2030/

To read the full story, visit https://globalnews.ca/news/7286726/montreal-city-wide-composting-zero-waste-2030/.
Author: Dan Spector, Global News
Image: Global News

BIOCYCLE

November 15, 2010

Tennessee Composting Facility Makes Full Recovery

Robert Spencer

BioCycle November 2010, Vol. 51, No. 11, p. 21

After a fire in 2007 destroyed the plant, Sevier Solid Waste, Inc. has constructed a new and improved facility that reflects lessons learned from years of composting mixed waste and biosolids.

THE small subset of the composting industry that uses rotary drum reactors (RDR) gets together for two days each year at an operating facility to share experiences with rotary drum in-vessel composting. In September 2010, Sevier Solid Waste, Inc. (SSWI), which operates a mixed solid waste/biosolids cocomposting plant with five RDRs, hosted the Rotary In-Vessel Users Group meeting in Pigeon Forge, Tennessee. The group votes each year to recognize the best or most improved rotary drum facility, and in 2010 the Eweson Award For Facility Excellence went to SSWI.

Phil Hayes of the Pinetop-Lakeside Sanitary District in Arizona, one of the primary organizers of the annual meeting, presented the award to Tom Leonard, manager of SSWI, saying: "The award this year to SSWI and Tom Leonard is certainly appropriate given the

devastating fire, and the fact that the largest MSW cocomposting plant in the U.S is again successfully running." Daily flow to the facility in Sevierville is 275 tons of mixed MSW, and 60 wet tons of biosolids.

An article in the November 2007 issue of BioCycle, "Tennessee Composting Facility Rises From The Ashes," recounts the story of the devastating fire on Memorial Day 2007 that destroyed almost the entire plant, built in 1992. Except for the five, 185-foot long rotary drums, which are not wholly contained within a building, the fire demolished over 100,000 square feet of buildings, including waste receiving, digester discharge and aeration floor, plus most of the associated equipment. The facility was insured for approximately $10.5 million. The plant was constructed at a cost of $6.5 million, and over a period of eight years, improvements were made, including the addition of two rotary drums, that increased total capital costs to $12.5 million.

Although SSWI could have issued bonds for a more expensive facility (the previous bonds had been repaid), SSWI's Board of Directors handed Leonard a tall order: Rebuild a 100,000 tons/year facility for no more than the insured amount, and keep operating costs low enough to compete with area transfer stations (hauling to regional landfills) with tipping fees of $35 to $40/ton. While staying within the insured coverage was a challenge, SSWI just about met the Board's capital cost mandate, coming in at a price tag of $10,547,267 (see Table 1). "Major aspects of rebuilding the 335 tons/ day cocomposting plant were things I learned from people I met at the annual RDR meetings and on various facility tours," Leonard notes.

Since Sevier County owns the lined landfill adjacent to the composting plant, SSWI was able to dispose of its MSW there after the fire and while the facility was being rebuilt. "Our trash used up seven acres," he says. "When the plant is operating we have approval to put the process residue in an unlined area so it's a big incentive to keep the composting facility running."

NEW DESIGN FEATURES

The rebuild provided an opportunity to address known challenges to facility operations. A review of the challenges and how they were addressed are below:

Traffic Flow: One of the major operational changes at the plant was to redesign the entrance road and scale house so that there is now one-way

traffic and more sufficient space for garbage trucks to line up on the site. This virtually eliminated parking on the county road.

Aeration Trenches To Windrow Turner: Like many composting facility operators with aeration trenches embedded in concrete, Leonard and his staff had virtually given up on keeping the grates in the trenches from clogging with packed compost as they turned piles with front-end-loaders. Prior to the fire, SSWI had purchased a Backhus windrow turner and had stopped running the blowers. That turner was destroyed in the fire, and another Backhus Model 17.50 was purchased.

With a rebuild of the plant, the two new compost buildings do not contain aeration trenches, but do have leachate drains. Instead, windrows are turned an average of two times per day during the initial month of composting, aerating the piles and driving off moisture. When higher proportions of biosolids are being added to the MSW and moisture levels increase, the piles may be turned three times each day.

Tipping Floor Coating: In order to make the tipping building concrete more resistant to corrosion and damage, major portions of it were coated with a special product from Delta Pacific.

Recycle Screen Overs: Final screen overs greater than three-eighth inch from the Liwell screen are conveyed back to the tipping floor through an opening in the wall, making them convenient to use as inoculant for incoming MSW. This also enables recovery of the oversized organics in the final screen.

Hair Ball Grapple: One of Leonard's major design enhancements, which all RDR operators who process mixed MSW can relate to, is a grapple to pull large balls off the discharge conveyor belt under the drums and load them into an adjacent dumpster. Such heavy "hair balls" are typically wrestled off the conveyor belt with loaders and manpower, sometimes even cutting them into pieces – all very time consuming tasks. Furthermore, a hairball that made its way up a conveyor headed to the primary trommel screen would exceed the motor capacity of the conveyor, or the trommel screen, shutting them down, and requiring more brutal wrestling matches.

Fabric Buildings: SSWI purchased four Coverall brand (now Norseman Structures) fabric buildings to house the tipping floor, digester discharge and two composting structures. One disadvantage of the fabric building for the Sevierville plant's two composting buildings was that the aluminum frames could not be used to span more than the 200 feet needed (one structure is

200-ft wide; the other is 220-ft wide). Instead, steel frames were used, and Leonard pointed out some surface rust on the frames, lamented he had not coated them, and said he is evaluating coatings that can be applied to the frames in place.

Final Screen: Compost is screened after approximately 60 days of active windrow composting. The previous final screen, a trommel, was destroyed by the fire. The replacement is a Liwell, selected because of its widespread use at other MSW composting plants, and its ability to screen relatively wet material compared to other screens. "The maximum moisture level going into the screen is 45 percent, but we try to hit 38 to 40 percent," says Leonard. The effective screening is attributed to a trampoline-like movement of polyurethane screen mats that rapidly alternate from loose to tight, stretching the mat panels and preventing blinding of the screen panels. All of the compost is sold to a broker who then markets it to farmers, soil blenders, landscapers and contractors.

Air Handling: An entirely new air handling system was installed in the reconstructed plant, something Leonard acknowledges has been the biggest challenge. Two, 94,000 cfm fans pull air out of the buildings and to the adjacent biofilter. "We were having trouble getting sufficient air out of the buildings once the new fans were operating," he says. "Eventually we determined that the existing air ducts to the biofilter were too small to handle the 188,000 cfm coming through new, larger ducts from the building, so we will be replacing those ducts." The tipping building is designed to provide eight air changes per hour; the digester discharge building is 10 per hour, and the two composting buildings are three per hour. To help control odors in the tipping building, two high-speed roll-up doors are used for trucks to enter and exit the building.

Biofilter: One of the few components of the previous plant that survived the fire was the biofilter, located far enough from the buildings to not catch fire. Despite the constrained air flow to the biofilter, Leonard says that so far there have been no odor complaints. The nearest occupied building is a National Guard center directly across the street.

One design improvement – which Leonard credits to participating in the annual RDR user group meeting – is a specially designed pretreatment biofilter to scrub out fine particles from the air stream prior to the main biofilter. The previous facility utilized conventional water spray scrubber

towers. The new "soil scrubber" is basically a covered biofilter in a box where exhaust air from the buildings is pushed down through the media in a very short retention time. The filter is kept saturated to scrub out particulates prior to the conventional biofilter. The media can be easily replaced as needed.

DAILY OPERATIONS

Of the five existing RDRs, two had to be refurbished due to heat damage, and one is still not operating since it requires a major replacement of the drive gear. The drums are discharged early each morning, making room for loading of fresh material later in the morning. Front-end loaders push MSW and biosolids to an open pit serving each of the drums, then a hydraulic ram pushes the material in. Addition of biosolids helps achieve a moisture content of approximately 55 to 60 percent, ideal for aerobic composting.

Positive displacement blowers push air into the RDRs from the discharge end, counter to the flow of material through the drum, accelerating the degradation process and removing heat and moisture. The mix of 3-day old compost and inorganic residue is conveyed into a 35-foot long Doppstadt SST 1025E trommel screen, where the raw compost passes through the 1-1/4-inch holes. Overs from the trommel screen drop into a roll-off container, and are hauled to the adjacent unlined landfill. A moisture content of 55 percent is optimal for screening, but SSWI runs as high as 65 percent. "You just have to clean it more often," notes Leonard.

SOURCE SEPARATED STREAMS

A fairly new occurrence in Sevierville is the increasing number of companies in other counties that are starting to send source separated organics (SSO) to the facility. "Our plant provides a recycling alternative," explains Leonard, acknowledging that SSO can be advantageous to his facility since there is a smaller percentage of inorganic residue for landfill disposal. "I'd like to get

more SSO, and since we don't have to have 100 percent organic waste, I do not have to be stringent about contaminants."

One SSO suitor has been Walmart, which has one store in Sevier County. Walmart stores in more distant counties have also sent their organics to the Sevierville facility until they find closer options. Another company using the plant is Green Mountain Coffee Roasters, which has a processing facility in Forks in the River, Tennessee. It sends about one load a day of coffee hulls to the Sevierville plant. Another new generator is the University of Tennessee in Knoxville. "The students decided to start a food waste separation program, and the University now hauls it to our plant, which is about an hour away," explains Leonard.

Over almost 20 years of operation, SSWI has made local education a priority, with tours to school groups, an educational video shown in the community and played on local cable television, as well as radio announcements. "There are not many students in Sevier County that have not had a tour of our compost plant," says Leonard. "It's one of the more enjoyable parts of my job, to show kids how we turn trash into something useful."

Robert Spencer, an environmental planning consultant based in Vernon, Vermont, is a Contributing Editor to BioCycle.

https://www.biocycle.net/tennessee-composting-facility-makes-full-recovery/

WASTEDIVE

Landfill mining may still be new, but it has a lot to offer

By Doug Logan
Published
July 24, 2020

Doug Logan of Aggregates Equipment, Inc. explores the benefits, costs and future outlook for landfill mining. While not yet widely adopted, that could change in the future.

Landfills are a flawed but necessary part of the current waste management process. Until we can greatly diminish our production of non-recyclable waste, they will be needed for its management and disposal.

Fortunately, processes like mining offer a potential – albeit still limited – solution to minimizing the impacts of these landfills. While a relatively new practice in the recovery industry, landfill mining has shown it can provide tremendous benefits despite cost concerns.

The purpose of landfill mining

Landfill mining operations extract and reprocess materials from older disposal sites. On the simplest level, the ultimate aim of the process is to "mine" landfills for recyclables or reusable materials which can then be refined or sold as is to the scrap markets. This practice has generally been employed as a means of waste management, with landfills being mined when it becomes necessary to increase space to meet current disposal capacity needs.

In other cases, though less commonly, landfill mining operations are deployed to address environmental concerns. In these scenarios, the process aims to remove hazardous waste that may be dangerous to the surrounding environment or the local population.

We've found there are currently multiple techniques being deployed in the mining process. Techniques vary, as sometimes a process must be modified to adapt to and address a specific need. In other cases, the sorting technologies can partly dictate the technique, and resulting processes vary substantially. Common technologies being deployed and tested in landfill mining applications include trommel, disc, or vibratory screens; magnetic separation and often mass excavators.

Current challenges and costs

Although it's fair to say the practice is in its developmental years, landfill mining has shown some noteworthy benefits – albeit not without its share of drawbacks.

On a high level, while the process has been researched over the past decades, there are some claims that the full implications have yet to be fully explored. In other words, few scientific studies have been conducted that thoroughly examine landfill mining's full technical and economic feasibility. This can make it a crapshoot in determining both where and when it's advisable to mine a landfill. At this point, some hard research is needed to really help the waste industry determine the scope and scale necessary for operations to have the desired impact while remaining economically feasible.

Aside from the broader research shortfalls, some studies suggest there may be issues with methane emissions and local pollution due to disturbing and moving waste. Again, without a more thorough understanding of the full-scale implications of the process, it can be hard to determine whether potential methane emissions outweigh future environmental returns.

And of course, in other cases, the revenue from selling reclaimed waste has not kept up with projections or expenses. This has only become increasingly true as stricter regulation, such as China's scrap import policies, have made contamination a larger concern.

Lastly, depending on the nature of the landfill and its waste, the necessary equipment can be expensive to purchase and operate. The costs of landfill mining are exacerbated by the non-uniformity of metals and other desirable materials in the waste. Some projects earn millions in profits, while others languish in the red.

Benefits of landfill mining

All of that aside, it's important to understand that, while still a relatively new process, landfill mining has clear benefits:

- **Environmental:** One of the key advantages of landfill mining is that it can be used to remove a number of hazardous materials from the landfills. As a result, it can help diminish landfill pollution, preserve soil quality and protect surrounding natural resources.
- **Community health:** Pollution and other hazards from landfill use can also negatively affect communities. Removing materials that could damage soil or prove harmful to the surrounding air or water quality can help protect public health.
- **Economic:** The potential economic gains are significant. Extracted recyclable or combustible waste can be sold. More important, from a long-term perspective,

mining also increases the available space in landfills. This can lead to larger cost-saving benefits over the long term.

Currently, the economic question is perhaps the most significant for most waste management organizations. While short-term yields from processed materials may be limited, reclamation of space is often a massive cost-saving measure for municipalities and private companies.

The good news for everyone else is those economic incentives can help drive the environmental and health benefits. As landfill mining continues to mature and evolve, we will hopefully see greater mitigation of the negative impacts of landfill use.

The future outlook

Of course, landfill mining is not in a static state. Improvements in the technologies used (some of which are already becoming available) could significantly enhance the benefits of landfill mining while minimizing the costs.

- **Screening and recovery improvements:** New technologies are making it easier for mining projects to efficiently screen excavated waste and recover materials. This can have a major effect on the economics of landfill mining. More efficient processes mean reduced costs and improved revenue. Therefore, more projects can be self-sustaining.
- **Procedural advancements:** To enjoy more of the benefits of landfill mining, municipalities and contractors can scale their operations. For example, using larger excavation tools can help decrease the cost to extract each cubic meter of soil. Additionally, better upfront analysis of the landfills can help prevent the initiation of unfeasible mining projects.

Landfill mining has a lot to offer. However, it remains a relatively uncommon practice. Furthermore, there are some negative perceptions due to a history of overpromising and under-delivering. Nonetheless, several efforts, particularly in Europe, are helping to show that more efficient technologies and processes can substantially improve the cost-benefit balance.

Additionally, research indicates that by getting greater buy-in from local residents, municipalities can more easily pay for mining and maintain projects. People in some areas have proven more willing to support efforts to clean up waste and protect public health and the environment.

It is likely that there will be a lot more interest in landfill mining once space starts to dwindle in certain regions. Worldwide, based on research published in the journal Waste Management & Research, there are over 2 billion metric tons of waste generated

annually. With rapid urbanization, population increases and economic growth, the World Bank predicts this amount could expand by 70% over the next three decades.

The implications are straightforward: landfill mining and its associated technologies could quickly grow to become a necessity for the global waste management industry.

Doug Logan is an applications specialist with Aggregates Equipment, Inc. He has over 20 years of experience in both management and equipment sales positions within the waste industry.

https://www.wastedive.com/news/landfill-mining-challenges-costs-benefits-aei/582026/

waste today

Florida county begins negotiations on expansion of waste-to-energy incinerator

Pasco County, Florida, commissioners have begun negotiating with Covanta Pasco Inc. to design, build and operate an expanded waste-to-energy incinerator.

April 29, 2020

Posted by Haley Rischar

Pasco County, Florida, has taken the first steps to pursue its goal of converting the area's waste into renewable energy in the coming years.

The Tampa Bay Times reports Pasco County commissioners unanimously agreed on April 28 to begin negotiating with their current resource recovery facility operator Covanta Pasco Inc., Spring Hill, Florida, to design, build and operate an expanded waste-to-energy incinerator. The county's maximum price tag for those services is $525 million.

Currently the county's Shady Hills resource recovery facility can handle 950 tons of garbage per day, but 1,100 tons of waste is produced daily. The new incinerator will add another 550 tons per day of capacity to the operation reducing the county's need to put garbage in an out-of-county landfill.

The county hired Covanta to design, build and operate the facility in 1989 and it began operations in 1991. The current agreement with Covanta ends at the end of 2024.

In October, Pasco solid waste officials advertised to find a company to design and build the new incinerator unit and operate it from 2025 through 2034. Thirty-four companies downloaded the bid package on the job but only Covanta responded.

That prompted county staff to do some industry research to determine whether another bidding process should be opened, according to a memo to the commission from County Solid Waste Director John Power.

That research indicated that the availability of other waste-to-energy operators in the marketplace "was very limited." Other major providers in the market have consolidated in the years since the Pasco operation was built and opened and some have left the market in North America all together, the examination concluded.

The county's purchasing ordinance allows negotiation with a single source in such cases. The total to design, build and operate the expansion would potentially allow expenses of up to $200 million for design and construction of the new incinerator unit and up to $325 million to operate the existing plant and the expansion for the 10 years.

After negotiating the details of a contract, county staff will bring it back to county commissioners for a final vote. County officials anticipate construction of the fourth unit in 2022 and for operation to begin in 2025.

https://www.wastetodaymagazine.com/article/florida-county-expanded-waste-to-energy-incinerator/

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June 4, 2020

Mr. Kenneth Webb
Director of Solid Waste
Transylvania County
500 Howell Rd.
Brevard, NC 28712

Re: Options Evaluation - Letter Report
Landfilling vs Transfer Station
Transylvania County, NC
Project No. 22200543/Phase No. 02

Dear Mr. Webb:

In accordance with our January 2020 proposal, Labella Associates, P.C. has prepared the following financial evaluation of landfilling versus transfer station as future solid waste management options for Transylvania County for the next 30 plus years or approximately 25 years beyond the life of the existing landfill.

The landfill option assumes expansion of the existing landfill onto the 56-acre area previously identified in the master plan as Option 2, allowing for continued waste disposal activities at the current landfill facility location. The transfer station option would likely require identification and purchase of a suitable tract of land (approximately 10 acres) that is zoned appropriately, free of environmental limitations, and in an area with good highway accessibility. Contracts for transportation and disposal of solid waste at an out-of-county landfill would be required.

The County is currently disposing of solid waste at the Woodruff Landfill, Permit Number 88-07, located near Rosman, North Carolina. Based on the July 29, 2019 Capacity Report and March 2020 master plan update, the airspace in Phases 1-5 is estimated to be exhausted in February 2027. Thereby requiring that either the landfill expansion or a transfer station be ready for operation before the end of calendar year 2026 to avoid disruption of the County's solid waste management activities.

For purposes of this study, an evaluation period of FY 2021 through FY2052 was established. This time period provided a reasonable stopping point for the study as it coincided with the filling of Phase II-6 of the expansion. At this point, it was assumed that the landfill would be closed and begin 30 years of post-closure care. At this same point under the transfer station option, the transfer station would be 25 years old out of an estimated 30 year expected life.

Anticipated costs through 2052 are included in this evaluation. An annual inflation rate of 2.0% was assumed. Costs associated with landfill operations or transfer station operations including out-of-county disposal beyond 2052 are not included in this evaluation.

Landfill Option

Conceptual grading plans were developed for the initial six phases of the expansion (Phases II-1 through Phase II-6). The total acreage for these six phases is approximately 41.9 acres with the phase footprints ranging between 6 acres and 9 acres. The exception being Phase II-6 which has a 3.3 acre footprint. Utilizing the existing contours as base grades, the total airspace available for waste is estimated to be approximately 1.77 million cubic yards. Liner and final cover sections are estimated to be 3.5' thick and 2' thick, respectively. The limits and final grades for Phase II-1 through Phase II-6 are shown on Drawing No.1 included as Attachment 4.

Phases	Gross Airspace	Area	Liner /Cap	Airspace	Cumulative Airspace	Airspace Available for Waste *
	(cy)	(ac)	(cy)	(cy)	(cy)	(cy)
II-1	295,000	9.2	81,635	213,365	213,365	202,697
II-2	325,000	7.3	64,775	260,225	473,590	449,911
II-3	355,000	6.9	61,226	293,774	767,364	728,996
II-4	361,000	6.2	55,015	305,985	1,073,349	1,019,682
II-5	427,000	9.0	79,860	347,140	1,420,489	1,349,465
II-6	468,000	3.3	29,282	438,718	1,859,207	1,766,247
	2,231,000	**41.9**	**371,793**	**1,859,207**		

*Airspace Available for Waste = 95% of Cumulative Airspace

To reduce permitting costs and avoid future changes to the solid waste regulations, this evaluation assumes that a Life of Site permit application will be prepared for Phases II-1 through II-6 at one time. This results in higher initial site suitability and hydrogeologic study costs but allows for lower overall permitting costs due to only one permit to construct application versus six.

To allow sufficient time for field investigations, site suitability, design, permitting, Department of Environmental Quality review and approval, the permitting effort should begin as early as FY2022. This should allow adequate time to complete construction of Phase II-1 and receive a permit to operate no later than the end of calendar year 2026 and avoid any disruption of waste disposal activities.

Construction of subsequent phases are proposed for the year prior to being needed. Phase construction costs, including engineering, bid phase services and construction quality assurance (CQA) services, are estimated at $500,000 per acre (2020 dollars), consistent with the updated master plan. Please note that these costs do not include the costs associated with wetlands or stream mitigation.

Closure of Phases 1-5 (approximately 19 acres) is proposed for FY2028, once the airspace in the current landfill is exhausted. For purposes of this evaluation, Closure of Phases II-1 through II-6 (approximately 41.9 acres) is proposed for FY2052. Closure costs, including

engineering, bid phase services and construction quality assurance (CQA) services, are estimated at $275,000 per acre (2020 dollars), consistent with the updated master plan.

The 30-year post-closure care period is proposed for the entire landfill (approximately 62 acres) starting in FY2053.

Transfer Station Option

For this option, it is assumed that a site other than the landfill is desired for the transfer station. As noted earlier, the transfer station option would require a parcel of land (approximately 10 acres) that is zoned appropriately, free of environmental limitations, and in an area with good highway accessibility. Ideally, the grade of the land should have approximately 8-10 feet of relief to accommodate the design and construction of the transfer station without needing excessive and costly grading and site improvements.

A limited review of the Transylvania Economic Alliance website was performed. From this review, a purchase price of approximately $900,000 was felt to be appropriate for a 10 +/- acre parcel along the Old US Highway 64 corridor, and therefore used in the evaluation.

Permitting for the transfer station should be a little less burdensome than the landfill, at least as far as DEQ is concerned. Local approvals, including site plan approval and building permit issuance, will be required. To allow sufficient time for design, permitting, local and DEQ approvals, the design and permitting effort should begin early in FY2025. This should allow adequate time to complete construction of the transfer station no later than the end of calendar year 2026 and avoid any disruption of waste disposal activities.

The cost to construct the transfer station, estimated to be $2.4 million (2020 dollars), assumes a facility with a tipping floor approximately 4,800 sf in size. Final size, features and associated site improvements will likely affect the final cost. The life of the transfer station is estimated to be 30 years with replacement of the tipping floor every 10 years.

Requests for proposals for transportation and disposal of solid waste at an out-of-county landfill should be issued concurrent with the construction of the transfer station so that contracts can be in place in time for operation of the transfer station. For purposes of this evaluation, transportation to an out-of-county landfill (approximately 100 miles away) at $21 per ton, and disposal at $20 per ton is assumed.

Closure of Phases 1-5 (approximately 19 acres) is proposed for FY2028, once the airspace in the current landfill is exhausted. The 30-year post-closure care period for Phases 1-5 is proposed to begin in FY2028.

Solid Waste Program Expenditures

The County's FY2018 actual expenditures, as well as budgets for FY2019 and FY 2020 were used as a baseline for the evaluation. Beginning with FY2021, annual program costs were projected using the assumed 2.0% inflation rate. For purposes of this evaluation, the

County's solid waste program costs were assumed to be the same for both the landfill option and the transfer station option as program costs cover more than just the landfill operations.

Professional Services Expenditures

In addition to the design, permitting and construction phase services described above, environmental compliance monitoring (Calvert and Woodruff landfills) and general consulting services will continue throughout the life of the landfill and post-closure care period for the landfill option. For the transfer station option, the environmental compliance monitoring for the Woodruff Landfill will be conducted as part of post-closure care beginning in FY2028. Beginning with FY2021, costs were projected using the assumed 2.0% inflation rate,

Capital Expenditures

Operations and Collections –

The County's FY2018 actual expenditures, as well as budgets for FY2019 and FY 2020 were used as a baseline for the evaluation. Beginning with FY2021, Operations and Collections capital budgets were projected using the assumed 2.0% inflation rate. For purposes of this evaluation, these budgets are assumed to be the same for both the landfill option and the transfer station option.

