



Landfill Disposal Efficiency Report



Brunswick County, NC

July 18, 2013

SUBMITTED BY:

Dewberry Engineers Inc.

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Suite 200
Raleigh, NC 27607
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SUBMITTED TO:

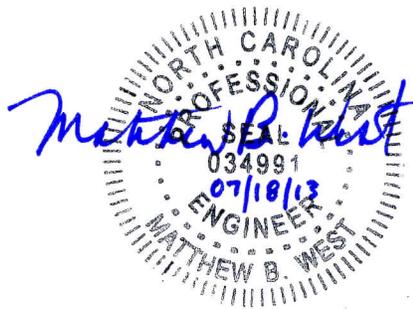
Brunswick County

P.O. Box 249
Bolivia, NC 28422

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TABLE OF CONTENTS

1. INTRODUCTION	1
2. BACKGROUND AND PURPOSE	1
3. DISCUSSION	2
3.1 C&D Debris Waste Stream Summary.....	2
3.2 Occupied Airspace	2
3.3 Useable Airspace	2
3.4 Landfill Disposal Efficiency.....	3
3.5 Remaining Landfill Life.....	4

LIST OF TABLES AND FIGURES

Figure 1. Construction and Demolition Debris Tonnage	4
Table 1. Projection of Remaining Capacity in C&D Debris Landfill.....	5

APPENDICES

Appendix A – C&D Debris Tonnage Report

Appendix B – Efficiency Study Analysis

LIST OF DRAWINGS

<u>Drawing</u>	<u>Content</u>
Drawing 1	Topographic Survey Performed July 3, 2013
Drawing 2	Comparison of July 20, 2012 Survey to July 3, 2012 Survey
Drawing 3	Comparison of July 3, 2013 Survey to Proposed Final Grades (Phase 6A, 6B, and 6C)

1. INTRODUCTION

Dewberry Engineers Inc. (Dewberry) has performed a landfill disposal efficiency report for the Brunswick County C&D Debris Landfill (landfill) which is currently operational. The facility permit number issued by the NC Division of Waste Management for Phases 1-6 is No. 10-07. The facility permit expires on March 28, 2014. This landfill disposal efficiency report evaluates the period from July 20, 2012 to July 3, 2013.

A survey was performed on July 3, 2012 for the Phases 6A and 6B areas. The Phases 6A and 6B areas have been receiving C&D debris since January 2005.

A composite survey was developed by combining the July 3, 2013 survey of these areas with the previous survey. This survey along with the survey dated July 20, 2012 and the final permitted grades for Phases 6A, 6B, and 6C comprise the data set analyzed in this report.

2. BACKGROUND AND PURPOSE

The Municipal Solid Waste portion of the landfill was closed on December 31, 1997 (Permit No. 10-04). Phase 1 of the C&D Debris Landfill was initially permitted, and subsequent phases were permitted as additional capacity was required. The capacity provided by each phase is as follows:

Phase 1 and Phase 1-New	223,500 cy
Phase 3	53,100 cy
Phase 4	133,700 cy
Phase 5	147,000 cy
Phases 6A, 6B, and 6C	<u>588,800 cy</u>
Total	1,146,100 cy

This report includes waste placed into Phase 6A and Phase 6B from July 2012 to July 2013 to determine the landfill efficiency for this period.

Brunswick County (County) entered into a contract with Sandlands Landfill during fiscal year 2007 – 2008. The contract with Sandlands Landfill ended during fiscal year 2011 – 2012 due to Sandlands Landfill ceasing operations. The County is currently diverting a portion of the C&D debris waste stream through the MSW Transfer Station through a contract with Waste Industries. This operation allows the County to divert a portion of the C&D waste stream in order to extend the life of the landfill. C&D waste diversion can continue in this manner as long as the landfill is operational and diversion is permitted by the NC Division of Waste Management.

The purpose of this report is to:

- Estimate the change in total occupied airspace.
- Estimate the total remaining airspace (and the