Equipment –

Replacement costs for major pieces of existing landfill equipment are included in the evaluation. Equipment replacement is estimated to occur every 12 years with a major overhaul being performed at mid-life of the respective equipment. Initial replacement or overhaul was established based on existing age of the respective equipment at the start of the evaluation period. For the landfill option, the replacement/overhaul cycle will continue throughout the life of the landfill. For the transfer station option, only the skid steer and the leachate tank truck will be replaced/overhauled throughout the entire evaluation period. The remaining landfill equipment will be replaced/overhauled only through FY2026. A rubber tire front end loader is proposed to be purchased in FY2028. Refer to Attachment 3 for the equipment replacement/overhaul schedule.

Waste Generation

Waste tonnages for 2020 were provided by the County and used as a baseline for the evaluation. Waste stream is assumed to increase at 2.0% annually, consistent with the 2019 capacity study and the updated master plan.

Evaluation Results and Conclusion

In order to evaluate the financial aspects of these options, spreadsheets were prepared for each option projecting costs through the year 2052. These spreadsheets are included as Attachments 1 and 2.

A summary of the projected costs is provided below along with corresponding costs per ton.

	Landfill Option		Transfer Station Option	
	Total Cost	Cost/Ton	Current Cost	Cost/Ton
Solid Waste Program Expenditures	$57,365,687	$49.35	$57,365,687	$49.35
Professional Engineering Services	$5,286,000	$4.55	$3,571,250	$3.07
Capital Costs	$60,347,446	$51.91	$16,463,706	$14.16
Post Closure Care	$8,161,332	$7.02	$3,278,521	$2.82
Offsite Transportation & Disposal	$0	$0.00	$60,731,535	$52.24
Total Expenditures	$131,160,465	$112.82	$141,410,700	$121.64
Tons	1,162,525		1,162,525	
Total Revenue	$69,751,510		$69,751,510	

Note: Waste stream assumed to increase at 2.0% annually. Costs adjusted 2% annually for inflation.

As can be seen, the total costs associated with the transfer station option over the evaluation period is higher than that of the landfill option due to the transportation and disposal costs for out-of-county disposal of solid waste. As noted previously, transportation to an out-of-county landfill (approximately 100 miles away) at $21 per ton, and disposal at $20 per ton is assumed. The revenue reflects the tipping fee charged at the landfill or the transfer station. Similar to the other costs, the County's tipping fee is assumed to increase an average of 2% per year.

Aside from the financial advantage offered by the landfill option, the primary advantage of this option is the level of control that the County maintains over its own waste disposal activities. Since the County would be operating its own end-use disposal unit, fluctuations in outside tip fees or available waste capacity would have little effect on the County's waste disposal practices.

There are also disadvantages associated with maintaining an active landfill. As with any landfill, expansion of the landfill could expose the County to long-term environmental risk and liability. Although the permitting and design requirements for Subtitle D waste cells are more stringent than those previously required, the possibility of the development of future environmental problems does still exist.

Complaints often increase in severity and magnitude as landfill's increase in size and continue to operate. However, at this time, the existing landfill property is reasonably well-situated away from the population, and contains substantial buffer zones between many of the adjacent properties. Siting a transfer station in the County may be difficult. County residents, may have concerns regarding blowing litter, noise, traffic, land values, or the overall stigma of the presence of a transfer station.

Based on the above financials, advantages and disadvantages, the landfill option appears to be best suited for the County. Therefore, similar to the master plan update, it is recommended that the County consider performing the site characterization for Option 2 and beginning the permitting process, rather sooner than later in order to provide continued solid waste services to the County's residents, commerce and industry.

If you have any questions or require additional information, please contact me at (804) 355-4520 (lbertolet@labellapc.com).

Respectfully submitted,
LaBella Associates, P.C.

Larry Bertolet, P.E.
Senior Technical Consultant

Attachments:
- Attachment 1 – Landfill Option Spreadsheet
- Attachment 2 – Transfer Station Option Spreadsheet
- Attachment 3 – Equipment Replacement/Overhaul Schedule
- Attachment 4 – Drawing No. 1 – Options Evaluation: Landfill Expansion Option

cc: Hannu Kemppinen – LaBella Associates
Jenny Johnson – LaBella Associates

Attachment 1

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Transyvania County

Landfill Option Evaluation
June 2020

General Assumptions:

Equipment Overhaul as a % of replacement cost:	15%
County Tip Fee per ton	$60
Annual Waste Stream Growth Rate:	2.0%
Inflation Rate:	2.0%

				FY	0 2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035
Solid Waste Program Expenditures																				
	Operations																			
		Personnel				$236,853	$241,590	$246,422	$251,350	$256,377	$261,504	$266,735	$272,069	$277,511	$283,061	$288,722	$294,497	$300,386	$306,394	$312,522
		Operating				$572,795	$584,251	$595,936	$607,855	$620,012	$632,412	$645,060	$657,961	$671,121	$684,543	$698,234	$712,199	$726,443	$740,971	$755,791
	Collections																			
		Personnel				$386,700	$394,434	$402,323	$410,370	$418,577	$426,948	$435,487	$444,197	$453,081	$462,143	$471,386	$480,813	$490,430	$500,238	$510,243
		Operating				$100,725	$102,740	$104,794	$106,890	$109,028	$111,209	$113,433	$115,701	$118,015	$120,376	$122,783	$125,239	$127,744	$130,299	$132,904
	Subtotal				**$0**	**$1,297,073**	**$1,323,014**	**$1,349,475**	**$1,376,464**	**$1,403,994**	**$1,432,073**	**$1,460,715**	**$1,489,929**	**$1,519,728**	**$1,550,122**	**$1,581,125**	**$1,612,747**	**$1,645,002**	**$1,677,902**	**$1,711,460**

Post-Closure Care																				
	Calvert																			
	Woodruff																			

Professional Services Expenditures																				
	Calvert Closed Landfill Environmental Monitoring					$25,000	$26,250	$26,250	$26,250	$27,500	$27,500	$27,500	$29,000	$29,000	$29,000	$30,500	$30,500	$30,500	$32,000	$32,000
	Woodruff Landfill Environmental Monitoring					$30,000	$31,500	$31,500	$31,500	$33,000	$33,000	$33,000	$34,750	$34,750	$34,750	$36,500	$36,500	$36,500	$38,500	$38,500
	General Landfill Consulting					$48,000	$50,500	$50,500	$50,500	$53,000	$53,000	$53,000	$55,500	$55,500	$55,500	$58,500	$58,500	$58,500	$61,500	$61,500
	Field Investigation & Design Hydrogeologic Report						$700,000	$50,000												
	Permit to Construct Application, E&S Plan & RTC							$80,000	$60,000	$30,000										
	Bid Phase and Construction Phase Services																			
	Subtotal					**$103,000**	**$808,250**	**$238,250**	**$168,250**	**$143,500**	**$113,500**	**$113,500**	**$119,250**	**$119,250**	**$119,250**	**$125,500**	**$125,500**	**$125,500**	**$132,000**	**$132,000**

Captial Expenditures																				
	Operations					$1,660	$1,694	$1,727	$1,762	$1,797	$1,833	$1,870	$1,907	$1,945	$1,984	$2,024	$2,064	$2,106	$2,148	$2,191
	Collections					$63,879	$65,156	$66,459	$67,789	$69,144	$70,527	$71,938	$73,377	$74,844	$76,341	$77,868	$79,425	$81,014	$82,634	$84,287
	Cell Construction			$500,000								$5,283,954			$4,449,330				$4,552,202	
	Closure Construction			$275,000									$6,057,479							
	Equipment																			
		1991 CAT D8N Dozer		$900,000			$140,454						$1,054,493						$178,130	
		2017 CAT D6 Dozer		$500,000				$79,591						$597,546						$100,940
		2017 EC220EL Volvo Trackhoe		$400,000				$63,672						$478,037						$80,752
		2019 CAT Trackhoe +		$400,000						$66,245						$497,350				
		2014 CAT 826H Compactor		$800,000							$900,930									
		2004 Volvo A250 Off Road Dump Truck		$500,000			$530,604						$87,874						$672,934	
		1997 CAT 416C Backhoe		$120,000				$19,102						$143,411						$24,226
		2014 Volvo BL70B Backhoe		$120,000							$135,139						$22,828			
		2018 Skid Steer		$60,000					$9,742						$73,140					
		2015 Mack Leachate Truck with Fixed Tank		$200,000		$30,600						$229,737						$38,808		
	Subtotal					**$96,139**	**$737,908**	**$230,552**	**$79,292**	**$137,186**	**$1,108,430**	**$5,587,499**	**$7,275,131**	**$1,295,784**	**$4,600,794**	**$577,241**	**$104,318**	**$121,927**	**$5,488,047**	**$292,395**

Off-Site Disposal																				
	Transport and Tip Fee				$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	Total Off-Site Disposal Fee				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Subtotal					**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Total Expenditures					**$0**	**$1,496,212**	**$2,869,172**	**$1,818,276**	**$1,624,007**	**$1,684,680**	**$2,654,003**	**$7,161,714**	**$8,884,310**	**$2,934,762**	**$6,270,167**	**$2,283,866**	**$1,842,565**	**$1,892,430**	**$7,297,949**	**$2,135,855**
Cost per Ton						$57	$107	$66	$58	$59	$91	$242	$294	$95	$200	$71	$56	$57	$215	$62
Waste Generation																				
	Total Waste Weighed at Scales					26,285	26,811	27,347	27,894	28,452	29,021	29,602	30,194	30,798	31,413	32,042	32,683	33,336	34,003	34,683
	Cumulative Waste Landfilled					26,285	53,097	80,444	108,338	136,790	165,811	195,413	225,607	256,404	287,818	319,860	352,542	385,878	419,881	454,564

Revenue																				
	Tip Fee (annual)					$1,577,124	$1,608,666	$1,640,840	$1,673,657	$1,707,130	$1,741,272	$1,776,098	$1,811,620	$1,847,852	$1,884,809	$1,922,505	$1,960,955	$2,000,175	$2,040,178	$2,080,982
	Tip Fee (cummulative)					$1,577,124	$3,185,790	$4,826,630	$6,500,287	$8,207,417	$9,948,689	$11,724,787	$13,536,406	$15,384,259	$17,269,068	$19,191,573	$21,152,529	$23,152,703	$25,192,881	$27,273,863

This spreadsheet model was prepared by LaBella Associates for the County of Transylvania in accordance with the standard of care ordinarily used by members of our engineering profession. No other warranties, express or implied, are made in connection with these projections

16 2036	17 2037	18 2038	19 2039	20 2040	21 2041	22 2042	23 2043	24 2044	25 2045	26 2046	27 2047	28 2048	29 2049	30 2050	31 2051	32 2052	TOTALS
$318,773	$325,148	$331,651	$338,284	$345,050	$351,951	$358,990	$366,169	$373,493	$380,963	$388,582	$396,354	$404,281	$412,366	$420,614	$429,026	$437,606	$10,475,290
$770,907	$786,325	$802,051	$818,092	$834,454	$851,143	$868,166	$885,529	$903,240	$921,305	$939,731	$958,526	$977,696	$997,250	$1,017,195	$1,037,539	$1,058,290	$25,333,021
$520,448	$530,857	$541,474	$552,303	$563,349	$574,616	$586,109	$597,831	$609,788	$621,983	$634,423	$647,111	$660,054	$673,255	$686,720	$700,454	$714,463	$17,102,608
$135,563	$138,274	$141,039	$143,860	$146,737	$149,672	$152,665	$155,719	$158,833	$162,010	$165,250	$168,555	$171,926	$175,365	$178,872	$182,449	$186,098	$4,454,768
$1,745,690	**$1,780,603**	**$1,816,215**	**$1,852,540**	**$1,889,590**	**$1,927,382**	**$1,965,930**	**$2,005,249**	**$2,045,354**	**$2,086,261**	**$2,127,986**	**$2,170,545**	**$2,213,956**	**$2,258,236**	**$2,303,400**	**$2,349,468**	**$2,396,458**	**$57,365,687**

																$8,161,332	**$8,161,332**

$32,000	$33,500	$33,500	$33,500	$35,250	$35,250	$35,250	$37,000	$37,000	$37,000	$38,750	$38,750	$38,750	$40,750	$40,750	$40,750	$42,750	$1,059,250
$38,500	$40,500	$40,500	$40,500	$42,500	$42,500	$42,500	$44,500	$44,500	$44,500	$46,500	$46,500	$46,500	$49,000	$49,000	$49,000	$51,500	$1,273,250
$61,500	$64,500	$64,500	$64,500	$67,500	$67,500	$67,500	$71,000	$71,000	$71,000	$74,500	$74,500	$74,500	$78,000	$78,000	$78,000	$82,000	$2,033,500
																	$750,000
																	$170,000
$132,000	**$138,500**	**$138,500**	**$138,500**	**$145,250**	**$145,250**	**$145,250**	**$152,500**	**$152,500**	**$152,500**	**$159,750**	**$159,750**	**$159,750**	**$167,750**	**$167,750**	**$167,750**	**$176,250**	**$5,286,000**

$2,235	$2,279	$2,325	$2,371	$2,419	$2,467	$2,517	$2,567	$2,618	$2,671	$2,724	$2,778	$2,834	$2,891	$2,948	$3,007	$3,068	$73,432
$85,972	$87,692	$89,446	$91,234	$93,059	$94,920	$96,819	$98,755	$100,730	$102,745	$104,800	$106,896	$109,034	$111,214	$113,439	$115,707	$118,022	$2,825,164
		$4,427,563				$6,956,909				$2,761,140							$28,431,097
																$9,743,075	$15,800,554
																	$0
				$1,337,353						$225,911							$2,936,341
					$757,833						$128,016						$1,663,927
					$606,267						$102,413						$1,331,141
	$84,014						$630,760						$106,551				$1,384,919
		$1,142,597															$2,043,527
				$111,446						$853,443							$2,256,302
					$181,880						$30,724						$399,342
		$171,390						$28,952									$358,309
$12,355						$92,759						$15,669					$203,665
			$291,362						$49,218								$639,726
$100,562	**$173,985**	**$5,833,320**	**$384,968**	**$1,544,277**	**$1,643,367**	**$7,149,003**	**$732,082**	**$132,300**	**$154,634**	**$3,948,018**	**$370,828**	**$127,537**	**$220,656**	**$116,387**	**$116,715**	**$9,864,164**	**$60,347,446**

$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
$1,978,251	**$2,093,089**	**$7,788,036**	**$2,376,008**	**$3,579,117**	**$3,715,999**	**$9,260,182**	**$2,889,830**	**$2,330,154**	**$2,393,394**	**$6,235,754**	**$2,701,123**	**$2,501,243**	**$2,646,641**	**$2,587,537**	**$2,635,933**	**$20,598,204**	**$131,160,465**
$56	$58	$212	$63	$93	$95	$232	$71	$56	$57	$145	$61	$56	$58	$55	$55	$424	

35,377	36,084	36,806	37,542	38,293	39,059	39,840	40,637	41,449	42,278	43,124	43,986	44,866	45,764	46,679	47,612	48,565	**1,162,525**
489,941	526,025	562,831	600,373	638,666	677,725	717,565	758,201	799,651	841,929	885,053	929,040	973,906	1,019,669	1,066,348	1,113,961	1,162,525	

$2,122,601	$2,165,053	$2,208,354	$2,252,521	$2,297,572	$2,343,523	$2,390,394	$2,438,202	$2,486,966	$2,536,705	$2,587,439	$2,639,188	$2,691,972	$2,745,811	$2,800,727	$2,856,742	$2,913,877	**$69,751,510**
$29,396,464	$31,561,517	$33,769,872	$36,022,393	$38,319,965	$40,663,488	$43,053,882	$45,492,084	$47,979,049	$50,515,754	$53,103,194	$55,742,381	$58,434,353	$61,180,164	$63,980,891	$66,837,633	$69,751,510	

Attachment 2

LaBella
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Transyvania County

Transfer Station Option Evaluation

June 2020

General Assumptions:

Inflation Rate:	2.0%	Equipment Overhaul as a % of replacement cost:	15%
		County Tip Fee per ton	$60
Annual Waste Stream Growth Rate:	2.0%	Out-of-County Tip Fee per ton	$20
		Transportation Cost per ton/trip	$21

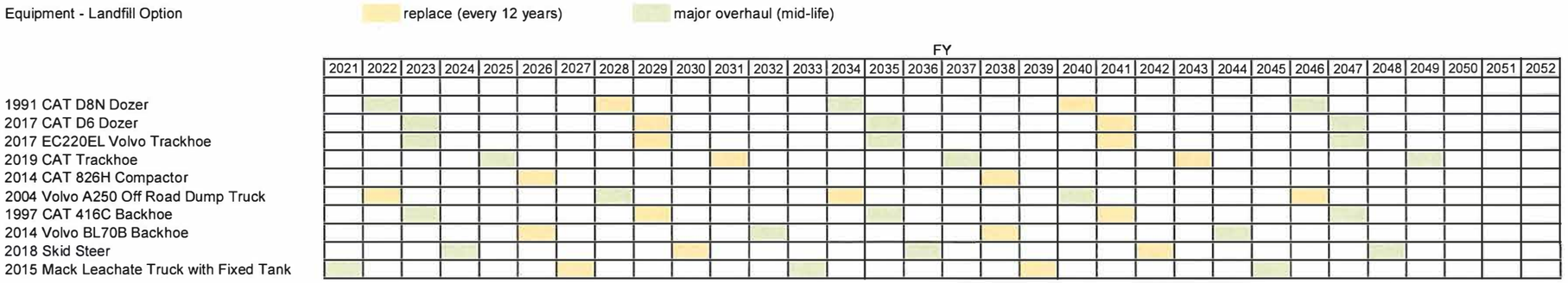
	FY	0 2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035
Solid Waste Program Expenditures																	
Operations (Landfill)																	
Personnel			$236,853	$241,590	$246,422	$251,350	$256,377	$261,504	$266,735								
Operating			$572,795	$584,251	$595,936	$607,855	$620,012	$632,412	$645,060								
Operations Transfer Station)																	
Personnel										$272,069	$277,511	$283,061	$288,722	$294,497	$300,386	$306,394	$312,522
Operating										$657,961	$671,121	$684,543	$698,234	$712,199	$726,443	$740,971	$755,791
Collections																	
Personnel			$386,700	$394,434	$402,323	$410,370	$418,577	$426,948	$435,487	$444,197	$453,081	$462,143	$471,386	$480,813	$490,430	$500,238	$510,243
Operating			$100,725	$102,740	$104,794	$106,890	$109,028	$111,209	$113,433	$115,701	$118,015	$120,376	$122,783	$125,239	$127,744	$130,299	$132,904
Subtotal		**$0**	**$1,297,073**	**$1,323,014**	**$1,349,475**	**$1,376,464**	**$1,403,994**	**$1,432,073**	**$1,460,715**	**$1,489,929**	**$1,519,728**	**$1,550,122**	**$1,581,125**	**$1,612,747**	**$1,645,002**	**$1,677,902**	**$1,711,460**
Post-Closure Care																	
Calvert																	
Woodruff										$80,815	$82,432	$84,080	$85,762	$87,477	$89,227	$91,011	$92,831
Professional Services Expenditures																	
Calvert Closed Landfill Environmental Monitoring			$25,000	$26,250	$26,250	$26,250	$27,500	$27,500	$27,500	$29,000	$29,000	$29,000	$30,500	$30,500	$30,500	$32,000	$32,000
Woodruff Landfill Environmental Monitoring			$30,000	$31,500	$31,500	$31,500	$33,000	$33,000	$33,000	$0	$0	$0	$0	$0	$0	$0	$0
General Consulting			$48,000	$50,500	$50,500	$50,500	$53,000	$53,000	$53,000	$55,500	$55,500	$55,500	$58,500	$58,500	$58,500	$61,500	$61,500
Transfer Station Design & Permitting (local & DEQ)							$100,000	$25,000									
Bid Phase and Construction Phase Services								$70,000	$60,000								
Subtotal			**$103,000**	**$108,250**	**$108,250**	**$108,250**	**$213,500**	**$208,500**	**$173,500**	**$84,500**	**$84,500**	**$84,500**	**$89,000**	**$89,000**	**$89,000**	**$93,500**	**$93,500**
Captial Expenditures																	
Operations			$1,660	$1,694	$1,727	$1,762	$1,797	$1,833	$1,870	$1,907	$1,945	$1,984	$2,024	$2,064	$2,106	$2,148	$2,191
Collections			$63,879	$65,156	$66,459	$67,789	$69,144	$70,527	$71,938	$73,377	$74,844	$76,341	$77,868	$79,425	$81,014	$82,634	$84,287
Cell Construction	$0																
Closure Construction	$275,000									$6,121,920							
Land Purchase	$900,000						$993,673										
Transfer Station Construction	$2,400,000								$2,756,846								
Transfer Station Floor Repair/Replacment	$200,000																
Equipment																	
1991 CAT D8N Dozer	$900,000			$140,454													
2017 CAT D6 Dozer	$500,000				$79,591												
2017 EC220EL Volvo Trackhoe	$400,000				$63,672												
2019 CAT Trackhoe +	$400,000						$66,245										
2014 CAT 826H Compactor	$800,000							$135,139									
2004 Volvo A250 Off Road Dump Truck	$500,000			$530,604													
1997 CAT 416C Backhoe	$120,000				$19,102												
2014 Volvo BL70B Backhoe	$120,000							$20,271						$22,828			
2018 Skid Steer	$60,000					$9,742						$73,140					
Broom attachment	$15,000									$17,575						$2,969	
2015 Mack Leachate Truck with Fixed Tank	$200,000		$30,600						$229,737						$38,808		
950 FE Loader (Rubber Tire)	300000									$351,498						$59,377	
Subtotal			**$96,139**	**$737,908**	**$230,552**	**$79,292**	**$1,130,859**	**$227,771**	**$3,060,390**	**$6,566,277**	**$76,789**	**$151,465**	**$79,892**	**$104,318**	**$121,927**	**$147,127**	**$86,477**
Off-Site Disposal																	
Transportation from TS to landfill										$742,910	$772,924	$804,150	$836,638	$870,438	$905,604	$942,190	$980,255
Total Off-Site Disposal Fee										$707,534	$736,118	$765,857	$796,798	$828,989	$862,480	$897,324	$933,576
Subtotal			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,450,444**	**$1,509,042**	**$1,570,007**	**$1,633,436**	**$1,699,427**	**$1,768,083**	**$1,839,514**	**$1,913,830**
Total Expenditures		**$0**	**$1,496,212**	**$2,169,172**	**$1,688,276**	**$1,584,007**	**$2,748,353**	**$1,868,344**	**$4,694,605**	**$9,671,965**	**$3,272,491**	**$3,440,175**	**$3,469,214**	**$3,592,969**	**$3,713,240**	**$3,849,054**	**$3,698,099**
Cost per Ton			$57	$81	$62	$56	$97	$64	$159	$320	$106	$110	$108	$110	$111	$113	$112
Waste Generation																	
Total Waste Weighed at Scales			26,285	26,811	27,347	27,894	28,452	29,021	29,602	30,194	30,798	31,413	32,042	32,683	33,336	34,003	34,683
Cumulative Waste Landfilled			26,285	53,097	80,444	108,338	136,790	165,811	195,413	225,607	256,404	287,818	319,860	352,542	385,878	419,881	454,564
Revenue																	
Tip Fee (annual)			$1,577,124	$1,608,666	$1,640,840	$1,673,657	$1,707,130	$1,741,272	$1,776,098	$1,611,620	$1,847,852	$1,884,809	$1,922,505	$1,960,955	$2,000,175	$2,040,178	$2,080,982
Tip Fee (cummulative)			$1,577,124	$3,185,790	$4,826,630	$6,500,287	$8,207,417	$9,948,689	$11,724,787	$13,536,406	$15,384,259	$17,269,068	$19,191,573	$21,152,529	$23,152,703	$25,192,881	$27,273,863

This spreadsheet model was prepared by LaBella Associates for the County of Transylvania in accordance with the standard of care ordinarily used by members of our engineering profession. No other warranties, express or implied, are made in connection with these projections

16 2038	17 2037	18 2038	19 2039	20 2040	21 2041	22 2042	23 2043	24 2044	25 2045	26 2046	27 2047	28 2048	29 2049	30 2050	31 2051	32 2052	TOTALS
																	$1,760,830
																	$4,258,320
$318,773	$325,148	$331,651	$338,284	$345,050	$351,951	$358,990	$366,169	$373,493	$380,963	$388,582	$396,354	$404,281	$412,366	$420,614	$429,026	$437,606	$8,714,460
$770,907	$786,325	$802,051	$818,092	$834,454	$851,143	$868,166	$885,529	$903,240	$921,305	$939,731	$958,526	$977,696	$997,250	$1,017,195	$1,037,539	$1,058,290	$21,074,701
$520,448	$530,857	$541,474	$552,303	$563,349	$574,616	$586,109	$597,831	$609,788	$621,983	$634,423	$647,111	$660,054	$673,255	$686,720	$700,454	$714,463	$17,102,608
$135,563	$138,274	$141,039	$143,860	$146,737	$149,672	$152,665	$155,719	$158,833	$162,010	$165,250	$168,555	$171,926	$175,365	$178,872	$182,449	$186,098	$4,454,768
$1,745,690	**$1,780,603**	**$1,816,215**	**$1,852,540**	**$1,889,590**	**$1,927,382**	**$1,965,930**	**$2,005,249**	**$2,045,354**	**$2,088,261**	**$2,127,986**	**$2,170,545**	**$2,213,956**	**$2,258,236**	**$2,303,400**	**$2,349,468**	**$2,396,458**	**$57,365,687**
$94,688	$96,582	$98,513	$100,484	$102,493	$104,543	$106,634	$108,767	$110,942	$113,161	$115,424	$117,733	$120,087	$122,489	$124,939	$127,438	$819,969	**$3,278,521**
$32,000	$33,500	$33,500	$33,500	$35,250	$35,250	$35,250	$37,000	$37,000	$37,000	$38,750	$38,750	$38,750	$40,750	$40,750	$40,750	$42,750	$1,059,250
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$223,500
$61,500	$64,500	$64,500	$64,500	$67,500	$67,500	$67,500	$71,000	$71,000	$71,000	$74,500	$74,500	$74,500	$78,000	$78,000	$78,000	$82,000	$2,033,500
																	$125,000
																	$130,000
$93,500	**$98,000**	**$98,000**	**$98,000**	**$102,750**	**$102,750**	**$102,750**	**$108,000**	**$108,000**	**$108,000**	**$113,250**	**$113,250**	**$113,250**	**$118,750**	**$118,750**	**$118,750**	**$124,750**	**$3,571,250**
$2,235	$2,279	$2,325	$2,371	$2,419	$2,467	$2,517	$2,567	$2,618	$2,671	$2,724	$2,778	$2,834	$2,891	$2,948	$3,007	$3,068	$73,432
$85,972	$87,692	$89,446	$91,234	$93,059	$94,920	$96,819	$98,755	$100,730	$102,745	$104,800	$106,896	$109,034	$111,214	$113,439	$115,707	$118,022	$2,825,164
																	$0
																	$6,121,920
																	$993,673
																	$2,756,846
	$280,048										$341,377						$621,426
																	$140,454
																	$79,591
																	$63,672
																	$66,245
																	$135,139
																	$530,604
																	$19,102
		$171,390															$214,489
$12,355						$92,759						$15,669					$203,665
				$22,289						$3,765							$46,598
			$291,362						$49,218								$639,726
				$445,784						$75,304							$931,962
$100,562	**$370,019**	**$263,160**	**$384,968**	**$563,551**	**$97,388**	**$192,094**	**$101,322**	**$103,348**	**$154,634**	**$186,593**	**$451,051**	**$127,537**	**$114,105**	**$116,387**	**$118,715**	**$121,089**	**$16,463,706**
$1,019,857	$1,061,059	$1,103,926	$1,148,524	$1,194,925	$1,243,200	$1,293,425	$1,345,679	$1,400,045	$1,456,607	$1,515,454	$1,576,678	$1,640,376	$1,706,647	$1,775,595	$1,847,329	$1,921,962	$31,106,396
$971,292	$1,010,532	$1,051,358	$1,093,833	$1,138,024	$1,164,000	$1,231,833	$1,281,599	$1,333,376	$1,387,244	$1,443,289	$1,501,598	$1,562,263	$1,625,378	$1,691,043	$1,759,361	$1,830,440	$29,625,139
$1,991,149	**$2,071,591**	**$2,155,284**	**$2,242,357**	**$2,332,948**	**$2,427,200**	**$2,525,258**	**$2,627,279**	**$2,733,421**	**$2,843,851**	**$2,958,743**	**$3,078,276**	**$3,202,638**	**$3,332,025**	**$3,466,639**	**$3,606,691**	**$3,752,401**	**$60,731,535**
$4,025,589	**$4,416,796**	**$4,431,173**	**$4,678,349**	**$4,991,334**	**$4,859,263**	**$4,892,888**	**$4,950,618**	**$5,101,065**	**$5,305,908**	**$5,501,995**	**$5,930,856**	**$5,777,469**	**$5,945,804**	**$6,130,115**	**$8,321,062**	**$7,214,687**	**$141,410,700**
$114	$122	$120	$125	$130	$119	$123	$122	$123	$125	$128	$135	$129	$130	$131	$133	$149	
35,377	36,084	36,806	37,542	38,293	39,059	39,840	40,637	41,449	42,278	43,124	43,986	44,866	45,764	46,679	47,612	48,565	**1,162,525**
489,941	526,025	562,831	600,373	638,666	677,725	717,565	758,201	799,651	841,929	885,053	929,040	973,906	1,019,669	1,066,348	1,113,961	1,162,525	
$2,122,601	$2,165,053	$2,208,354	$2,252,521	$2,297,572	$2,343,523	$2,390,394	$2,438,202	$2,486,966	$2,536,705	$2,587,439	$2,639,188	$2,691,972	$2,745,811	$2,800,727	$2,856,742	$2,913,877	**$69,751,510**
$29,396,464	$31,561,517	$33,769,872	$36,022,393	$38,319,965	$40,663,488	$43,053,882	$45,492,084	$47,979,049	$50,515,754	$53,103,194	$55,742,381	$58,434,353	$61,180,164	$63,980,891	$66,837,633	$69,751,510	

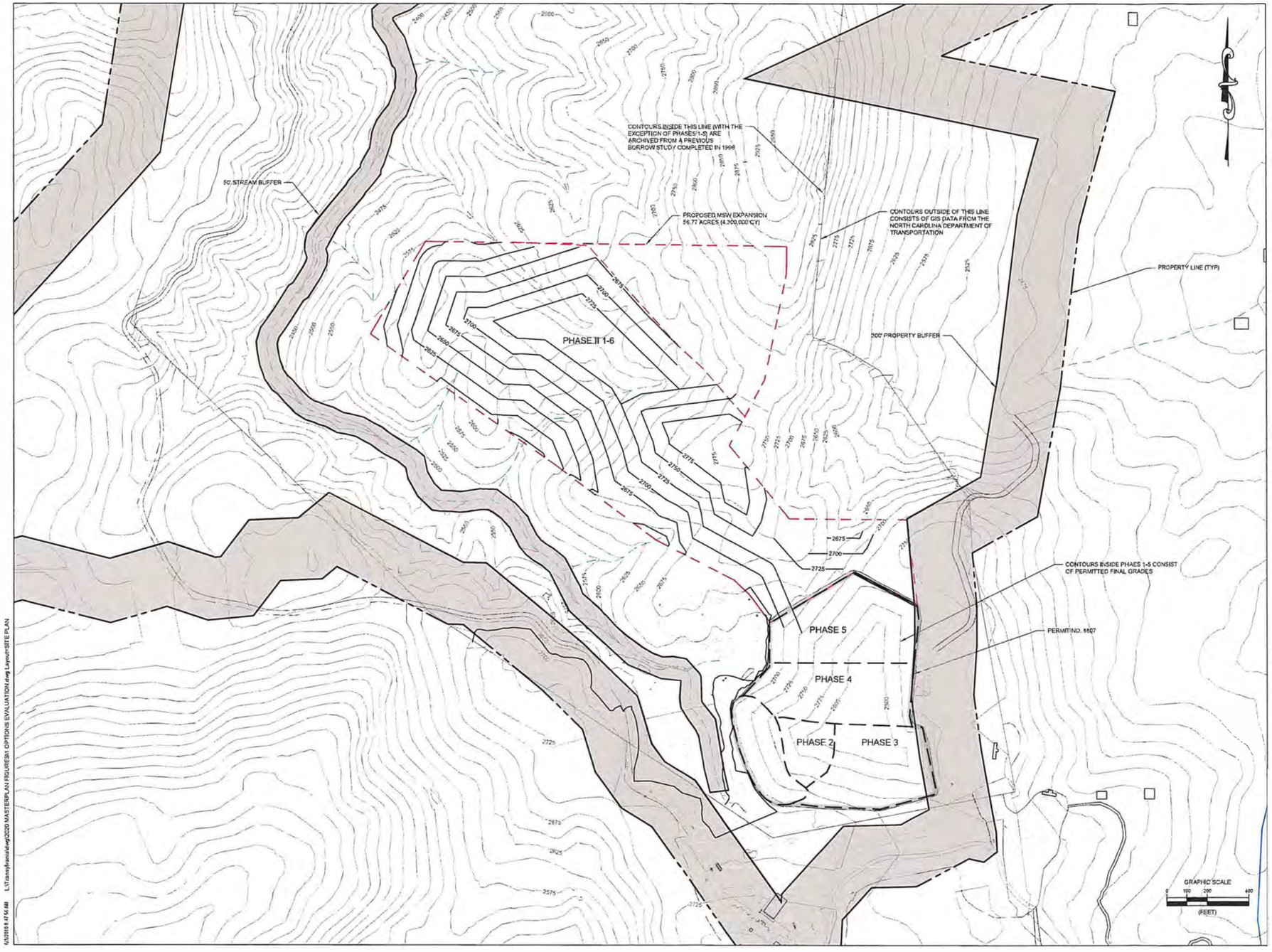
Attachment 3

Equipment - Landfill Option



Equipment - Transfer Station Option

Attachment 4



6/3/2020 8:47:56 AM L:\Transylvania\dwg\2020 MASTER PLAN FIGURES\H OPTIONS EVALUATION.dwg Layout:SITE PLAN

LaBella
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1604 Ownby Lane
Richmond, VA 23220
804-355-4520
labellapc.com

WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER: ----------
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 06/04/2020
DRAWING NAME:

OPTIONS EVALUATION: LANDFILL EXPANSION OPTION

DRAWING NUMBER:

1

June 11, 2020

Jennifer P. Johnson
LaBella Associates, P.C.
1604 Ownby Lane
Richmond, VA 23220

SUBJECT: **Preliminary Wetlands Determination**
Woodruff Landfill Expansion
Rosman, Transylvania County, North Carolina
STV Project No. 4020639

Dear Ms. Johnson:

On behalf of LaBella Associates, P.C. (LaBella) and in accordance with our Subcontract for Professional Services LaBella No. 371AR dated April 13th, 2020, STV Engineers, Inc. (STV) conducted a field review and preliminary wetlands determination of the approximate 106-acre Woodruff Landfill Expansion site located in Rosman, Transylvania County, North Carolina north of Howell Road.

Background & Methodology

The Woodruff Landfill Expansion site is located is Rosman, Transylvania County, North Carolina north of Howell Road. The project study area (PSA) consists of an approximately 106-acre tract of land located within a 736-acre parcel (parcel no. 8542-84-8134) owned by Transylvania County; see **Figure 1 – USGS Topographic Map** for a map depicting the location of the PSA. The majority of the PSA is undeveloped forested land with abandoned logging roads and steep mountain ravines with surface waters/gullies. The southwestern portion of the PSA is occupied by the active landfill. Additionally, there is an access road along the eastern boundary of the PSA that leads to a cellular base station tower.

STV Environmental Scientists Joshua Kotheimer, PWS and Timothy O'Halloran, WPIT conducted a preliminary field review of the Woodruff Landfill Expansion site project study area (PSA) from May 19th through May 21st, 2020. The purpose of the preliminary field review was to assess the PSA for the presence of wetlands and other potentially jurisdictional waters of the U.S. (WoUS). Prior to the field visit, STV reviewed various resources, including U.S. Geological Survey (USGS) topographic quadrangle maps, United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping, Google Earth aerial photography, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Digital Soil Survey of Transylvania County, North Carolina (2019), USDA NRCS Historic Soil Survey of Transylvania County, North Carolina (1974), the National Hydrography Dataset (NHD), and USGS digital elevation models to help identify potential jurisdictional WoUS.

Jurisdictional WoUS are defined by 33 CFR 328.3(b) and protected by Section 404 of the Clean Water Act (33 U.S.C. 1344), which is administered and enforced in North Carolina by the U.S. Army Corps of Engineers

(USACE), Wilmington District. Potential wetland areas were defined using the USACE Routine On-Site Determination method as described in the 1987 "Corps of Engineers Wetlands Delineation Manual."[1] This technique uses a multi-parameter approach, which requires positive evidence of hydrophytic vegetation, wetland hydrology, and hydric soils. In addition, the USACE "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)"[2] was utilized for further procedural and technical guidance.

Water resources in the PSA are part of the French Broad River Basin, Upper French Broad subbasin (USGS Hydrologic Unit 06010105). The USGS topographic map depicts seven water resource or 'blue line' stream features within the Woodruff Landfill Expansion PSA (See Figure 1). No water features are shown within the PSA on the USFWS NWI or NHD. Additionally, the USDA Soil Survey does not depict hydric soils existing within the PSA. However, crenulations are visible on the USGS digital elevation models which match the streams depicted on the USGS topographic mapping.

Findings of Field Review

The field review of the PSA identified eleven potentially jurisdictional streams; five of the streams were determined to be perennial and six were determined to be intermittent with two of the perennial streams also having intermittent upper reaches. Stream features identified during the field review are listed in Table 1. Additionally, two potentially jurisdictional wetlands and a potentially jurisdictional problematic wetland were identified during the field survey (Table 2). An open water sediment basin is also located within the PSA but is likely to be non-jurisdictional.

The attached photo pages depict the potentially jurisdictional and non-jurisdictional features located within the PSA. Tables 1 and 2 include the features respective photograph number. Additionally, the approximate locations of these features are shown in **Figure 2 – Preliminary Wetlands Determination Map** and are also described in more detail below.

[1] *Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.*

[2] U.S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region*. Vicksburg MS: U.S. Army Engineer Research and Development Center.

Table 1: Potential jurisdictional streams in the PSA and respective photograph.

Map ID	Length (ft.)	Photograph Number
Stream A (Perennial)	220	1
Stream A (Intermittent)	328	N/A
Stream B (Intermittent)	229	2
Stream C (Perennial)	1,025	3
Stream D (Intermittent)	47	4
Stream E (Intermittent)	75	5
Stream F (Perennial)	70	6
Stream G (Perennial)	988	7
Stream H (Perennial)	825	8
Stream H (Intermittent)	245	N/A
Stream I (Intermittent)	134	12
Stream J (Intermittent)	126	13
Stream K (Intermittent)	63	15
Total	**4,375**	

Table 2: Potential jurisdictional wetlands in the PSA and respective photograph.

Map ID	Area (ac.)	Photograph Number
Wetland A	0.040	9
Wetland B	0.001	N/A
Wetland C (Problematic)	0.210	14
Total	**0.251**	

Each stream located within the PSA was assessed using the North Carolina Division of Water Quality "Methodology for Identification of Intermittent and Perennial Streams and Their Origins."[3] Geomorphological indicators including but not limited to continuity of channel bed and bank, sinuosity of channel along thalweg, in channel structures (riffle-pool, step-pool,ripple-pool sequence), particle size of stream substrate, depositional features/deposits, and headcuts/grade control were used in determining the strength of the geomorphology for each channel. Hydrology indicators including presence of baseflow, iron oxidizing bacteria, leaf litter, sediment observed on plants/debris, organic drift lines, and soil based evidence of a high water table were used in assessing the hydrologic strength of each channel. Biological indicators including fibrous roots in streambed, rooted upland plants in streambed, benthic macroinvertebrates, aquatic mollusks, fish, crayfish, amphibians, algae, and wetland plants in streambed were used to assess the strength of each channel.

[3] NC Division of Water Quality. (2010). *Methodology for Identificotion of Intermittent and Perennial Streams and their Origins, Version 4.11.* Raleigh, NC: North Carolina Department of Environment and Natural Resources, Division of Water Quality.

Streams A, C, F, G, and H within the PSA were all identified as potentially perennial streams based on geomorphic, hydrologic, and biologic indicators. Strong geomorphic features observed include defined bed and bank, particle size of stream substrate, and in channel structures. Strong hydrologic indicators include presence of baseflow, little to no leaf litter, and organic debris lines. Strong biologic indicators observed were an absence of fibrous roots in streambed, no rooted upland plants in streambed, presence of benthic macroinvertebrates such as caddisflies, mayflies, amphipods, and annelids (worms), and salamanders ranging from juveniles to adults.

Streams B, D, E, I, J, and K along with the upper reaches of Streams A and H were all identified as potentially intermittent streams based on geomorphic, hydrologic, and biologic indicators. These channels exhibited weak to moderate continuity of bed and bank, a similarity in substrate between the streambed and streambank, and weak depositional features. Hydrologic indicators associated with these intermittent features include moderate baseflow and soil based evidence of a high water table. It should be noted that it had rained 48 hours prior to the field review and on all three days of the field review. Strong biologic indicators were observed in the intermittent channels including a variety of macrobenthos such as caddisfly and annelids. Salamanders were also observed in several of the intermittent streams.

Two potentially jurisdictional wetlands (Wetlands A and B) were identified during the field review; the approximate locations are depicted on **Figure 1**. Wetlands A and B were determined to be headwater forest wetlands using wetland classifications from the NC Wetland Assessment Method (NCWAM). Wetland A is located along Stream H, and Wetland B is located upstream from Stream I at the edge of an ephemeral draw.

Wetland C is a problematic wetland which appears to have been created as a result of the excavation of soils to be used for landfill capping. This wetland is located within the active portion of the landfill and collects and holds stormwater runoff. This is a problematic area due to the significant amount of disturbance and alteration. Google Earth historical aerial imagery shows that excavation in this area started between October 2006 and October 2008. Since its creation in this excavated area Wetland C has varied in size. Wetland C gets its hydrology from stormwater runoff from the landfill access roads and the access road to the cellular tower base station. Hydrophytic vegetation was observed around the edge of the wetland, the dominant species included shallow sedge (*Carex lurida*) an obligate species, and common rush (*Juncus effusus*) a facultative wetland species. Hydric soils were not clearly observed due to a thick layer of sediment at the surface. Due to the excavation of this area, beneath the sediment layer is a restrictive layer of bedrock.

The open water sediment basin is located at the base of Stream I. This feature appears to be a permitted sediment basin due to signage at the edge of the basin. Additionally, a floating skimmer was identified within the sediment and an outfall pipe was identified draining the feature off-site.

Regulatory Process & Recommendations

If future project activities would occur in proximity to any of the potentially jurisdictional wetlands or WoUS identified within the PSA, then a delineation of the potentially jurisdictional features and jurisdictional determination process with the USACE is recommended.

If direct impacts to jurisdictional features are anticipated from any proposed development plan, a Nationwide Permit (NWP) could cover minor activites/discharges. Current NWP's generally limit impacts to no greater than 0.5 acre of freshwater wetlands and less than 300 linear feet (lf) of streambed determined to provide important aquatic function. Pursuant to Sections 404 and 401, regulated discharges would include, but are not necessarily limited to, the placement of fill material, riprap, pipes, culverts, etc., into jurisdictional wetlands or WoUS. If NWP thresholds cannot be met then an Individual Permit (IP) from the USACE would be necessary. In the event that an IP is required then an alternatives analysis may be needed to demonstrate to the USACE that the proposed alternative was the least environmentally damaging practicable alternative (LEDPA). The USACE holds the final discretion as to what permit will be required to authorize project construction. If a Section 404 permit is required then a corresponding Section 401 Water Quality Certification (WQC) from the NCDWR will be needed. The 404 permitting process will also necessitate that impacts to WoUS be avoided and minimized to the maximum extent practicable; unavoidable impacts would likely require compensatory mitigation. Should compensatory mitigation be required, it is anticipated that the N.C. Division of Mitigation Services (DMS) in-lieu fee program will be utilized.

Closing

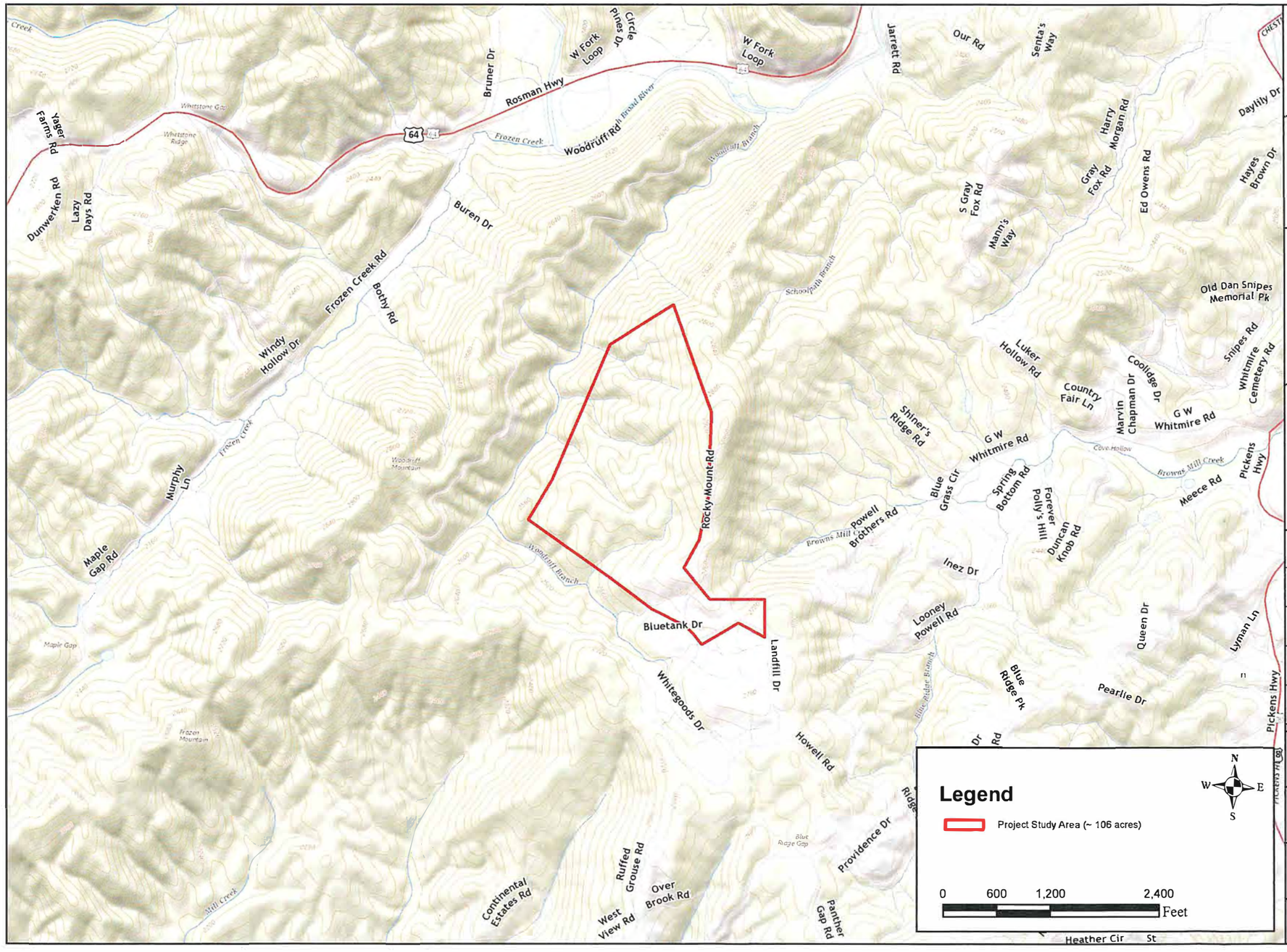
We appreciate the opportunity to perform these preliminary wetland determination services on the Woodruff Landfill Expansion project. Please contact the undersigned at (704) 372-1885, Joshua.Kotheimer@stvinc.com, or Michael.Iagnocco@stvinc.com should you have any questions or concerns.

Sincerely,

STV Engineers, Inc.

Joshua Kotheimer, P.W.S.
Environmental Science Manager

Michael A. Iagnocco, P.W.S.
Senior Scientist/Senior Project Manager



STV 100 Years

Client: LaBella Powered by partnership.

Project:

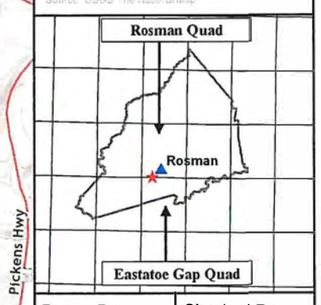
Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

USGS TOPOGRAPHIC MAP

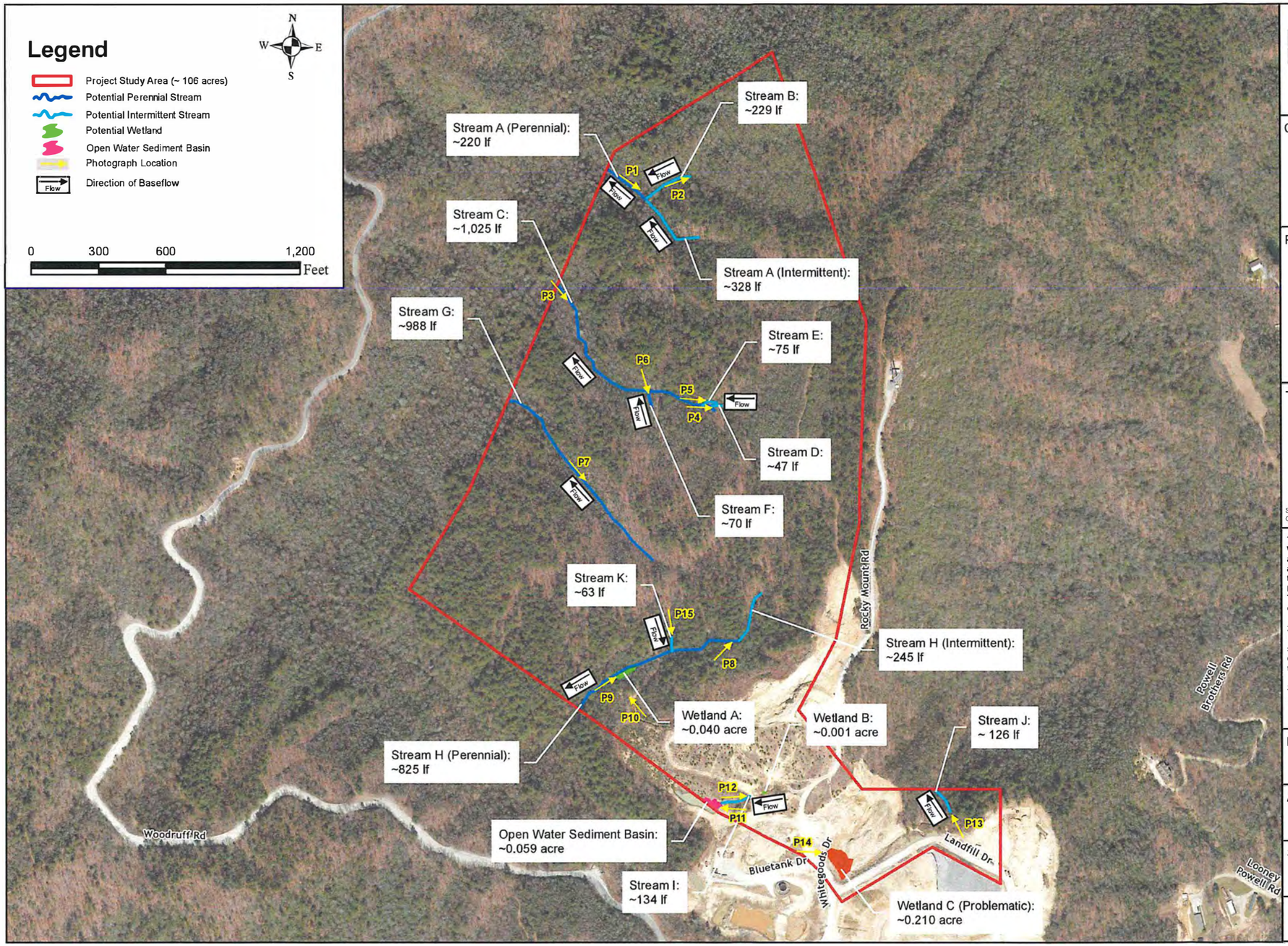
Source: USGS The National Map



Drawn By:	Checked By:
TPO	JLK
Approved By:	Date:
MAI	6/8/2020

STV Inc. Project No. **4020639**

FIGURE 1



STV 100 Years

Client:

LaBella
Powered by partnership.

Project:

Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

PRELIMINARY WETLANDS DETERMINATION MAP

Source: NCDOT GIS Unit, NCOneMap Center for Geographic Information & Analysis

1. The boundaries of potentially jurisdictional wetlands and waters of the U.S. (WoUS) were approximated by STV Engineers, Inc. during a field review conducted from May 19 through 21, 2020. Potential jurisdictional boundaries were approximated using a Trimble Geo7X hand-held GPS unit capable of subfoot accuracy.

2. The approximated jurisdictional boundaries of wetlands and WoUS are subject to change following a complete delineation and subsequent verification by the U.S. Army Corps of Engineers.

3. This map is intended for planning purposes only.

Drawn By:	Checked By:
TPO	**JLK**
Approved By:	Date:
MAI	**6/11/2020**

STV Inc. Project No.
4020639

FIGURE 2

Photo 1 – View of the perennial portion of Stream A; facing upstream to the east.

Photo 2 – View of the top of Stream B (Intermittent); facing upstream to the east.

Photo 3 – View of Stream C (Perennial) at the western property boundary; facing upstream to the southeast.

Photo 4 – View of Stream D, an intermittent stream that flows into Stream C. Facing upstream to the east.

Photo 5 – View of Stream E, an intermittent stream that flows into Stream C. Facing upstream to the east.

Photo 6 – View of the upper end of Stream F (Perennial), facing upstream to the southeast.

Photo 7 – View of Stream G (Perennial); facing upstream to the southeast.

Photo 8 – View of Stream H (Perennial); facing upstream to the northeast.

Photo 9 – View of Stream H (Perennial) and Wetland A. Sediment has been transported downstream from a cleared area of the landfill where sediment and erosion control measures are failing.

Photo 10 – View of an example of a failed sediment and erosion control which is contributing to sedimentation in Stream H (Perennial).

Photo 11 – View of the open water sediment basin that Stream I (Intermittent) drains into; facing west.

Photo 12 – View of the upper portion of Stream I (Intermittent) at a dirt roadway; facing upstream to the northeast.

Photo 13 – View of upper portion of Stream J (Intermittent); facing downstream to the northwest.

Photo 14 – View of Wetland C and the open water sediment basin that is fed by runoff from the landfill and access road to the cellular base station tower; facing east.

Photo 15 – View of Stream K (Intermittent); facing downstream to the south towards Stream H.

Biological Assessment for Federally Threatened and Endangered Species
Woodruff Landfill Expansion
Transylvania County, North Carolina
STV Project No. 4020639
June 2020

LaBella Associates, PC (LaBella) has requested a biological assessment from STV Engineers, Inc. (STV) relating to the Woodruff Landfill Expansion in Transylvania County, North Carolina. The purpose of this Biological Assessment was an effort to identify federally threatened and endangered plant species and potential habitat for federally threatened and endangered animal species, within the project study area (PSA).

Literature and Field Review Methodology

Prior to conducting fieldwork, the following reference material was reviewed:

- North Carolina Natural Heritage Program (NCNHP) for Transylvania County (Date last accessed June 1, 2020)
- NC OneMap Aerial Imagery (2019)
- USGS 7.5 Minute Topographic Quadrangle Maps: Eastatoe Gap, NC (2019)
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Series Data for Transylvania County, NC (Data last updated July 31, 2019)
- USDA NRCS National Hydric Soils List (2019)
- USDA Soil Conservation Service Soil Survey of Transylvania County, North Carolina (1974)
- U.S. Fish and Wildlife Service (USFWS) North Carolina List of At-Risk, Candidate, Endangered, and Threatened Species for Transylvania County (Last updated April 6, 2020).
- USFWS National Wetlands Inventory (NWI) Wetlands Online Mapper (Data last updated October 8, 2019)

Field reviews of the PSA were conducted by STV Environmental Scientists Joshua Kotheimer, PWS and Timothy O'Halloran, WPIT from May 19th through May 21st, 2020 to document the presence of natural resources, habitat communities, and federally protected species. The Woodruff Landfill Expansion site is an approximately 106-acre tract of land located within a 736-acre parcel (parcel no. 8542-84-8134) owned by Transylvania County; see **Appendix A, Figure 1 – Site Location Map** for a map depicting the location of the PSA. The majority of the PSA is undeveloped forested land with abandoned logging roads; the terrain is steep, and intermittent and perennial surface waters were identified during the field survey. The southwestern portion of the PSA is occupied by the active landfill. Additionally, there is an access road along the eastern boundary of the PSA that leads to a cellular base station tower.

The Woodruff Landfill Expansion site was assessed for federally threatened and endangered species and potential habitat using a transect method. The transects were determined using topography to assess each ridge and the slopes leading to the streams/gullies located between the ridges. Vegetative communities in each transect were determined based on species and were determined to be in the Mountain Cove Forest or Mountain Oak Forest categories; specifically, Rich Cove Forest (Montane Intermediate Subtype), Acidic Cove Forest (Typic Subtype), and Chestnut Oak Forest (Mesic Subtype) (NCNHP 2012). For a map depicting the natural communities located within the PSA, see **Appendix A, Figure 2 – Natural Communities Map**. Additionally, photographs depicting the natural communities found within the PSA are shown in **Appendix B**.

Federally Protected Threatened and Endangered Species

Pursuant to Section 7 of the Endangered Species Act (ESA), as amended (16 USC 1531-1534), consultation with the USFWS is required for proposed projects with a federal nexus, i.e., involves a federal action and/or funding, that "may affect" federally endangered and threatened species as designated by the USFWS. This Biological Assessment (BA) provides a summary of the literature and field reviews conducted for the project including descriptions of the federally endangered and threatened species listed for Transylvania County and discussion of potential project impacts to these species.

The USFWS online protected species database, updated April 6, 2020, lists twelve federally protected species as occurring, having the potential to occur, or historically occurring in Transylvania County including the bald eagle (*Haliaeetus leucocephalus*) which is protected under the Bald and Golden Eagle Protection Act (BGEPA). Per NCNHP protected species occurrence records obtained on June 1, 2020, there are no documented occurrences of federally threatened or endangered species within or within one mile of the PSA. A brief description of each species, including habitat requirements and physical characteristics, and biological conclusion rendered based on surveys of the PSA follow. Habitat requirements for each species are based on current USFWS guidance and available literature.

Table 1. Transylvania County Federally Protected (Endangered and Threatened) Species

Protected Species		Protection Status
Common Name	**Scientific Name**	**Federal**
Animal		
Appalachian elktoe	*Alasmidonta raveneliana*	E
Rusty-patched bumble bee	*Bombus affinis*	E
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E
Bog turtle	*Glyptemys muhlenbergii*	T (S/A)
Bald eagle	*Haliaeetus leucocephalus*	BGEPA
Gray bat	*Myotis grisescens*	E
Northern long-eared bat	*Myotis septentrionalis*	T
Plant		
Rock gnome lichen	*Gymnoderma lineare*	E
Swamp pink	*Helonias bullata*	T
Small whorled pogonia	*Isotria medeoloides*	T
Mountain sweet pitcherplant	*Sarracenia rubra ssp. jonesii*	E
Virginia spiraea	*Spiraea virginiana*	T

T = Threatened
T (S/A) = Threatened due to Similar Appearance
E = Endangered
BGEPA = Bald and Golden Eagle Protection Act

The federally protected species listed for Transylvania County and their physical descriptions and respective habitats are briefly described below:

Appalachian elktoe (*Alasmidonta raveneliana)*
USFWS Recommended Survey Window: March 1 – November 1

The Appalachian elktoe has a thin, kidney-shaped shell, extending to about 10 centimeters (4 inches). Juveniles generally have a yellowish-brown periostracum (outer shell surface), while the periostracum of the adults is usually dark brown to greenish-black in color. Although rays are prominent on some shells, particularly in the posterior portion of the shell, many individuals have only obscure greenish rays. The shell nacre (inside shell surface) is shiny, often white to bluish-white, changing to a salmon, pinkish, or brownish color in the central and beak cavity portions of the shell; some specimens may be marked with irregular brownish blotches.

Critical Habitat Description: Critical habitat for the Appalachian elktoe has been designated in 144.2 total river miles in six distinct units:

1. Encompasses approximately 24 miles of the main stem on the Little Tennessee River from the Lake Emory Dam in Franklin, Macon County, NC, downstream to the backwaters of Fontana Reservoir in Swain County, NC.
2. Encompasses approximately 26 miles of the main stem of the Tuckasegee River from NC State Route 1002 bridge in Cullowhee, Jackson County, NC, downstream to the NC 19 bridge north of Bryson City, Swain County, NC.
3. Encompasses approximately 9.1 miles of the main stem of the Cheoah River from the Santeelah Dam downstream to its confluence with the Little Tennessee River, in Graham County, NC.
4. Encompasses approximately 4.7 miles of the main stem of the Little River (French Broad River Basin) from the Cascade Lake Power Plant, downstream to its confluence with the French Broad River in Transylvania County, NC.
5. Encompasses approximately 11.1 miles of the main stem of the West Fork Pigeon River (French Broad River Basin) from the confluence with the Little East Fork Pigeon River downstream to the confluence with the East Fork Pigeon River, and the main stem of the Pigeon River from the confluence of the East Fork Pigeon River and West Fork Pigeon River downstream to the NC 215 crossing, south of Canton, Haywood County, NC.
6. Encompasses approximately 3.7 miles of the main stem of the North Toe River, Yancey and Mitchell counties, NC, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; approximately 14.1 miles of the main stem of the South Toe River, Yancey County, NC, from the NC State Route 1152 crossing, downstream to its confluence with the North Toe River; approximately 21.6 miles of the main stem of the Toe River, Yancey and Mitchell counties, NC, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; approximately 16.5 miles of the main stem of the Cane River, Yancey County, NC, from the NC State Route 1381 crossing, downstream to its confluence with the Toe River; and approximately 13.5 miles of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey County and Mitchell County, NC downstream to the US 23/19W crossing, southwest of Erwin, Unicoi County, TN (USFWS 1996).

Potential habitat for Appalachian elktoe does not exist within the PSA. Although perennial streams exist within the PSA, the size of the streams are too small to provide adequate habitat for the species. Review of the North Carolina Natural Heritage Program (NCNHP) records obtained on June 1, 2020 revealed no known occurrences of Appalachian elktoe within the PSA or within one mile of the PSA. Based on the literature review and site location outside of the designated critical habitat, it is determined that the project will have no effect on the Appalachian elktoe.
Biological Conclusion: No Effect

Rusty-patched bumble bee (*Bombus affinis)*
USFWS Recommended Survey Window: Early June – mid-August

Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Habitat Description: Rusty-patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil) (USFWS 2017).

Potential habitat does not exist within the PSA. The North Carolina Natural Heritage Program (NCNHP) website was reviewed (June 1, 2020) to determine the locations of the nearest populations of rusty-patched bumble bee. The NCNHP determined that no populations of rusty-patched bumble bee were present within one mile of the PSA, and no effect to rusty-patched bumble bee is anticipated. Additionally, the USFWS website states that Section 7 Consultation and Take Permits are not needed in areas that are mapped as historic range only which can be determined through mapping located on their website.

Field surveys were conducted by STV scientists for the presence of rusty-patched bumble bee habitat on May 19th through May 21st, 2020. Grasslands and tall grass prairies were not identified within the PSA; the PSA is dominated by mountain cove forest, mountain oak forest, and ravines. Review of the NCNHP element occurrence records revealed no documented occurrences or populations of rusty-patched bumble bee within or within one mile of the PSA. Based on the literature review and field surveys conducted, it is determined that the project would have no effect on rusty-patched bumble bee.
Biological Conclusion: No Effect

Carolina northern flying squirrel (*Glaucomys sabrinus coloratus)*
USFWS Recommended Survey Window: May – October

Northern flying squirrels are about one-third larger than the very common southern species. Also, northern flying squirrels have brown colored fur on their backs, and bicolored fur on their bellies that is gray at the base and creamy white at the tip. Southern flying squirrels have brown or gray fur on their backs with bright white fur on their bellies, and a clearly defined (usually black) line separates the fur colors. The endangered Carolina northern flying squirrel is a subspecies of the northern flying squirrel.

Habitat Description: Carolina northern flying squirrels are typically found in areas where hardwoods, such as yellow birch, are adjacent to the higher-elevation red spruce-Fraser fir forest. These habitats are often moist and cool. Such habitat varies in age but typically includes some widely spaced, mature trees and an abundance of standing and down snags (ideally old-growth forest). Such habitats seem well suited to the species' gliding form of locomotion, use of cavities for nesting, and reliance of wood-borne fungi and lichens for food (USFWS 2011a).

Potential habitat does not exist within the PSA. Based on information from the Appalachian Northern Flying Squirrel Recovery Plan, in North Carolina all captures have occurred above 1,540 meters (5,052 feet). Elevation within the PSA ranges from approximately 2,480 feet to 2,920 feet. The NCNHP database was reviewed (June 1, 2020) to determine the locations of the nearest populations of Carolina northern flying squirrel. The NCNHP determined that no populations of Carolina northern flying squirrel were present within or within one mile of the PSA. Based on habitat limitations, literature review, and field surveys conducted, it is determined that the project would have no effect on Carolina northern flying squirrel.
Biological Conclusion: No Effect

Bog turtle (*Glyptemys muhlenbergii)*
USFWS Recommended Survey Window: April 1 – October 1

The bog turtle is the smallest turtle in North America measuring just three to four inches in length and weighing about four ounces. The bog turtle can most easily be identified by a mahogany-colored shell and bright yellow-orange blotches located on both sides of the head.

Habitat Description: Bog turtles usually occur in small, discrete populations, generally occupying open-canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands are a mosaic of micro-habitats that include dry pockets, saturated areas, and areas that are periodically flooded. Bog turtles depend upon this diversity of micro-habitats for foraging, nesting, basking, hibernating, and

sheltering. Unfragmented riparian systems that are sufficiently dynamic to allow the natural creation of open habitat are needed to compensate for ecological succession. Bog Turtles inhabit open, unpolluted emergent and scrub/shrub wetlands such as shallow spring-fed fens, sphagnum bogs, swamps, marshy meadows, and wet pastures. These habitats are characterized by soft muddy bottoms, interspersed wet and dry pockets, vegetation dominated by low grasses and sedges, and a low volume of standing or slow-moving water which often forms a network of shallow pools and rivulets (USFWS 2020).

Potential habitat for bog turtle does not exist within the PSA. The emergent wetland habitats that that bog turtles inhabit were not identified during the May 2020 field survey. The NCNHP website was reviewed (June 1, 2020) to determine the locations of the nearest populations of bog turtle. The NCNHP determined that no populations of bog turtle were present within or within one mile of the PSA. Based on lack of suitable habitat observed during field surveys and literature review, it is determined that the project would have no effect on the bog turtle.
Biological Conclusion: No Effect

Bald eagle (*Haliaeetus leucocephalus)*
USFWS Recommended Survey Window: Year-round; November – March (optimal to observe birds and nest); February – May (optimal to observe active nesting)

The bald eagle is protected under the Bald and Golden Eagle Protection Act and enforced by the USFWS. Adult bald eagles generally have a blackish-brown back and breast, a white head, neck, and tail, and a yellow bill. Juveniles are generally brown and white in color with a black bill.

Habitat Description: The bald eagle can be found throughout the continental U.S. In the southeastern portion of its range, bald eagles nest in mature live pines or cypress trees in the transition zone between mature forests and large bodies of open water. Nests are large, up to six feet in width, and constructed of sticks and soft materials such as dead vegetation, grasses, and pine needles. Nesting trees are usually less than two miles from open water. Winter roosts are usually in mature trees, similar to nesting trees, but may be somewhat farther from water (USFWS 1989).

A desktop-GIS assessment of the PSA, as well as the area within a one-mile radius of the project limits, was performed prior to the field surveys conducted in May 2020 using the latest ESRI ArcGIS color aerials. The PSA does not contain waterbodies large enough for foraging; however, West Fork French Broad River, North Fork French Broad River, and French Broad River area located within one mile of the PSA and are Class B, trout waters which are high quality foraging habitat for bald eagle. No eagle nests were observed within the PSA during the field survey. Review of the NCNHP database on June 1, 2020 revealed no known occurrences of this species within or within one mile of the PSA. Due to the lack of foraging habitat, literature review, and field surveys, it has been determined that this project will have no effect on bald eagle.
Biological Conclusion: No Effect

Gray bat (*Myotis grisescens)*
USFWS Recommended Survey Window: May 15 – August 15

Gray bats are distinguished from other bats by the unicolored fur on their back. In addition, following their molt in July or August, gray bats have dark gray fur which often bleaches to a chestnut brown or russet. These bats weigh 7-16 grams. The bat's wing membrane connects to its ankle instead of at the toe, where it is connected in other species of *Myotis.*

Habitat Description: Gray bats are known mainly from the cave regions of the Southeast and Midwest. These bats live in colonies in caves, utilizing different caves for summer roosting and winter hibernating. Summer caves are usually within one half mile of a river or reservoir, which provides foraging habitat. During the summer, females give birth and rear the young in maternity caves, while males and yearlings

roost in separate bachelor caves. Caves preferred for hibernation are typically deep, vertical caves with a temperature between 42 and 52 degrees Fahrenheit. Gray bats are highly selective in choosing suitable caves, and nine known caves (not located in North Carolina) are thought to provide hibernation space for 95 percent of the population. Migration from summer to winter caves begins in September and is mainly complete by the beginning of November. Unlike other bats, gray bats do not use houses or barns (USFWS 1997).

Potential habitat does not exist within the PSA. Field surveys conducted from May 19th through May 21st, 2020 did not reveal any caves within the PSA. A review of the USGS historic mining data for North Carolina did not show any historic mines within the PSA. Additionally, a review of the NCNHP database on June 1, 2020 revealed no known occurrences of this species within or within one mile of the PSA. Due to the lack of habitat observed during field surveys and literature review it has been determined that this project will have no effect on the gray bat.
Biological Conclusion: No Effect

Northern long-eared bat (*Myotis septentrionalis)*
USFWS Recommended Survey Window: May 15 – August 15

The northern long-eared bat (NLEB) is a medium-sized bat approximately three to 3.7 inches in body length with a wingspan of nine to 10 inches. As its name suggests, this bat species is distinguished from other species in the genus *Myotis* by its long ears. The range of the NLEB consists of the eastern and north central portions of the United States including 37 states. In North Carolina specifically, the NLEB primarily occurs in the western part of the state in the mountain region. Only scattered occurrences have been documented in the piedmont and coastal plain regions of the state. In western North Carolina, NLEBs spend winter hibernating in caves and mines. During the summer, NLEBs roost singly or in colonies within trees including underneath the bark, in cavities, or in crevices. Roosting trees can be both live and dead and are typically ≥ three inches diameter at breast height in size. Males and non-reproductive females may also roost in cooler places such as caves and mines. The NLEB has also been observed roosting in man-made structures including barns and sheds, under eaves of buildings, behind window shutters, in bridges, and bat houses. Foraging habitat includes forested hillsides and ridges, the airspace above waterways, and along woodland edges. Mature forests are generally considered to be an important habitat type for foraging.

The final 4(d) rule for the NLEB went into effect February 16, 2016. Within the range of the NLEB in North Carolina, any take of the species within a hibernaculum (breeding grounds) is prohibited including any action that may change the nature of the hibernaculum's environment or entrance ways. The 4(d) rule exempts incidental takes of the species for tree-cutting activities occurring greater than 0.25-mile from a known hibernaculum or more than 150 feet from a known maternity roost during the pup-rearing season (June 1 through July 31) (USFWS 2015).

Additionally, the U.S. Army Corps of Engineers (USACE), and the USFWS developed a Standard Local Operating Procedures for Endangered Species (SLOPES) agreement concerning potential effects to the federally-threatened NLEB (*Myotis septentrionalis*). The SLOPES was signed and became effective on January 30th, 2017. The SLOPES agreement details how the USACE will make determinations of effect to the NLEB when the USACE is the lead federal agency for a project, and is applicable to activities regulated pursuant to Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA) of 1899 in the western 41 counties of North Carolina.

Based on review of the USFWS Asheville Field Office's online database on June 1, 2020, NLEB hibernation or maternity sites have been documented within Transylvania County. Suitable summer roosting habitat may be present within the PSA for NLEB. The May 2020 field surveys concluded that no caves or mines (potential hibernacula) exist within the PSA; however, potential foraging and roosting habitat, including trees and the air space above streams is present. Dead trees and trees with shaggy bark were examined for evidence of bats such as guano and staining; no evidence was observed on the

trees examined. It should be noted that a bat survey was not conducted, only a visual observation of potential habitat. Review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of NLEB within the PSA or within one mile of the PSA. The final 4(d) rule (effective as of February 16, 2016), exempts incidental take of NLEB associated with activities that occur greater than 0.25 miles from a known hibernation site, and greater than 150 feet from a known, occupied maternity roost during the pup season (June 1 – July 31). The project (which may or may not require tree clearing) would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. Based on the findings of the literature and field reviews and per the final 4(d) rule, it has been determined that the project qualifies for the exemption for incidental take and 'May Affect – Not Likely to Adversely Affect' the NLEB.
Biological Conclusion: May Affect – NLEB is exempt due to consistency with 4(d) rule

Rock gnome lichen (*Gymnoderma lineare)*
USFWS Recommended Survey Window: Year round

Rock gnome lichen occurs in dense colonies of narrow strap-like lobes that are about one millimeter across and generally one to two centimeters long. These lobes are blue gray on the terminal upper surface, and generally shiny white on the lower surface, grading to black near the base. The fruiting bodies are born on the tips of these lobes, are black, and have been found from July through September. The primary means of propagation appears to be asexual, with colonies spreading clonally.

Habitat Description: Rock gnome lichen occurs in high elevation coniferous forests (particularly those dominated by red spruce and Fraser fir) usually on rocky outcrop or cliff habitats. This squamulose lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet where there is often bog or on boulders and large outcrops in deep river gorges at lower elevations. Habitat is primarily limited to vertical rock faces where seepage water from forest soils above flows only at very wet times. The species requires a moderate amount of sunlight but cannot tolerate high-intensity solar radiation. The lichen does well on moist, generally open sites with northern exposures, but requires at least partial canopy coverage on southern or western aspects because of its intolerance to high solar radiation (USFWS 2011b).

Potential habitat for rock gnome lichen exists within the PSA. During the May 2020 field surveys, a large rock outcrop was observed on the northern portion of the PSA. This rock outcrop had a vertical face and gets seepage water from soils above. The rock outcrop was examined for rock gnome lichen, but the lichen was not observed. Additionally, rock outcrops by the streams located at the lower elevations within the PSA were examined for rock gnome lichen but the species was not found. Review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of rock gnome lichen within the PSA or within one mile of the PSA. Based on STVs findings from the May 2020 field surveys and literature review, it has been determined that this project will have no effect on the rock gnome lichen.
Biological Conclusion: No Effect

Swamp pink (*Helonias bullata)*
USFWS Recommended Survey Window: April – May

Swamp pink is a perennial herb in the lily family. This plant has a basal rosette of evergreen, strap-like leaves and an upright pink to lavender flower head. The tall flower stalks (up to 4.5 feet) appear from March to May. During the winter the leaves often turn reddish brown and lie flat or slightly raised above the ground. These winter leaves are often hidden by leaf litter, but a visible button in the center of the leaves represents the next season's flower head.

Habitat Description: Swamp pink occurs in clonal clumps in a variety of groundwater-influenced wetland habitats including southern Appalachian bogs and swamps, Atlantic white cedar swamps, swampy forests bordering meandering small streams, boggy meadows, headwater wetlands, and spring seepage areas.

The perennial herb requires a constantly saturated, but not flooded, water supply. The plant often grows on hummocks formed by trees, shrubs, and sphagnum moss, and exhibits varying degrees of shade tolerance. Swamp pink occurs in acidic soils that contain a very thin layer of decomposed organic matter over a dark silt loam and subsoil of sand, loam, and gravel (USFWS 2019a).

Potential habitat exists for swamp pink within the PSA. Spring seepage areas were observed on steep slopes throughout the PSA adjacent to small meandering streams. The seepage areas are located in areas with extremely to moderately acidic soils (Chestnut-Edneyville complex (AeF)). Additionally, one headwater wetland was observed along one of the perennial streams. Although potential habitat exists within the PSA, swamp pink was not observed during the May 2020 field surveys, which is within the USFWS recommended survey window. Review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of swamp pink within the PSA or within one mile of the PSA. Based on STVs findings from the May 2020 field surveys conducted during the USFWS recommended survey window and literature review, it has been determined that this project will have no effect on swamp pink.
Biological Conclusion: No Effect

Small whorled pogonia (*Isotria medeoloides)*
USFWS Recommended Survey Window: mid May – early June

The small whorled pogonia is a member of the orchid family. This plant usually has a single grayish-green stem that grows about 10 inches tall when in flower and about 14 inches when bearing fruit. The plant is named for the whorl of five or six leaves near the top of the stem and beneath the flower. The leaves are grayish-green, somewhat oblong and one to 3.5 inches long. The single or paired greenish-yellow flowers are about 0.5 to one inch long and appear in May or June. The fruit, an upright ellipsoid capsule, appears later in the year.

Habitat Description: Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. This plant does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The orchid, often limited by shade, requires small light gaps or canopy breaks, and typically grows under canopies that are relatively open or near features like logging roads or streams that create long-persisting breaks in the forest canopy (USFWS 2016).

Potential habitat for small whorled pogonia exists within the PSA. During the field surveys conducted by STV scientists in May 2020, open dry deciduous woods, moist slopes, ravines lacking stream channels, and seasonal stream habitats were identified within the PSA. Plant by plant surveys were conducted in these areas of the site and within the USFWS recommended survey window, but small whorled pogonia was not identified. A species similar in appearance to small whorled pogonia, Indian cucumber-root (*Medeola virginiana*) was identified throughout the PSA. Additionally, review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of small whorled pogonia within the PSA or within one mile of the PSA. Based on STVs findings from the May 2020 field surveys conducted during the USFWS recommended survey window and literature review, is has been determined that this project will have no effect on small whorled pogonia.
Biological Conclusion: No Effect

Mountain sweet pitcher plant (*Sarracenia rubra ssp. jonesii)*
USFWS Recommended Survey Window: April – October

Mountain sweet pitcher plant is a carnivorous perennial herb with tall, hollow pitcher-shaped leaves and red sweet-smelling flowers. The hollow leaves contain liquid and enzymes. When insects fall into the

pitchers, they're digested and the nutrients are incorporated into the plant's tissues. The evolutionary role of carnivory in such plants is not fully understood, but some evidence indicates that absorption of minerals from insect prey may allow carnivorous species to compete in nutrient-poor habitats. The unusual red flowers (yellow in rare cases) appear from April to June, with fruits ripening in August. Flowering plants reach heights of 29 inches. Very little specific information is available on the biology of mountain sweet pitcher plant. Like other pitcher plants, it has rhizomes that are probably long-lived and capable of persisting and reproducing vegetatively for decades without producing seedlings.

Habitat Description: Mountain sweet pitcher plant, endemic to the Blue Ridge Mountains of North and South Carolina, is found along stream banks and in shrub/herb-dominated, seepage-fed mountain bogs (Southern Appalachian Bog-Southern Subtype). Both stream bank and bog habitats are usually situated along intermittently exposed to intermittently flooded level depressions associated with valley floodplains. These habitats, typically on soils of the Toxaway or Hatboro series, contain deep, poorly drained, saturated soils of loam, sand, and silt with a high organic matter content and medium to high acidity. A few occurrences of the pitcher plant also grow in cataract bogs, either in thin strips along the edges of waterfalls or on soil islands over granite rock faces, where sphagnum and other bog plant species line the sides. This early successional species relies on natural disturbance (e.g., drought, water fluctuation, periodic fire, ice damage) to maintain its habitat by preventing the establishment of later successional woody seedlings (USFWS 2019b).

Potential habitat for mountain sweet pitcher plant does not exist within the PSA. During the May 2020 field surveys, habitats were assessed for adequate conditions to support mountain pitcher plant; no bog habitats were observed throughout the PSA. Additionally, review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of mountain sweet pitcher plant within the PSA or within one mile of the PSA. Based on STV's findings from the May 2020 field surveys conducted during the USFWS recommended survey window and literature review, it has been determined that this project will have no effect on mountain sweet pitcher plant.
Biological Conclusion: No Effect

Virginia spiraea (*Spiraea virginiana)*
USFWS Recommended Survey Window: May – early June

Virginia spiraea is a perennial shrub with many branches and grows three to ten feet tall. These plants alternate leaves are singletooth serrated; one to six inches long and one to two inches wide; occasionally curved; and have a narrow, moderately tapered base. The leaves are also darker green above than below. The plant produces flowers that are yellowish green to pale white, with stamens twice the length of the sepal. This plant blooms from late May to late July, but flower production is sparse and does not begin until after the first year of establishment. Virginia spiraea has a clonal root system that can fragment and produce more plants. This form of vegetative reproduction is more common than flower pollination and seed dispersal in this species.

Habitat Description: Virginia spiraea occurs in flood-scoured, high-gradient sections of rocky riverbanks of second and third order streams, often in gorges or canyons. This perennial shrub grows in sunny areas on moist, acidic soils, primarily over sandstone. The shrub tends to be found in thickets with little arboreal or herbaceous competition along early successional areas that rely on periodic disturbances such as high-velocity scouring floods to eliminate such competition. Virginia spiraea also occurs on meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, often near the stream mouth. Scoured, riverine habitat sites are found where deposition occurs after high water flows such as on floodplains and overwash islands, rather than along areas of maximum erosion. Occurrences in depositional habitats are found among riparian debris piles, on fine alluvial sand and other alluvial deposits, or between boulders (USFWS 2011c).

Potential habitat for Virginia spiraea occurs within the PSA. Plant by plant surveys were conducted in and around the streams located within the PSA, during the recommended USFWS survey window. Braided

stream features and stream mouths/discharge points that experience high velocity scouring exist within the PSA; however, Virginia spiraea was not observed. Review of the NCNHP records obtained on June 1, 2020 revealed no known occurrences of Virginia spiraea within or within one mile of the PSA. Based on STV's findings from the May 2020 field surveys conducted during the USFWS recommended survey window and literature review, it has been determined that this project will have no effect on Virginia spiraea.
Biological Conclusion: No Effect

Conclusion and Recommendations

Federally threatened and/or endangered species are protected under the Endangered Species Act of 1973. The North Carolina Department of Environment and Natural Resources landfill siting restrictions state that a new municipal solid waste landfill unit or lateral expansion is not permitted to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the ESA.

Based on literature review and of the NCNHP database and field surveys conducted from May 19th through May 21st, 2020, it is determined that the Woodruff Landfill Expansion project will have no effect on Appalachian elktoe, rusty-patched bumble bee, Carolina northern flying squirrel, bog turtle, bald eagle, gray bat, rock gnome lichen, swamp pink, small whorled pogonia, mountain sweet pitcherplant, and Virginia spiraea.

The northern long-eared bat may be affected by the Woodruff Landfill Expansion project due to potential habitat existing within the PSA. However, the project would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. Although not required, it is encouraged to avoid any associated tree clearing activities during this animal's maternity roosting season from May 15 – August 15.

Literature Cited

North Carolina Natural Heritage Program (NCNHP). 2012. Guide to the Natural Communities of North Carolina Fourth Approximation. Michael P. Schafale. Last Accessed June 1, 2020, from: https://files.nc.gov/dncr-nhp/documents/files/Natural-Community-Classification-Fourth-Approximation-2012.pdf

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2019. Web Soil Survey. Last Accessed June 1, 2020, from: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

U.S. Fish and Wildlife Service (USFWS). 1989. Southeastern states bald eagle recovery plan. U.S. Department of the Interior, Atlanta, Ga. 63 pp.

USFWS. 1996. Recovery Plan for Appalachian Elktoe (*Alasmidonta* raveneliana) Lea. USFWS Asheville Field Office. Last Accessed June 1, 2020, from: https://ecos.fws.gov/docs/recovery_plan/960826.pdf

USFWS. 1997. Gray Bat (*Myotis grisescens*) Fact Sheet. USFWS Midwest Region. Last Accessed June 1, 2020, from: https://www.fws.gov/midwest/endangered/mammals/graybat/grbat_fc.html

USFWS. 2011a. Carolina northern flying squirrel (*Glaucomys sabrinus*). USFWS Asheville Field Office. Last Accessed June 1, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/carolina-northern-flying-squirrel.pdf

USFWS. 2011b. Rock gnome lichen (*Gymnoderna lineare*). USFWS Asheville Field Office. Last Accessed June 1, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/rock-gnome-lichen.pdf

USFWS. 2011c. Virginia spiraea (*Spiraea virginiana*). USFWS Asheville Field Office. Last Accessed June 1, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/virginia-spiraea.pdf

USFWS. 2015. Northern Long-Eared Bat (*Myotis septentrionalis*). USFWS Midwest Region. Last Accessed June 1, 2020, from: https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/NLEBFactSheet01April2015.pdf

USFWS. 2016. Small Whorled Pogonia (*Isotria medeoloides*). USFWS Midwest Region. Last Accessed June 1, 2020, from: https://www.fws.gov/midwest/endangered/plants/pdf/smallwhorledpogoniafctsht.pdf

USFWS. 2017. Rusty Patched Bumble Bee (*Bombus affinis*). USFWS Midwest Region. Last Accessed June 1, 2020, from: https://www.fws.gov/midwest/Endangered/insects/rpbb/pdf/RPBBFactSheet10Jan2017.pdf

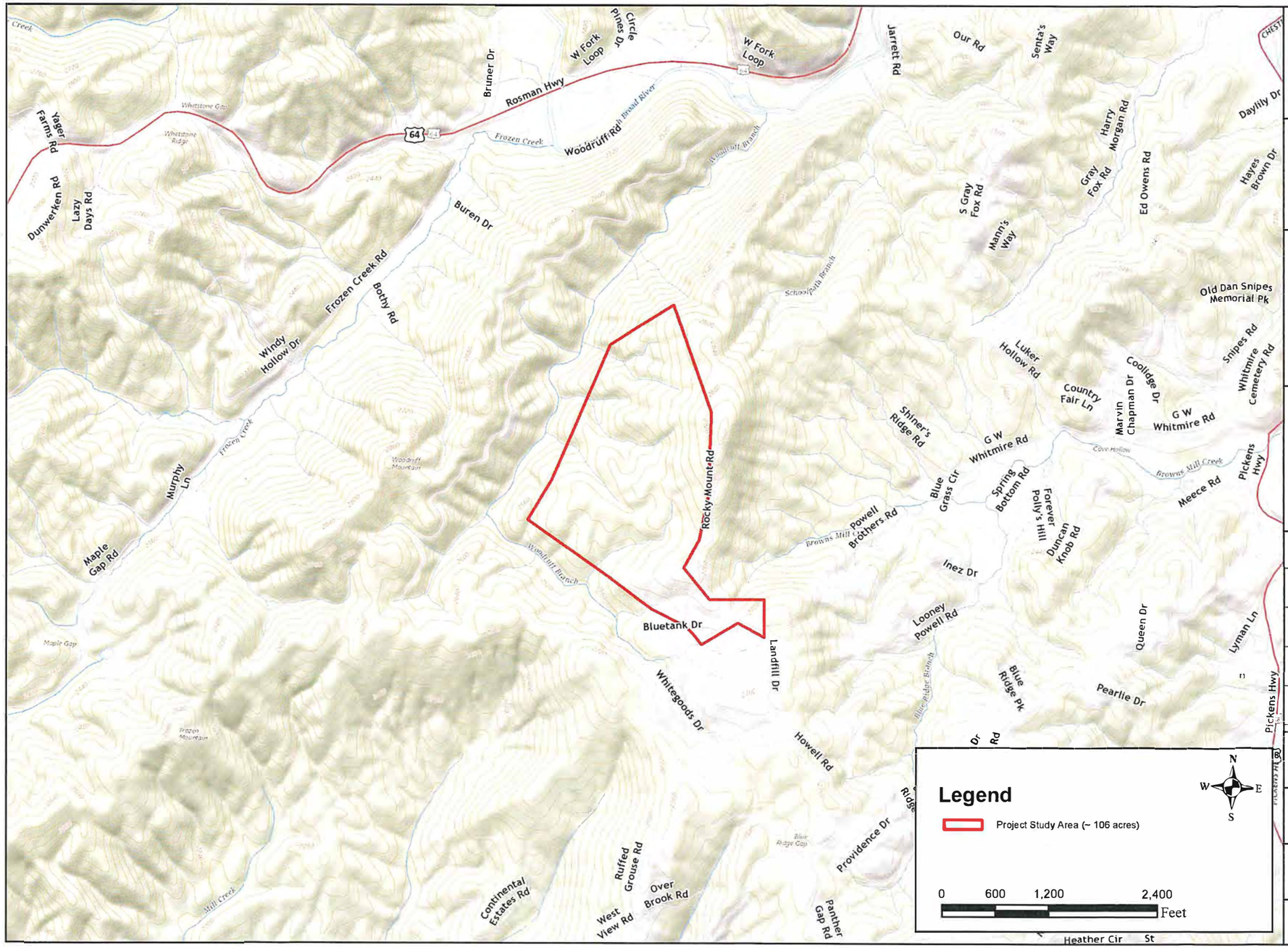
USFWS. 2019a. Swamp pink (*Helonias bullata*). USFWS Southeast Region. Last Accessed June 1, 2020, from: https://www.fws.gov/southeast/wildlife/plants/swamp-pink/

USFWS. 2019b. Mountain sweet pitcher plant (*Sarracenia rubra ssp. jonesii*). USFWS Southeast Region. Last Accessed June 1, 2020, from: https://www.fws.gov/southeast/wildlife/plants/mountain-sweet-pitcher-plant/

USFWS. 2020. Bog Turtle. USFWS New York Field Office. Last Accessed June 1, 2020, from: https://www.fws.gov/northeast/nyfo/es/bogturtle.htm

Appendix A

Figures



STV 100 Years

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LaBella
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Project:

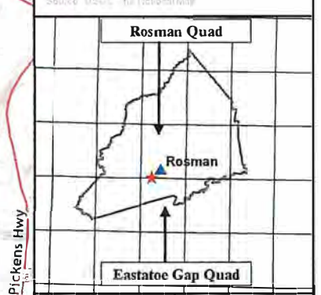
Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

USGS TOPOGRAPHIC MAP

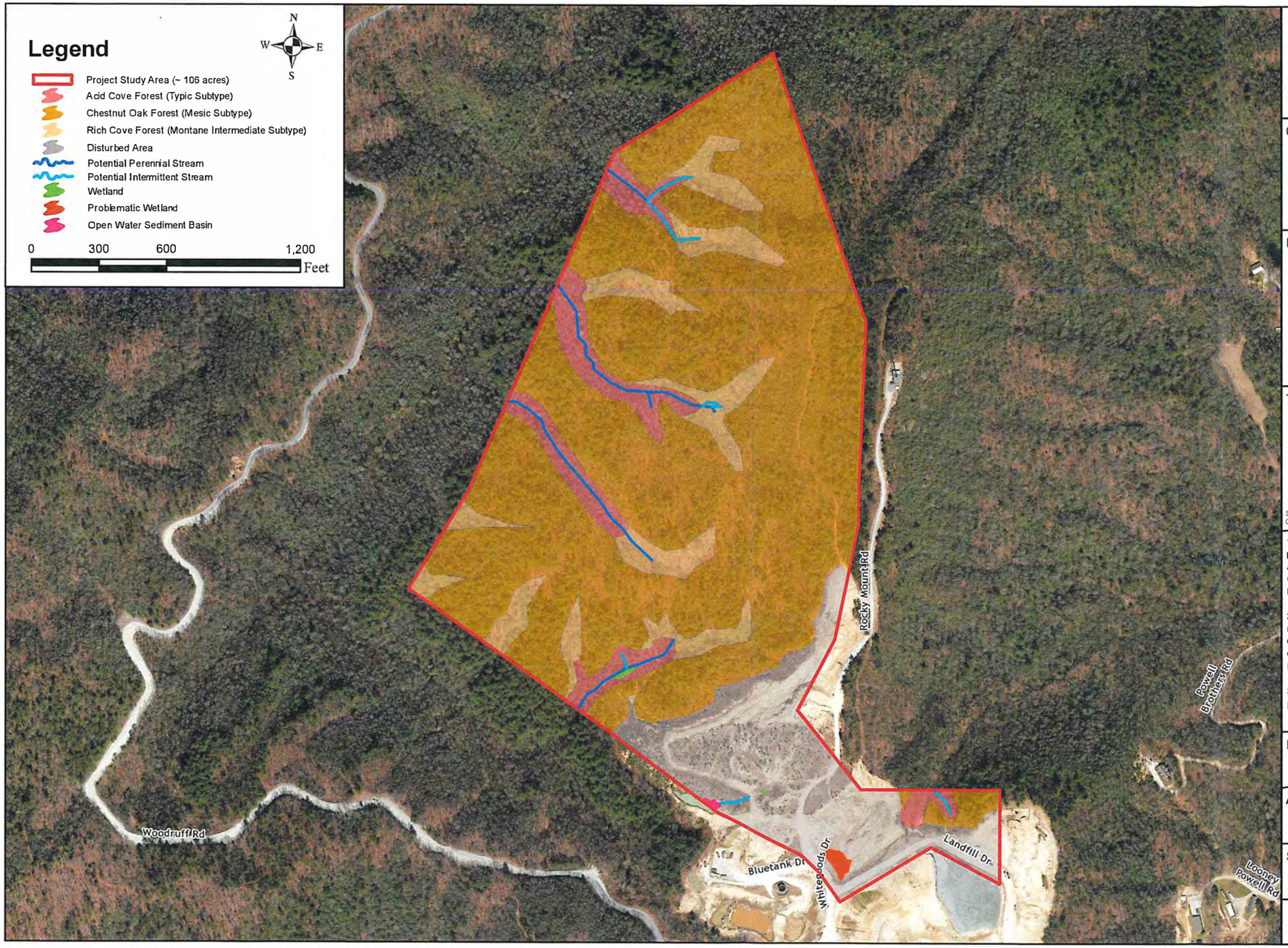
Source: USGS The National Map



Drawn By:	Checked By:
TPO	JLK
Approved By:	Date:
MAI	6/8/2020

STV Inc. Project No.
4020639

FIGURE 1



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Project:

Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

NATURAL COMMUNITIES MAP

Source: NCDOT GIS Unit, NCOneMap Center for Geographic Information & Analysis

1. Areas of terrestrial communities within the project study area were determined to be Acid Cove Forest (Typic Subtype), Chestnut Oak Forest (Mesic Subtype), and Rich Cover Forest (Montane Intermediate Subtype).

2. Streams and wetlands depicted were mapped during a preliminary wetlands determination and have not been delineated or verified by the U.S. Army Corps of Engineers.

3. This map is intended for planning purposes only.

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TPO	**JLK**
Approved By:	Date:
MAI	**6/8/2020**

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FIGURE 2

Appendix B

Representative Photographs

Photo 1 – View of a Chestnut Oak Forest (Mesic Subtype) habitat with a clear understory; potential habitat for small whorled pogonia.

Photo 2 – View of a large outcrop with a vertical face located on the northern portion of the PSA; potential habitat for rock gnome lichen.

Photo 3 – View of a Rich Cove Forest (Montane Intermediate Subtype) habitat; this type of habitat was commonly found at the upper end of drainage features.

Photo 4 – View of an abandoned logging road, these roads were found throughout the wooded portions of the PSA.

Photo 5 – View of a perennial stream and Acid Cove Forest (Typic Subtype) habitat located on the steep slopes adjacent to the stream.

Photo 6 – View of a perennial stream and a headwater forest wetland habitat.

From: Iagnocco, Michael
To: Johnson, Jenny
Cc: Kotheimer, Joshua L.
Subject: ~~RE: Transylvania Land~~fill - 50-Ac Parcel
Date: Thursday, July 23, 2020 4:41:37 PM
Attachments: image001.png
Woodruff_Landfill_Preliminary_Determination_Features_Revised_07202020.dgn

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Hey Jenny – sorry – I jumped the gun a bit - I should of waited for Josh's email of findings which I've pasted in below; the updated CAD files are attached.

A Preliminary Waters Determination on the 50-acre portion of the Woodruff Landfill was conducted on July 8-9, 2020. We did not have any rain during our determination but received rain the previous day and in the evenings after we concluded our determinations for the day. The USACE Antecedent Precipitation Tool reports that the area is experiencing a wet season and reports that July 8 is wetter than normal but July 9 is within normal conditions on a rolling 30 day average. We identified five perennial streams within the expanded study area, two of which had intermittent portions upstream of the perennial channel sections. No wetlands or open waters were identified during the site visit.

Stream J within the expanded study area was an extension of a feature picked up in the previous determination, was the most defined stream channel in the expanded study area and was depicted on the USGS and soil survey mapping. Stream L was determined to be perennial from a headcut and flowed east into Stream J. Stream L was depicted only on the USGS mapping. Stream M began as an Intermittent channel and changed to perennial at a headcut as it flowed southeast into Stream L.

Streams N and O both began as perennial streams flowing for very short distances above ground before flowing back underground. They were both in topographic crenulations or gullies but the geology in the area appeared to allow the water coming down these gullies to flow subsurface within the study area for all but a few short segments. Streams N and O could potentially be determined to be isolated and non-jurisdictional, however, the USGS and soil survey both depict a stream channel in this area - but it is hard to determine which channel is being depicted due to their close proximity. The area in the northern end above streams N and O had streams depicted on either the USGS or soil survey mapping but well defined channels were not observed within the PSA.

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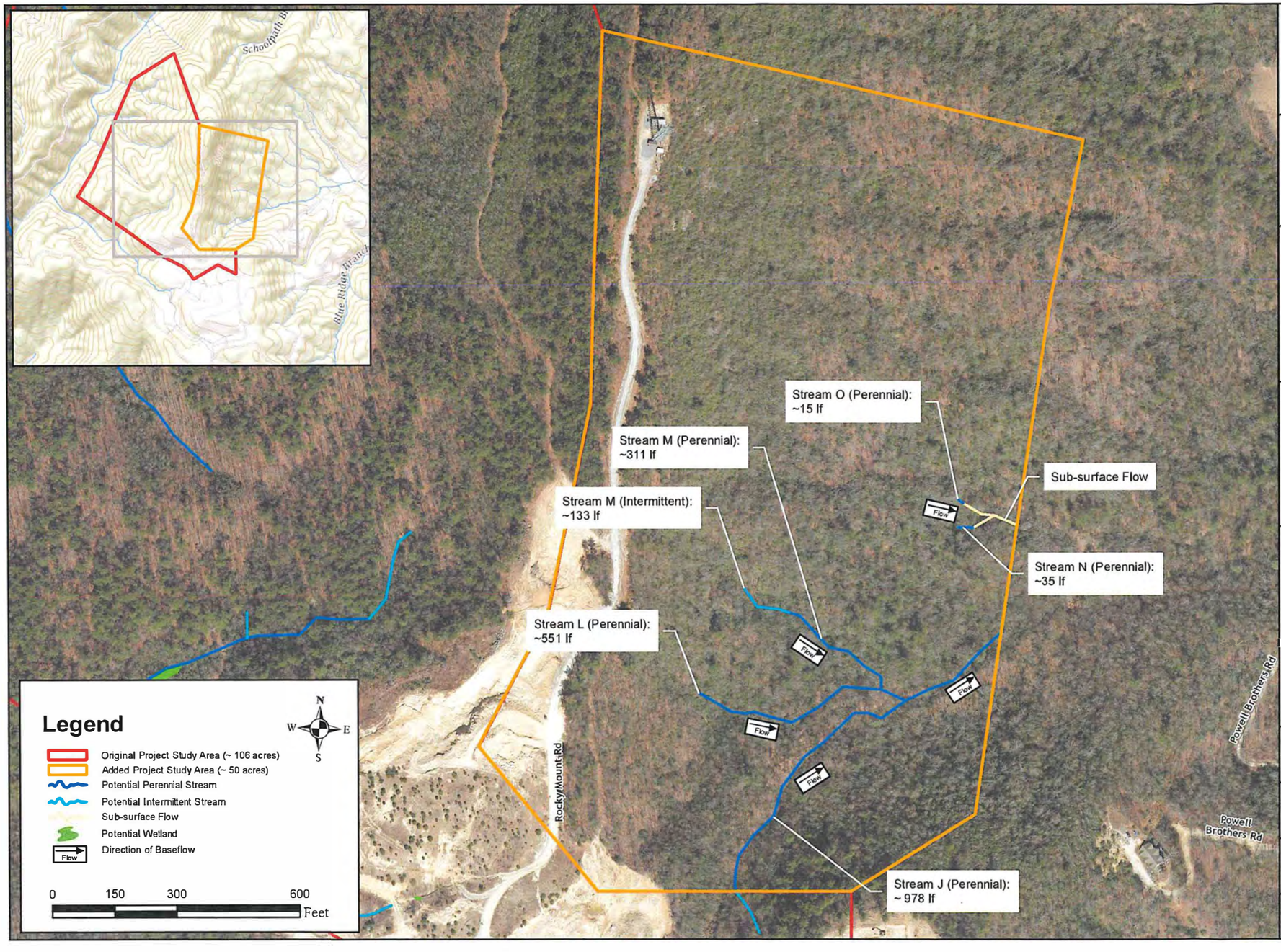

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Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

PRELIMINARY WETLANDS DETERMINATION MAP

Source: NCDOT GIS Unit
USGS The National Map: National Boundaries

1. The boundaries of potentially jurisdictional wetlands and waters of the U.S. (WoUS) were approximated by STV Engineers, Inc. Field reviews were conducted from May 19 through 21, 2020 and July 8 through July 9, 2020. Potential jurisdictional boundaries were approximated using a Trimble Geo7X hand-held GPS unit capable of subfoot accuracy.

2. The approximated jurisdictional boundaries of wetlands and WoUS are subject to change following a complete delineation and subsequent verification by the U.S. Army Corps of Engineers.

3. This map is intended for planning purposes only.

Drawn By:	Checked By:
TPO	**JLK**
Approved By:	Date:
MAI	**7/23/2020**

STV Inc. Project No.
4020639

FIGURE 1

Biological Assessment for Federally Threatened and Endangered Species
Woodruff Landfill Expansion (Part 2)
Transylvania County, North Carolina
STV Project No. 4020639
July 2020

LaBella Associates, PC (LaBella) has requested a biological assessment from STV Engineers, Inc. (STV) relating to the Woodruff Landfill Expansion in Transylvania County, North Carolina. The purpose of this Biological Assessment was an effort to identify federally threatened and endangered plant species and potential habitat for federally threatened and endangered animal species, within the project study area (PSA).

Literature and Field Review Methodology

Prior to conducting fieldwork, the following reference material was reviewed:

- North Carolina Natural Heritage Program (NCNHP) for Transylvania County (Date last accessed July 14, 2020)
- NC OneMap Aerial Imagery (2019)
- USGS 7.5 Minute Topographic Quadrangle Maps: Eastatoe Gap, NC (2019)
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Series Data for Transylvania County, NC (Data last updated July 31, 2019)
- USDA NRCS National Hydric Soils List (2019)
- USDA Soil Conservation Service Soil Survey of Transylvania County, North Carolina (1974)
- U.S. Fish and Wildlife Service (USFWS) North Carolina List of At-Risk, Candidate, Endangered, and Threatened Species for Transylvania County (Last updated July 9, 2020).
- USFWS National Wetlands Inventory (NWI) Wetlands Online Mapper (Data last updated October 8, 2019)

Field reviews of the PSA were conducted by STV Environmental Scientists Joshua Kotheimer, PWS and Timothy O'Halloran, WPIT from July 8th through July 9th, 2020 to document the presence of natural resources, habitat communities, and federally protected species. The Woodruff Landfill Expansion site is an approximately 50-acre tract of land located within a 736-acre parcel (parcel no. 8542-84-8134) owned by Transylvania County; see **Appendix A, Figure 1 – Site Location Map** for a map depicting the location of the PSA. The majority of the PSA is undeveloped forested land with abandoned logging roads; the terrain is steep, and intermittent and perennial surface waters were identified during the field survey. Additionally, there is an access road along the western boundary of the PSA that leads to a cellular base station tower.

The Woodruff Landfill Expansion site was assessed for federally threatened and endangered species and potential habitat using a transect method. The transects were determined using topography to assess each ridge and the slopes leading to the streams/gullies located between the ridges. Vegetative communities in each transect were determined based on species and were determined to be in the Mountain Cove Forest or Mountain Oak Forest categories; specifically, Rich Cove Forest (Montane Intermediate Subtype), Acidic Cove Forest (Typic Subtype), and Chestnut Oak Forest (Mesic Subtype) (NCNHP 2012). For a map depicting the natural communities located within the PSA, see **Appendix A, Figure 2 – Natural Communities Map**. Additionally, photographs depicting the natural communities found within the PSA are shown in **Appendix B**.

Federally Protected Threatened and Endangered Species

Pursuant to Section 7 of the Endangered Species Act (ESA), as amended (16 USC 1531-1534), consultation with the USFWS is required for proposed projects with a federal nexus, i.e., involves a federal action and/or funding, that "may affect" federally endangered and threatened species as designated by the USFWS. This Biological Assessment (BA) provides a summary of the literature and field reviews conducted for the project including descriptions of the federally endangered and threatened species listed for Transylvania County and discussion of potential project impacts to these species.

The USFWS online protected species database, updated July 9, 2020, lists twelve federally protected species as occurring, having the potential to occur, or historically occurring in Transylvania County including the bald eagle (*Haliaeetus leucocephalus*) which is protected under the Bald and Golden Eagle Protection Act (BGEPA). Per NCNHP protected species occurrence records obtained on July 14, 2020, there are no documented occurrences of federally threatened or endangered species within or within one mile of the PSA. A brief description of each species, including habitat requirements and physical characteristics, and biological conclusion rendered based on surveys of the PSA follow. Habitat requirements for each species are based on current USFWS guidance and available literature.

Table 1. Transylvania County Federally Protected (Endangered and Threatened) Species

Protected Species		Protection Status
Common Name	**Scientific Name**	**Federal**
Animal		
Appalachian elktoe	*Alasmidonta raveneliana*	E
Rusty-patched bumble bee	*Bombus affinis*	E
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E
Bog turtle	*Glyptemys muhlenbergii*	T (S/A)
Bald eagle	*Haliaeetus leucocephalus*	BGEPA
Gray bat	*Myotis grisescens*	E
Northern long-eared bat	*Myotis septentrionalis*	T
Plant		
Rock gnome lichen	*Gymnoderma lineare*	E
Swamp pink	*Helonias bullata*	T
Small whorled pogonia	*Isotria medeoloides*	T
Mountain sweet pitcherplant	*Sarracenia rubra ssp. jonesii*	E
Virginia spiraea	*Spiraea virginiana*	T

T = Threatened
T (S/A) = Threatened due to Similar Appearance
E = Endangered
BGEPA = Bald and Golden Eagle Protection Act

The federally protected species listed for Transylvania County and their physical descriptions and respective habitats are briefly described below:

Appalachian elktoe (*Alasmidonta raveneliana)*
USFWS Recommended Survey Window: March 1 – November 1

The Appalachian elktoe has a thin, kidney-shaped shell, extending to about 10 centimeters (4 inches). Juveniles generally have a yellowish-brown periostracum (outer shell surface), while the periostracum of the adults is usually dark brown to greenish-black in color. Although rays are prominent on some shells, particularly in the posterior portion of the shell, many individuals have only obscure greenish rays. The shell nacre (inside shell surface) is shiny, often white to bluish-white, changing to a salmon, pinkish, or brownish color in the central and beak cavity portions of the shell; some specimens may be marked with irregular brownish blotches.

Critical Habitat Description: Critical habitat for the Appalachian elktoe has been designated in 144.2 total river miles in six distinct units:

1. Encompasses approximately 24 miles of the main stem on the Little Tennessee River from the Lake Emory Dam in Franklin, Macon County, NC, downstream to the backwaters of Fontana Reservoir in Swain County, NC.
2. Encompasses approximately 26 miles of the main stem of the Tuckasegee River from NC State Route 1002 bridge in Cullowhee, Jackson County, NC, downstream to the NC 19 bridge north of Bryson City, Swain County, NC.
3. Encompasses approximately 9.1 miles of the main stem of the Cheoah River from the Santeelah Dam downstream to its confluence with the Little Tennessee River, in Graham County, NC.
4. Encompasses approximately 4.7 miles of the main stem of the Little River (French Broad River Basin) from the Cascade Lake Power Plant, downstream to its confluence with the French Broad River in Transylvania County, NC.
5. Encompasses approximately 11.1 miles of the main stem of the West Fork Pigeon River (French Broad River Basin) from the confluence with the Little East Fork Pigeon River downstream to the confluence with the East Fork Pigeon River, and the main stem of the Pigeon River from the confluence of the East Fork Pigeon River and West Fork Pigeon River downstream to the NC 215 crossing, south of Canton, Haywood County, NC.
6. Encompasses approximately 3.7 miles of the main stem of the North Toe River, Yancey and Mitchell counties, NC, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; approximately 14.1 miles of the main stem of the South Toe River, Yancey County, NC, from the NC State Route 1152 crossing, downstream to its confluence with the North Toe River; approximately 21.6 miles of the main stem of the Toe River, Yancey and Mitchell counties, NC, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; approximately 16.5 miles of the main stem of the Cane River, Yancey County, NC, from the NC State Route 1381 crossing, downstream to its confluence with the Toe River; and approximately 13.5 miles of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey County and Mitchell County, NC downstream to the US 23/19W crossing, southwest of Erwin, Unicoi County, TN (USFWS 1996).

Potential habitat for Appalachian elktoe does not exist within the PSA. Although perennial streams exist within the PSA, the size of the streams are too small to provide adequate habitat for the species. Review of the North Carolina Natural Heritage Program (NCNHP) records obtained on July 14, 2020 revealed no known occurrences of Appalachian elktoe within the PSA or within one mile of the PSA. Based on the literature review and site location outside of the designated critical habitat, it is determined that the project will have no effect on the Appalachian elktoe.
Biological Conclusion: No Effect

Rusty-patched bumble bee (*Bombus affinis*)
USFWS Recommended Survey Window: Early June – mid-August

Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Habitat Description: Rusty-patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil) (USFWS 2017).

Potential habitat does not exist within the PSA. The North Carolina Natural Heritage Program (NCNHP) website was reviewed (July 14, 2020) to determine the locations of the nearest populations of rusty-patched bumble bee. The NCNHP determined that no populations of rusty-patched bumble bee were present within one mile of the PSA, and no effect to rusty-patched bumble bee is anticipated. Additionally, the USFWS website states that Section 7 Consultation and Take Permits are not needed in areas that are mapped as historic range only which can be determined through mapping located on their website.

Field surveys were conducted by STV scientists for the presence of rusty-patched bumble bee habitat on July 8th through July 9th, 2020. Grasslands and tall grass prairies were not identified within the PSA; the PSA is dominated by mountain cove forest, mountain oak forest, and ravines. Review of the NCNHP element occurrence records revealed no documented occurrences or populations of rusty-patched bumble bee within or within one mile of the PSA. Based on the literature review and field surveys conducted, it is determined that the project would have no effect on rusty-patched bumble bee.
Biological Conclusion: No Effect

Carolina northern flying squirrel (*Glaucomys sabrinus coloratus)*
USFWS Recommended Survey Window: May – October

Northern flying squirrels are about one-third larger than the very common southern species. Also, northern flying squirrels have brown colored fur on their backs, and bicolored fur on their bellies that is gray at the base and creamy white at the tip. Southern flying squirrels have brown or gray fur on their backs with bright white fur on their bellies, and a clearly defined (usually black) line separates the fur colors. The endangered Carolina northern flying squirrel is a subspecies of the northern flying squirrel.

Habitat Description: Carolina northern flying squirrels are typically found in areas where hardwoods, such as yellow birch, are adjacent to the higher-elevation red spruce-Fraser fir forest. These habitats are often moist and cool. Such habitat varies in age but typically includes some widely spaced, mature trees and an abundance of standing and down snags (ideally old-growth forest). Such habitats seem well suited to the species' gliding form of locomotion, use of cavities for nesting, and reliance of wood-borne fungi and lichens for food (USFWS 2011a).

Potential habitat does not exist within the PSA. Based on information from the Appalachian Northern Flying Squirrel Recovery Plan, in North Carolina all captures have occurred above 1,540 meters (5,052 feet). Elevation within the PSA ranges from approximately 2,480 feet to 2,920 feet. The NCNHP database was reviewed (July 14, 2020) to determine the locations of the nearest populations of Carolina northern flying squirrel. The NCNHP determined that no populations of Carolina northern flying squirrel were present within or within one mile of the PSA. Based on habitat limitations, literature review, and field surveys conducted, it is determined that the project would have no effect on Carolina northern flying squirrel.
Biological Conclusion: No Effect

Bog turtle (*Glyptemys muhlenbergii)*
USFWS Recommended Survey Window: April 1 – October 1

The bog turtle is the smallest turtle in North America measuring just three to four inches in length and weighing about four ounces. The bog turtle can most easily be identified by a mahogany-colored shell and bright yellow-orange blotches located on both sides of the head.

Habitat Description: Bog turtles usually occur in small, discrete populations, generally occupying open-canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands are a mosaic of micro-habitats that include dry pockets, saturated areas, and areas that are periodically flooded. Bog turtles depend upon this diversity of micro-habitats for foraging, nesting, basking, hibernating, and

sheltering. Unfragmented riparian systems that are sufficiently dynamic to allow the natural creation of open habitat are needed to compensate for ecological succession. Bog Turtles inhabit open, unpolluted emergent and scrub/shrub wetlands such as shallow spring-fed fens, sphagnum bogs, swamps, marshy meadows, and wet pastures. These habitats are characterized by soft muddy bottoms, interspersed wet and dry pockets, vegetation dominated by low grasses and sedges, and a low volume of standing or slow-moving water which often forms a network of shallow pools and rivulets (USFWS 2020).

Potential habitat for bog turtle does not exist within the PSA. The emergent wetland habitats that that bog turtles inhabit were not identified during the July 2020 field survey. The NCNHP website was reviewed (July 14, 2020) to determine the locations of the nearest populations of bog turtle. The NCNHP determined that no populations of bog turtle were present within or within one mile of the PSA. Based on lack of suitable habitat observed during field surveys and literature review, it is determined that the project would have no effect on the bog turtle.
Biological Conclusion: No Effect

Bald eagle (*Haliaeetus leucocephalus)*
USFWS Recommended Survey Window: Year-round; November – March (optimal to observe birds and nest); February – May (optimal to observe active nesting)

The bald eagle is protected under the Bald and Golden Eagle Protection Act and enforced by the USFWS. Adult bald eagles generally have a blackish-brown back and breast, a white head, neck, and tail, and a yellow bill. Juveniles are generally brown and white in color with a black bill.

Habitat Description: The bald eagle can be found throughout the continental U.S. In the southeastern portion of its range, bald eagles nest in mature live pines or cypress trees in the transition zone between mature forests and large bodies of open water. Nests are large, up to six feet in width, and constructed of sticks and soft materials such as dead vegetation, grasses, and pine needles. Nesting trees are usually less than two miles from open water. Winter roosts are usually in mature trees, similar to nesting trees, but may be somewhat farther from water (USFWS 1989).

A desktop-GIS assessment of the PSA, as well as the area within a one-mile radius of the project limits, was performed prior to the field surveys conducted in July 2020 using the latest ESRI ArcGIS color aerials. The PSA does not contain waterbodies large enough for foraging; however, West Fork French Broad River, North Fork French Broad River, and French Broad River area located within one mile of the PSA and are Class B, trout waters which are high quality foraging habitat for bald eagle. No eagle nests were observed within the PSA during the field survey. Review of the NCNHP database on July 14, 2020 revealed no known occurrences of this species within or within one mile of the PSA. Due to the lack of foraging habitat, literature review, and field surveys, it has been determined that this project will have no effect on bald eagle.
Biological Conclusion: No Effect

Gray bat (*Myotis grisescens)*
USFWS Recommended Survey Window: May 15 – August 15

Gray bats are distinguished from other bats by the unicolored fur on their back. In addition, following their molt in July or August, gray bats have dark gray fur which often bleaches to a chestnut brown or russet. These bats weigh 7-16 grams. The bat's wing membrane connects to its ankle instead of at the toe, where it is connected in other species of *Myotis*.

Habitat Description: Gray bats are known mainly from the cave regions of the Southeast and Midwest. These bats live in colonies in caves, utilizing different caves for summer roosting and winter hibernating. Summer caves are usually within one half mile of a river or reservoir, which provides foraging habitat. During the summer, females give birth and rear the young in maternity caves, while males and yearlings

roost in separate bachelor caves. Caves preferred for hibernation are typically deep, vertical caves with a temperature between 42 and 52 degrees Fahrenheit. Gray bats are highly selective in choosing suitable caves, and nine known caves (not located in North Carolina) are thought to provide hibernation space for 95 percent of the population. Migration from summer to winter caves begins in September and is mainly complete by the beginning of November. Unlike other bats, gray bats do not use houses or barns (USFWS 1997).

Potential habitat does not exist within the PSA. Field surveys conducted during July 2020 did not reveal any caves within the PSA. A review of the USGS historic mining data for North Carolina did not show any historic mines within the PSA. Additionally, a review of the NCNHP database on July 14, 2020 revealed no known occurrences of this species within or within one mile of the PSA. Due to the lack of habitat observed during field surveys and literature review it has been determined that this project will have no effect on the gray bat.
Biological Conclusion: No Effect

Northern long-eared bat (*Myotis septentrionalis)*
USFWS Recommended Survey Window: May 15 – August 15

The northern long-eared bat (NLEB) is a medium-sized bat approximately three to 3.7 inches in body length with a wingspan of nine to 10 inches. As its name suggests, this bat species is distinguished from other species in the genus *Myotis* by its long ears. The range of the NLEB consists of the eastern and north central portions of the United States including 37 states. In North Carolina specifically, the NLEB primarily occurs in the western part of the state in the mountain region. Only scattered occurrences have been documented in the piedmont and coastal plain regions of the state. In western North Carolina, NLEBs spend winter hibernating in caves and mines. During the summer, NLEBs roost singly or in colonies within trees including underneath the bark, in cavities, or in crevices. Roosting trees can be both live and dead and are typically ≥ three inches diameter at breast height in size. Males and non-reproductive females may also roost in cooler places such as caves and mines. The NLEB has also been observed roosting in man-made structures including barns and sheds, under eaves of buildings, behind window shutters, in bridges, and bat houses. Foraging habitat includes forested hillsides and ridges, the airspace above waterways, and along woodland edges. Mature forests are generally considered to be an important habitat type for foraging.

The final 4(d) rule for the NLEB went into effect February 16, 2016. Within the range of the NLEB in North Carolina, any take of the species within a hibernaculum (breeding grounds) is prohibited including any action that may change the nature of the hibernaculum's environment or entrance ways. The 4(d) rule exempts incidental takes of the species for tree-cutting activities occurring greater than 0.25-mile from a known hibernaculum or more than 150 feet from a known maternity roost during the pup-rearing season (July 14 through July 31) (USFWS 2015).

Additionally, the U.S. Army Corps of Engineers (USACE), and the USFWS developed a Standard Local Operating Procedures for Endangered Species (SLOPES) agreement concerning potential effects to the federally-threatened NLEB (*Myotis septentrionalis*). The SLOPES was signed and became effective on January 30th, 2017. The SLOPES agreement details how the USACE will make determinations of effect to the NLEB when the USACE is the lead federal agency for a project, and is applicable to activities regulated pursuant to Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA) of 1899 in the western 41 counties of North Carolina.

Based on review of the USFWS Asheville Field Office's online database (last updated September 4, 2018), NLEB hibernation or maternity sites have not been documented within Transylvania County. Suitable summer roosting habitat may be present within the PSA for NLEB. The July 2020 field surveys concluded that no caves or mines (potential hibernacula) exist within the PSA; however, potential foraging and roosting habitat, including trees and the air space above streams is present. Dead trees and trees with shaggy bark were examined for evidence of bats such as guano and staining; no evidence was

observed on the trees examined. It should be noted that a bat survey was not conducted, only a visual observation of potential habitat. Review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of NLEB within the PSA or within one mile of the PSA. The final 4(d) rule (effective as of February 16, 2016), exempts incidental take of NLEB associated with activities that occur greater than 0.25 miles from a known hibernation site, and greater than 150 feet from a known, occupied maternity roost during the pup season (July 14 – July 31). The project (which may or may not require tree clearing) would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. Based on the findings of the literature and field reviews and per the final 4(d) rule, it has been determined that the project qualifies for the exemption for incidental take and 'May Affect – Not Likely to Adversely Affect' the NLEB.
Biological Conclusion: May Affect – NLEB is exempt due to consistency with 4(d) rule

Rock gnome lichen (*Gymnoderma lineare)*
USFWS Recommended Survey Window: Year round

Rock gnome lichen occurs in dense colonies of narrow strap-like lobes that are about one millimeter across and generally one to two centimeters long. These lobes are blue gray on the terminal upper surface, and generally shiny white on the lower surface, grading to black near the base. The fruiting bodies are born on the tips of these lobes, are black, and have been found from July through September. The primary means of propagation appears to be asexual, with colonies spreading clonally.

Habitat Description: Rock gnome lichen occurs in high elevation coniferous forests (particularly those dominated by red spruce and Fraser fir) usually on rocky outcrop or cliff habitats. This squamulose lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet where there is often bog or on boulders and large outcrops in deep river gorges at lower elevations. Habitat is primarily limited to vertical rock faces where seepage water from forest soils above flows only at very wet times. The species requires a moderate amount of sunlight but cannot tolerate high-intensity solar radiation. The lichen does well on moist, generally open sites with northern exposures, but requires at least partial canopy coverage on southern or western aspects because of its intolerance to high solar radiation (USFWS 2011b).

Potential habitat for rock gnome lichen exists within the PSA. During the July 2020 field surveys, large rock outcrops were observed towards the northern boundary of the PSA. This exposed rock outcrop is vertically faced and receives some water seepage from the soils above. The rock outcrop was examined for rock gnome lichen, but the lichen was not observed. Additionally, rock outcrops by the streams located at the lower elevations within the PSA were examined for rock gnome lichen but the species was not found. Review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of rock gnome lichen within the PSA or within one mile of the PSA. Based on STVs findings from the July 2020 field surveys and literature review, it has been determined that this project will have no effect on the rock gnome lichen.
Biological Conclusion: No Effect

Swamp pink (*Helonias bullata)*
USFWS Recommended Survey Window: April – May

Swamp pink is a perennial herb in the lily family. This plant has a basal rosette of evergreen, strap-like leaves and an upright pink to lavender flower head. The tall flower stalks (up to 4.5 feet) appear from March to May. During the winter the leaves often turn reddish brown and lie flat or slightly raised above the ground. These winter leaves are often hidden by leaf litter, but a visible button in the center of the leaves represents the next season's flower head.

Habitat Description: Swamp pink occurs in clonal clumps in a variety of groundwater-influenced wetland habitats including southern Appalachian bogs and swamps, Atlantic white cedar swamps, swampy forests

bordering meandering small streams, boggy meadows, headwater wetlands, and spring seepage areas. The perennial herb requires a constantly saturated, but not flooded, water supply. The plant often grows on hummocks formed by trees, shrubs, and sphagnum moss, and exhibits varying degrees of shade tolerance. Swamp pink occurs in acidic soils that contain a very thin layer of decomposed organic matter over a dark silt loam and subsoil of sand, loam, and gravel (USFWS 2019a).

Potential habitat for swamp pink does not exist within the PSA. No wetlands were observed within the 50-acre PSA. Review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of swamp pink within the PSA or within one mile of the PSA. Although the field survey was conducted outside of the USFWS recommended survey window, adequate habitat for swamp pink is not present within the PSA; therefore, the project will have no effect on swamp pink.
Biological Conclusion: No Effect

Small whorled pogonia (*Isotria medeoloides)*
USFWS Recommended Survey Window: mid May – early July

The small whorled pogonia is a member of the orchid family. This plant usually has a single grayish-green stem that grows about 10 inches tall when in flower and about 14 inches when bearing fruit. The plant is named for the whorl of five or six leaves near the top of the stem and beneath the flower. The leaves are grayish-green, somewhat oblong and one to 3.5 inches long. The single or paired greenish-yellow flowers are about 0.5 to one inch long and appear in May or June. The fruit, an upright ellipsoid capsule, appears later in the year.

Habitat Description: Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. This plant does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The orchid, often limited by shade, requires small light gaps or canopy breaks, and typically grows under canopies that are relatively open or near features like logging roads or streams that create long-persisting breaks in the forest canopy (USFWS 2016).

Potential habitat for small whorled pogonia exists within the PSA. During the field surveys conducted by STV scientists in July 2020, open dry deciduous woods, moist slopes, ravines lacking stream channels, and seasonal stream habitats were identified within the PSA. Plant by plant surveys were conducted in these areas of the site and within the USFWS recommended survey window, but small whorled pogonia was not identified. A species similar in appearance to small whorled pogonia, Indian cucumber-root (*Medeola virginiana*) was identified throughout the PSA. Additionally, review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of small whorled pogonia within the PSA or within one mile of the PSA. Based on STVs findings from the July 2020 field surveys conducted during the USFWS recommended survey window and literature review, is has been determined that this project will have no effect on small whorled pogonia.
Biological Conclusion: No Effect

Mountain sweet pitcher plant (*Sarracenia rubra ssp. jonesii)*
USFWS Recommended Survey Window: April – October

Mountain sweet pitcher plant is a carnivorous perennial herb with tall, hollow pitcher-shaped leaves and red sweet-smelling flowers. The hollow leaves contain liquid and enzymes. When insects fall into the pitchers, they're digested and the nutrients are incorporated into the plant's tissues. The evolutionary role of carnivory in such plants is not fully understood, but some evidence indicates that absorption of minerals from insect prey may allow carnivorous species to compete in nutrient-poor habitats. The

unusual red flowers (yellow in rare cases) appear from April to June, with fruits ripening in August. Flowering plants reach heights of 29 inches. Very little specific information is available on the biology of mountain sweet pitcher plant. Like other pitcher plants, it has rhizomes that are probably long-lived and capable of persisting and reproducing vegetatively for decades without producing seedlings.

Habitat Description: Mountain sweet pitcher plant, endemic to the Blue Ridge Mountains of North and South Carolina, is found along stream banks and in shrub/herb-dominated, seepage-fed mountain bogs (Southern Appalachian Bog-Southern Subtype). Both stream bank and bog habitats are usually situated along intermittently exposed to intermittently flooded level depressions associated with valley floodplains. These habitats, typically on soils of the Toxaway or Hatboro series, contain deep, poorly drained, saturated soils of loam, sand, and silt with a high organic matter content and medium to high acidity. A few occurrences of the pitcher plant also grow in cataract bogs, either in thin strips along the edges of waterfalls or on soil islands over granite rock faces, where sphagnum and other bog plant species line the sides. This early successional species relies on natural disturbance (e.g., drought, water fluctuation, periodic fire, ice damage) to maintain its habitat by preventing the establishment of later successional woody seedlings (USFWS 2019b).

Potential habitat for mountain sweet pitcher plant does not exist within the PSA. During the July 2020 field surveys, habitats were assessed for adequate conditions to support mountain pitcher plant; no bog habitats were observed throughout the PSA. Additionally, review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of mountain sweet pitcher plant within the PSA or within one mile of the PSA. Based on STV's findings from the July 2020 field surveys conducted during the USFWS recommended survey window and literature review, it has been determined that this project will have no effect on mountain sweet pitcher plant.
Biological Conclusion: No Effect

Virginia spiraea (*Spiraea virginiana)*
USFWS Recommended Survey Window: May – early July

Virginia spiraea is a perennial shrub with many branches and grows three to ten feet tall. These plants alternate leaves are singletooth serrated; one to six inches long and one to two inches wide; occasionally curved; and have a narrow, moderately tapered base. The leaves are also darker green above than below. The plant produces flowers that are yellowish green to pale white, with stamens twice the length of the sepal. This plant blooms from late May to late July, but flower production is sparse and does not begin until after the first year of establishment. Virginia spiraea has a clonal root system that can fragment and produce more plants. This form of vegetative reproduction is more common than flower pollination and seed dispersal in this species.

Habitat Description: Virginia spiraea occurs in flood-scoured, high-gradient sections of rocky riverbanks of second and third order streams, often in gorges or canyons. This perennial shrub grows in sunny areas on moist, acidic soils, primarily over sandstone. The shrub tends to be found in thickets with little arboreal or herbaceous competition along early successional areas that rely on periodic disturbances such as high-velocity scouring floods to eliminate such competition. Virginia spiraea also occurs on meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, often near the stream mouth. Scoured, riverine habitat sites are found where deposition occurs after high water flows such as on floodplains and overwash islands, rather than along areas of maximum erosion. Occurrences in depositional habitats are found among riparian debris piles, on fine alluvial sand and other alluvial deposits, or between boulders (USFWS 2011c).

Potential habitat for Virginia spiraea occurs within the PSA. Plant by plant surveys were conducted in and around the streams located within the PSA, during the recommended USFWS survey window. Braided stream features and stream mouths/discharge points that experience high velocity scouring exist within the PSA; however, Virginia spiraea was not observed. Review of the NCNHP records obtained on July 14, 2020 revealed no known occurrences of Virginia spiraea within or within one mile of the PSA. Based

on STV's findings from the July 2020 field surveys conducted during the USFWS recommended survey window and literature review, it has been determined that this project will have no effect on Virginia spiraea.
Biological Conclusion: No Effect

Conclusion and Recommendations

Federally threatened and/or endangered species are protected under the Endangered Species Act of 1973. The North Carolina Department of Environment and Natural Resources landfill siting restrictions state that a new municipal solid waste landfill unit or lateral expansion is not permitted to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the ESA.

Based on literature review and of the NCNHP database and field surveys conducted from July 8th through July 9th, 2020, it is determined that the Woodruff Landfill Expansion project will have no effect on Appalachian elktoe, rusty-patched bumble bee, Carolina northern flying squirrel, bog turtle, bald eagle, gray bat, rock gnome lichen, small whorled pogonia, swamp pink, mountain sweet pitcherplant, and Virginia spiraea.

The northern long-eared bat may be affected by the Woodruff Landfill Expansion project due to potential habitat existing within the PSA. However, the project would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. Although not required, it is encouraged to avoid any associated tree clearing activities during this animal's maternity roosting season from May 15 – August 15.

Literature Cited

North Carolina Natural Heritage Program (NCNHP). 2012. Guide to the Natural Communities of North Carolina Fourth Approximation. Michael P. Schafale. Last Accessed July 14, 2020, from: https://files.nc.gov/dncr-nhp/documents/files/Natural-Community-Classification-Fourth-Approximation-2012.pdf

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2019. Web Soil Survey. Last Accessed July 14, 2020, from: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

U.S. Fish and Wildlife Service (USFWS). 1989. Southeastern states bald eagle recovery plan. U.S. Department of the Interior, Atlanta, Ga. 63 pp.

USFWS. 1996. Recovery Plan for Appalachian Elktoe (*Alasmidonta* raveneliana) Lea. USFWS Asheville Field Office. Last Accessed July 14, 2020, from: https://ecos.fws.gov/docs/recovery_plan/960826.pdf

USFWS. 1997. Gray Bat (*Myotis grisescens*) Fact Sheet. USFWS Midwest Region. Last Accessed July 14, 2020, from: https://www.fws.gov/midwest/endangered/mammals/graybat/grbat_fc.html

USFWS. 2011a. Carolina northern flying squirrel (*Glaucomys sabrinus*). USFWS Asheville Field Office. Last Accessed July 14, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/carolina-northern-flying-squirrel.pdf

USFWS. 2011b. Rock gnome lichen (*Gymnoderna lineare*). USFWS Asheville Field Office. Last Accessed July 14, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/rock-gnome-lichen.pdf

USFWS. 2011c. Virginia spiraea (*Spiraea virginiana*). USFWS Asheville Field Office. Last Accessed July 14, 2020, from: https://www.fws.gov/southeast/pdf/fact-sheet/virginia-spiraea.pdf

USFWS. 2015. Northern Long-Eared Bat (*Myotis septentrionalis*). USFWS Midwest Region. Last Accessed July 14, 2020, from: https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/NLEBFactSheet01April2015.pdf

USFWS. 2016. Small Whorled Pogonia (*Isotria medeoloides*). USFWS Midwest Region. Last Accessed July 14, 2020, from: https://www.fws.gov/midwest/endangered/plants/pdf/smallwhorledpogoniafctsht.pdf

USFWS. 2017. Rusty Patched Bumble Bee (*Bombus affinis*). USFWS Midwest Region. Last Accessed July 14, 2020, from: https://www.fws.gov/midwest/Endangered/insects/rpbb/pdf/RPBBFactSheet10Jan2017.pdf

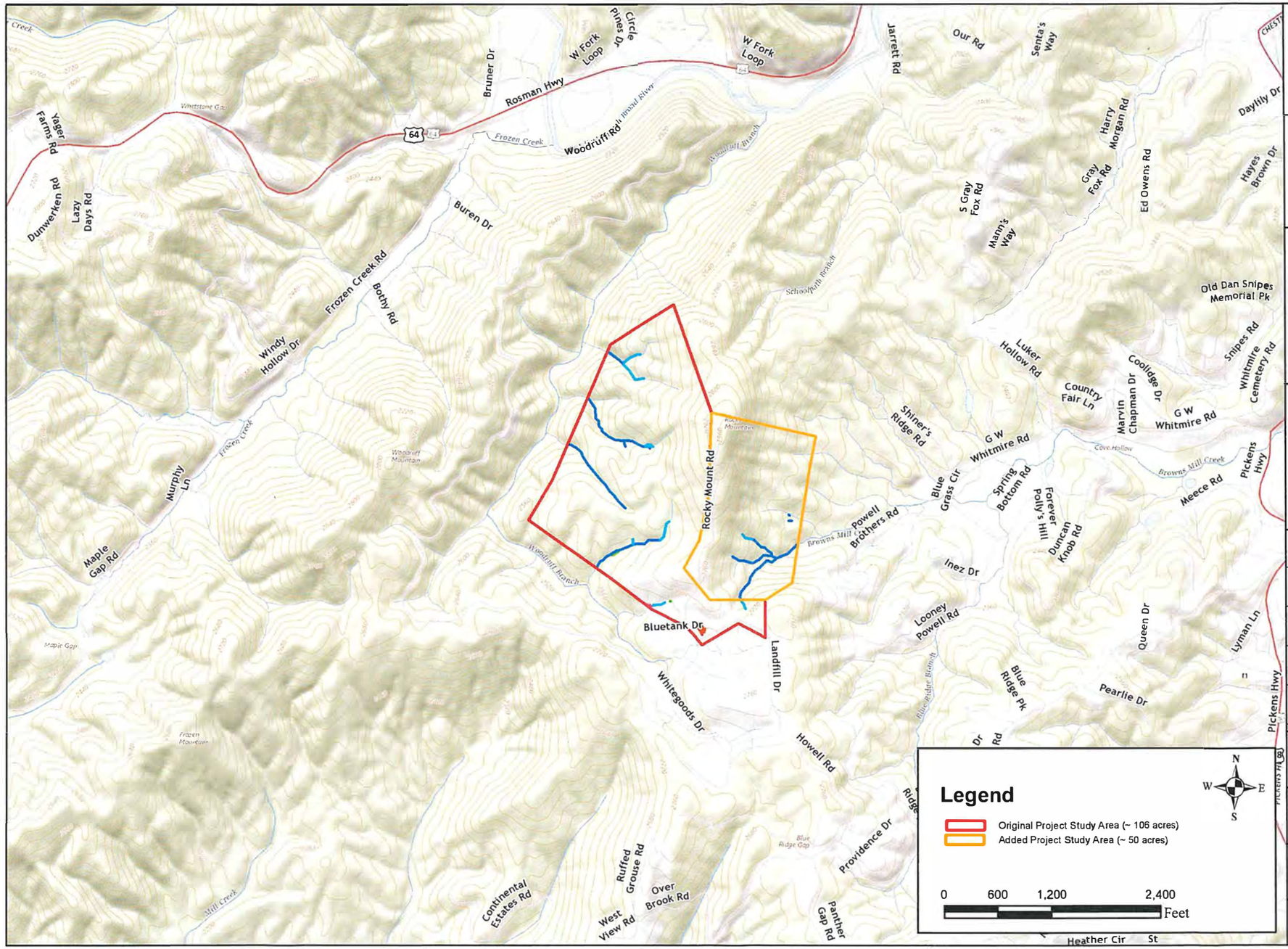
USFWS. 2019a. Swamp pink (*Helonias bullata*). USFWS Southeast Region. Last Accessed July 14, 2020, from: https://www.fws.gov/southeast/wildlife/plants/swamp-pink/

USFWS. 2019b. Mountain sweet pitcher plant (*Sarracenia rubra ssp. jonesii*). USFWS Southeast Region. Last Accessed July 14, 2020, from: https://www.fws.gov/southeast/wildlife/plants/mountain-sweet-pitcher-plant/

USFWS. 2020. Bog Turtle. USFWS New York Field Office. Last Accessed July 14, 2020, from: https://www.fws.gov/northeast/nyfo/es/bogturtle.htm

Appendix A

Figures



STV 100 Years

Client:

LaBella
Powered by partnership.

Project:

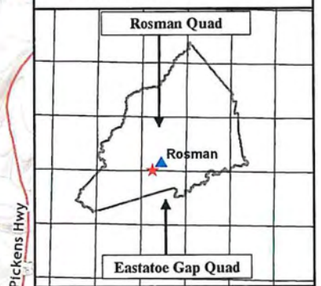
Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

USGS TOPOGRAPHIC MAP

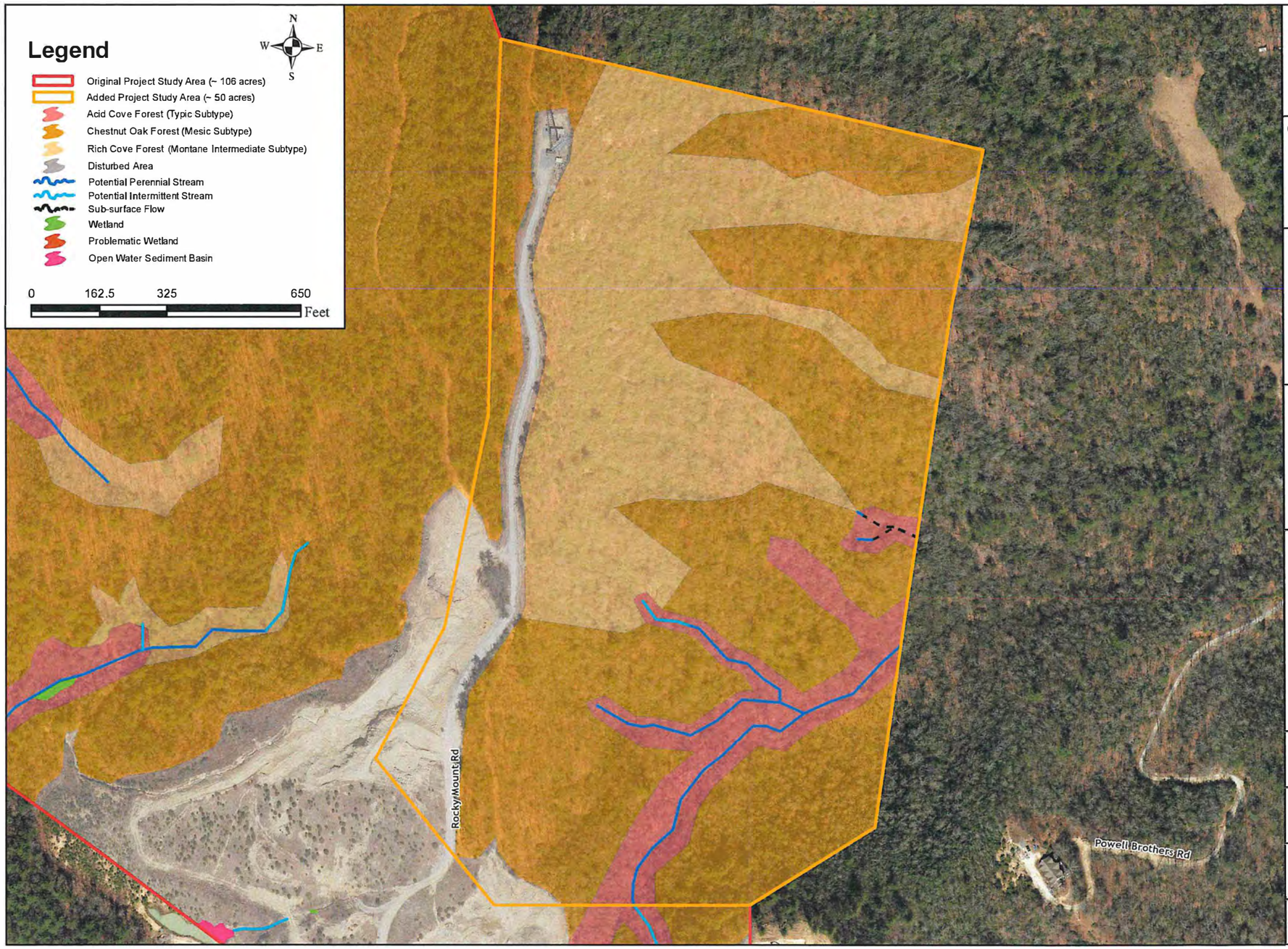
Source: USGS The National Map



Drawn By:	Checked By:
TPO	JLK
Approved By:	Date:
MAI	7/21/2020

STV Inc. Project No.
4020639

FIGURE 1



STV 100 Years

Client:

LaBella
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Project:

Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

NATURAL COMMUNITIES MAP

Source: NCDOT GIS Unit, NCOneMap Center for Geographic Information & Analysis

1. Areas of terrestrial communities within the project study area were determined to be Acid Cove Forest (Typic Subtype), Chestnut Oak Forest (Mesic Subtype), and Rich Cover Forest (Montane Intermediate Subtype).

2. Streams and wetlands depicted in the original project study area were mapped during a preliminary wetlands determination from May 19 through May 21, 2020. Streams depicted in the added project study area were mapped during a preliminary wetlands determination from July 8 through July 9, 2020. All depicted streams and wetlands have not been delineated or verified by the U.S. Army Corps of Engineers.

3. This map is intended for planning

Drawn By:	Checked By:
TPO	**JLK**
Approved By:	Date:
MAI	**7/22/2020**

STV Inc. Project No.
4020639

FIGURE 2

Appendix B

Representative Photographs

Photo 1 – View of a perennial stream and Acid Cove Forest (Typic Subtype) habitat located on the steep slopes adjacent to the stream.

Photo 2 – View of a vertical rock outcrop located along a perennial stream; potential rock gnome lichen habitat.

Photo 3 – View of a perennial stream and Acid Cove Forest (Typic Subtype) habitat located on the slopes adjacent to the stream.

Photo 4 – View of a Rich Cove Forest (Montane Intermediate Subtype) habitat; this type of habitat was commonly found towards to the top of drainage features.

Photo 5 – View of a Chestnut Oak Forest (Mesic Subtype) habitat; this type of habitat was commonly found towards the higher elevation areas and on top of ridges.

Photo 6 – View of an eastern box turtle (*Terrapene carolina*); observed in a forested upland area.

Photo 7 – View of a juvenile yellow-bellied slider (*Trachemys scripta*); observed in an upland area of the site but are more commonly found in aquatic habitats.

Photo 8 – View of a copperhead snake (*Agkistrodon contortrix*); observed in a forested upland area.

Photo 9 – View of a wood frog (*Lithobates sylvaticus*); observed in a forested upland area.

Photo 10 – View of a red-spotted newt (*Notophthalmus viridescens*); observed towards the top of a stream.

A. Landfill Expansion West to North West (left of cell tower)

- Slope
- Viewshed same as current LF
- No new neighbors impacted
- Completed wetland & species survey
- Known area for construction potential
- 57 Acres capacity ~4,300,000 cy (86 yrs)
- Piggyback to existing landfill provides huge capacity benefit.
- Quicker timeline to construction startup
- Utilize existing LF infrastructure
  - Roads
  - Leachate collection
- Would require relocation of
  - Tower access road
  - Tower utilities in/out
- Construction continued above Woodruff Creek buffer
- Additional 35 Acres capacity ~2,500,000 cy (50 yrs)

B. Landfill Expansion North to North East (right of cell tower)

- Bowl
- New viewshed to the NE (Rosman)
- New neighbors (to landfill construction) in vicinity of GW Whitmire Road
- Completed wetland & species survey
- Unknown construction potential. Steep slopes may be too severe for landfill construction (pending Engineer Review)
- 35 Acres capacity ~2,500,000 cy (50 yrs)
- Based on steep slopes, may NOT provide piggyback potential to existing landfill. Huge reduction in capacity.
- Possible delay in timeline
- Requires new LF infrastructure
  - Roads
  - Leachate collection
  - Scale relocation (possible)
- Limited impact on
  - Tower access road
  - Tower utilities in/out
- Construction outside of Woodruff Creek

Transylvania County Landfill Expansion Options (Woodruff Landfill)
Western Area vs. Eastern Area Estimated Mitigation Costs

Estimated Mitigation Fees*	Unit Cost	Total Cost
Wetlands (per acre) 2:1	$ 52,273.99	$ 104,547.98
Perrenial Stream (per LF) 2:1	$ 525.65	$ 1,051.30
Inttermittent Stream (per LF) 1:1	$ 525.65	$ 525.65

*Source of fees: STV Engineers, Inc.

Western Area 56.77 Acres (4,300,000 CY) **Note: volume based on existing grade**

Stream	Perennial (LF)		Intermittent (LF)
	Inside Footprint	Outside footprint*	
H	825	150	245
K			63
G	500	688	
I		250	134
J			126
Totals	**1325**	**1088**	**568**

*"Outside footprint" includes portions of streams between outside of the proposed footprint and stream along south and west side of expansion in case COE takes approach that impacts are more than just those being destroyed.

Wetlands	Acres
A	0.04
B	0.001
C	0.21
Total	0.251

(if determine Wetlands C is E&S feature, total mitigation acreage would be 0.041)

Western Area Mitigation costs (ESTIMATE)

Wetlands: 0.251 acres at $52,273.99 per acre - assume 2:1 =	$26,242
Perennial Streams: 2.413 LF at $525.65 per linear foot - assume 2:1 = (includes portions of steam outside of footprint*)	$2,536,787
Intermittent Steams: 568 LF at $525.65 per linear foot - assume 1:1 =	$298,569
TOTAL	**$2,861,598**
Mitigation Cost/Acre	**$50,407**
Mitigation Cost/CY	**$0.67**

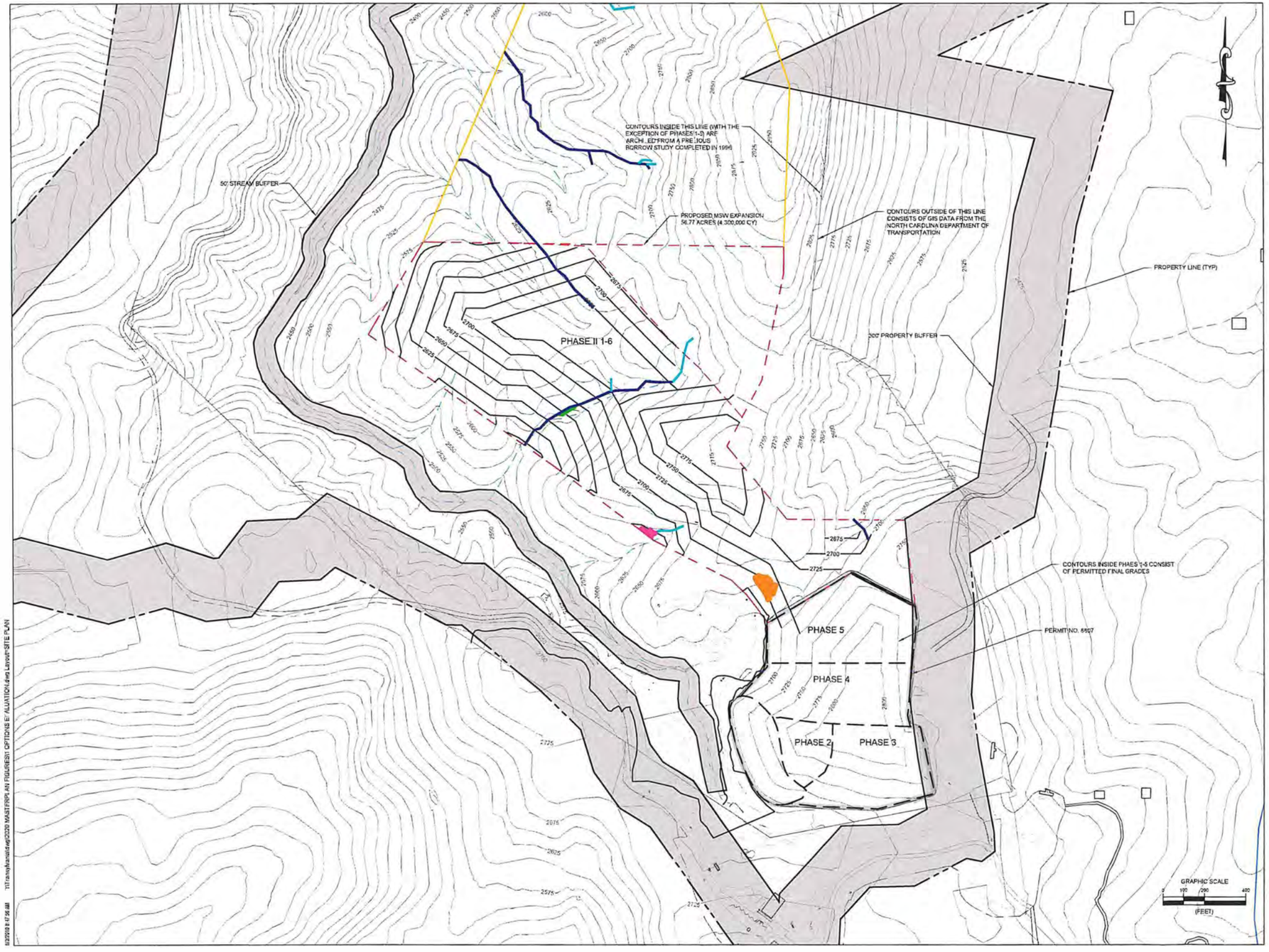
Eastern Area 34.8 Acres (2,500,000 CY) **Note: volume based on existing grade**

Steam	Perennial (LF)		Intermittent (LF)
	Inside Footprint	Outside footprint	
J	978		
L	551		
M	311		133
N	35		
O	15		
Totals	**1890**	**0**	**133**

Mitigation costs (ESTIMATE)

Wetlands: 0.0 acres at $52,273.99 per acre - assume 2:1 =	$	-
Perennial Streams: 1.890 LF at $525.65 per linear foot - assume 2:1 =	$	1,986,957
Intermittent Steams: 133 LF at $525.65 per linear foot - assume 1:1 =	$	69,911
TOTAL	**$**	**2,056,868**
Mitigation Cost/Acre	**$**	**59,105**
Mitigation Cost/CY	**$**	**0.82**

Note: All volumes, acreages, and linear feet are estimates.



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WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO.	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER: ----------
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 08/04/2020
DRAWING NAME:

OPTION EVALUATION LANDFILL EXPANSION OPTION

DRAWING NUMBER

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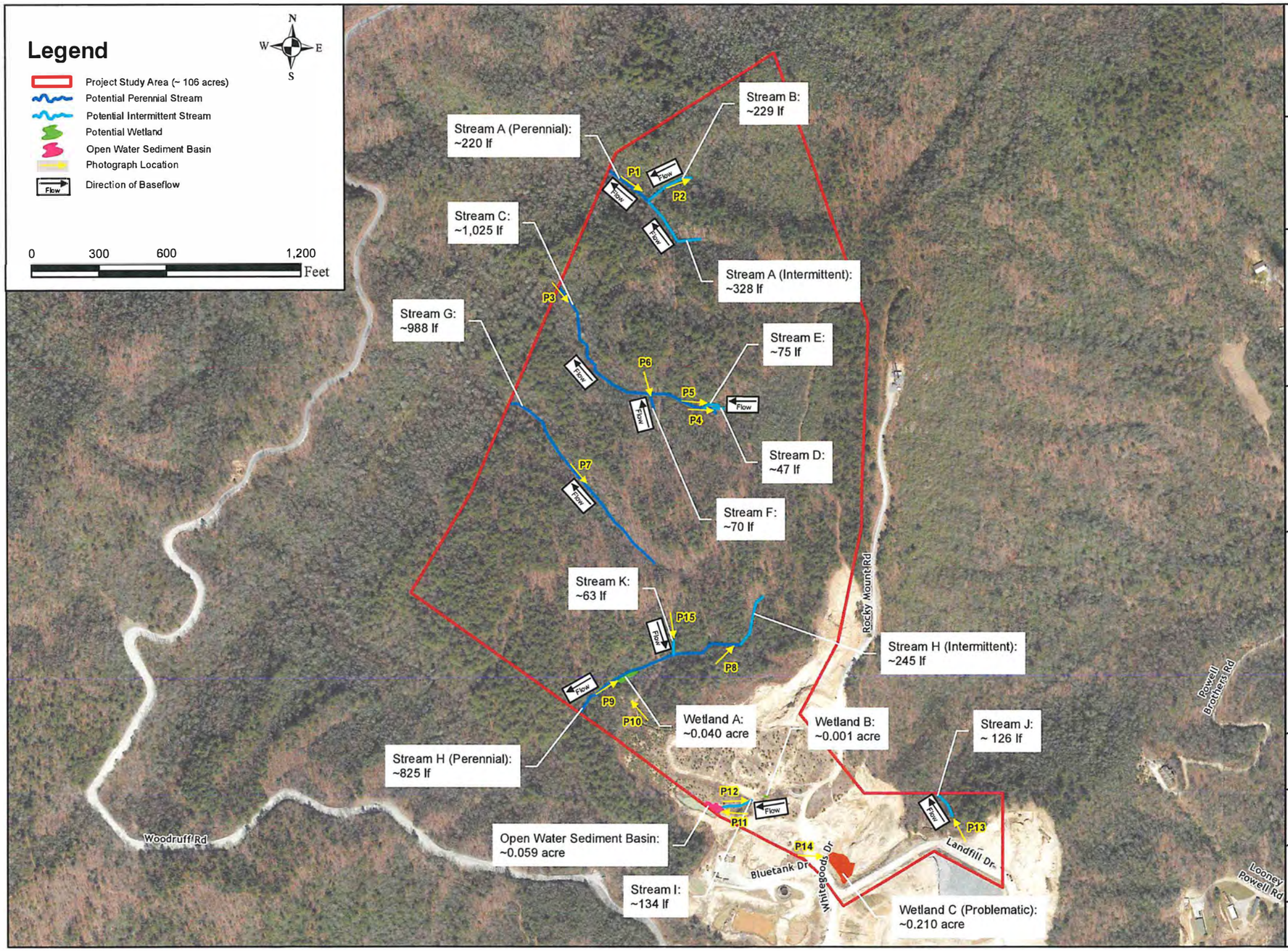

STV 100 Years

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Project:

Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

PRELIMINARY WETLANDS DETERMINATION MAP

Source: NCDOT GIS Unit, NCOneMap Center for Geographic Information & Analysis

1. The boundaries of potentially jurisdictional wetlands and waters of the U.S. (WoUS) were approximated by STV Engineers, Inc. during a field review conducted from May 19 through 21, 2020. Potential jurisdictional boundaries were approximated using a Trimble Geo7X hand-held GPS unit capable of subfoot accuracy.

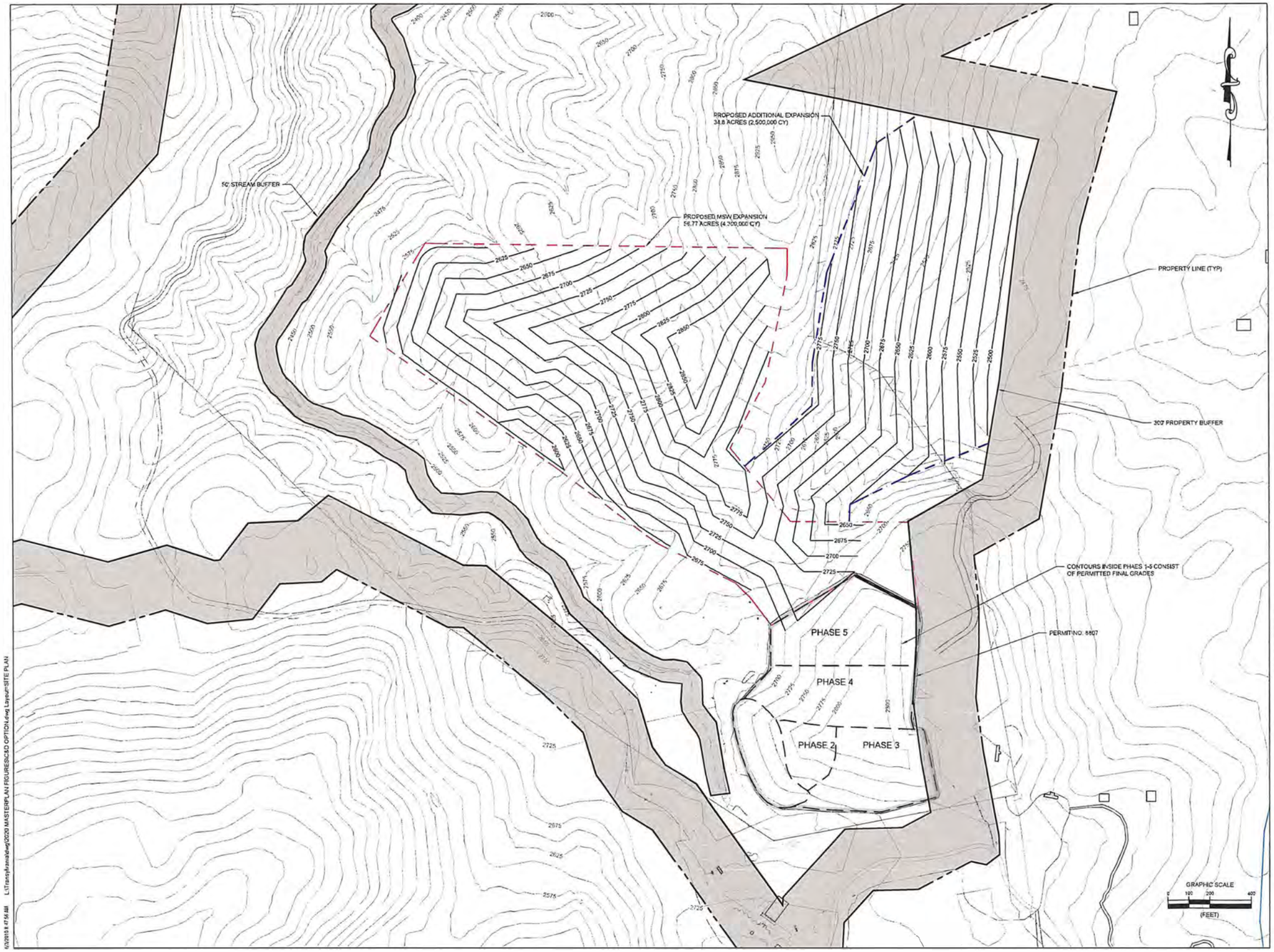
2. The approximated jurisdictional boundaries of wetlands and WoUS are subject to change following a complete delineation and subsequent verification by the U.S. Army Corps of Engineers.

3. This map is intended for planning purposes only.

Drawn By:	Checked By:
TPO	**JLK**
Approved By:	Date:
MAI	**6/11/2020**

STV Inc. Project No.
4020639

FIGURE 2



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WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO.	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER: ----------
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 02/24/20
DRAWING NAME:

ADDITIONAL CONCEPTUAL AREA 2,500,000 CY

DRAWING NUMBER

2

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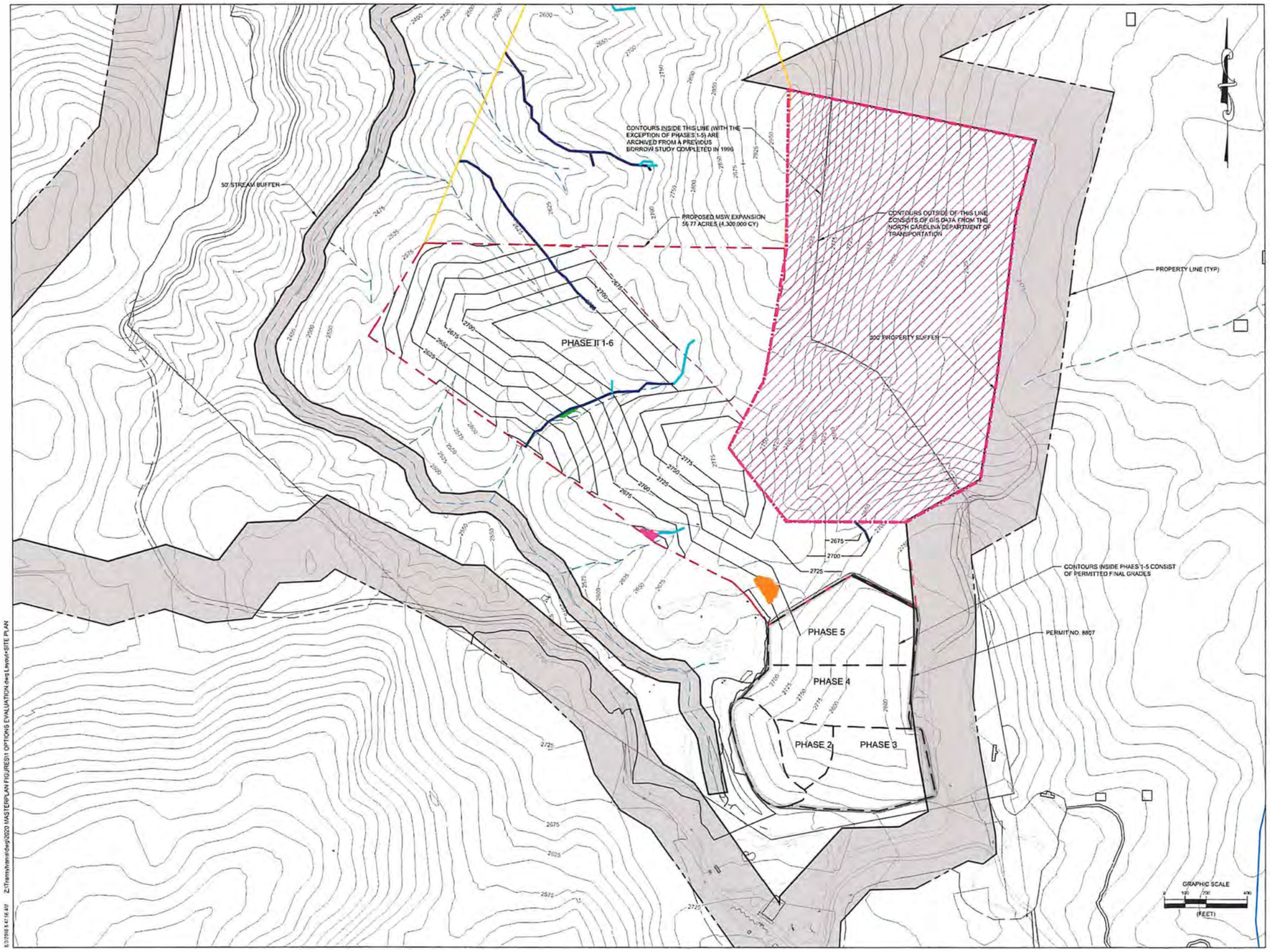

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WOODRUFF LANDFILL
TRANSYLVANIA COUNTY, NORTH CAROLINA

NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER: ----------
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 06/04/2020
DRAWING NAME:

OPTIONS EVALUATION: LANDFILL EXPANSION OPTION

DRAWING NUMBER:

1

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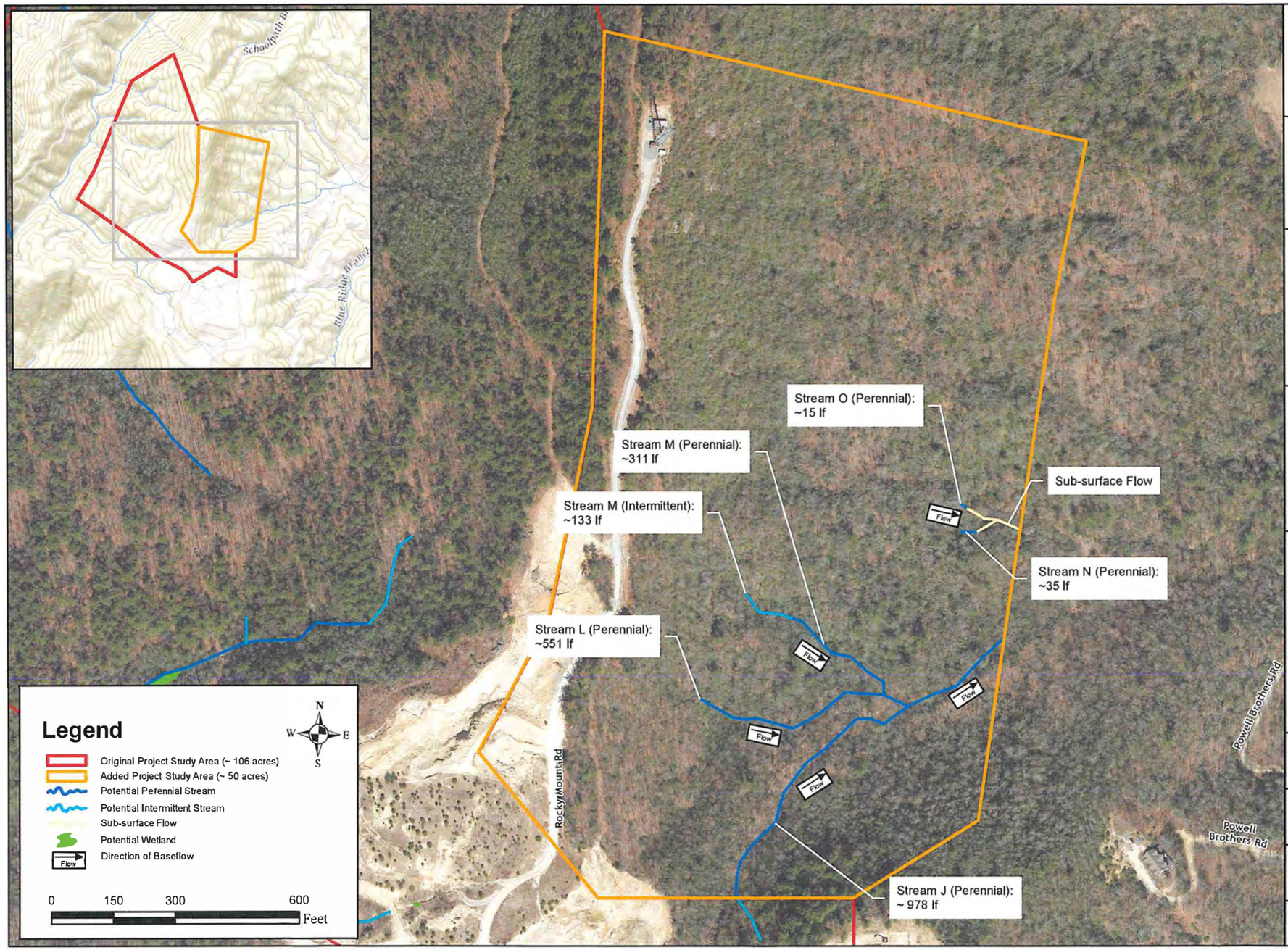

STV 100 Years

Client:

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Project:

Woodruff Landfill Expansion

Transylvania County, North Carolina

Title:

PRELIMINARY WETLANDS DETERMINATION MAP

Source: NCDOT GIS Unit
USGS The National Map: National Boundaries

1. The boundaries of potentially jurisdictional wetlands and waters of the U.S. (WoUS) were approximated by STV Engineers, Inc. Field reviews were conducted from May 19 through 21, 2020 and July 8 through July 9, 2020. Potential jurisdictional boundaries were approximated using a Trimble Geo7X hand-held GPS unit capable of subfoot accuracy.

2. The approximated jurisdictional boundaries of wetlands and WoUS are subject to change following a complete delineation and subsequent verification by the U.S. Army Corps of Engineers.

3. This map is intended for planning purposes only.

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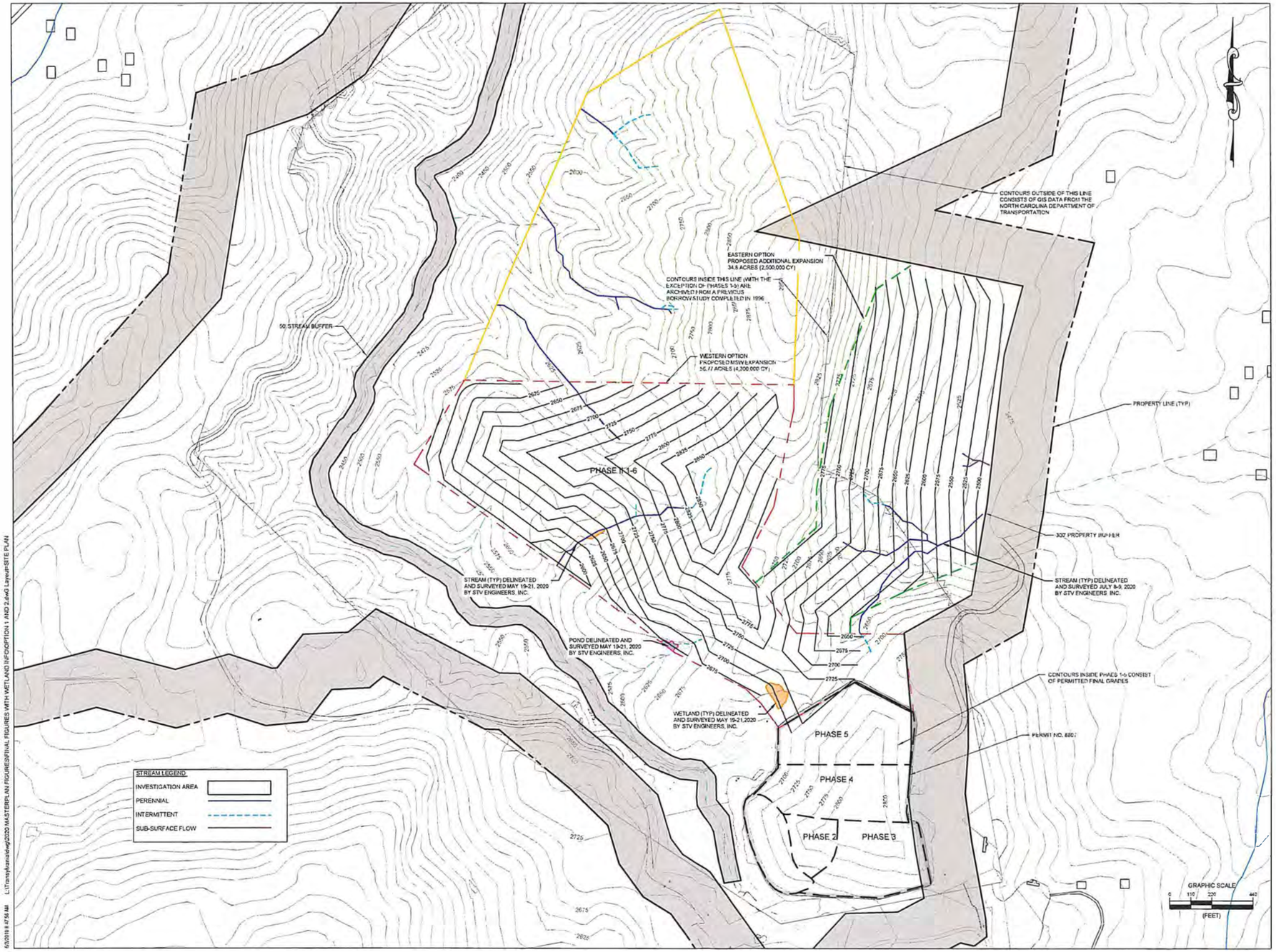
TPO	**JLK**
Approved By:	Date:
MAI	**7/23/2020**

STV Inc. Project No.
4020639

FIGURE 1



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WOODRUFF LANDFILL
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NO	DATE	DESCRIPTION
Revisions		

PROJECT NUMBER
DRAWN BY: RH
REVIEWED BY: LB
ISSUED FOR: REVIEW
DATE: 08/11/20
DRAWING NAME:

WESTERN OPTION AND EASTERN OPTION SITE PLAN

DRAWING NUMBER

1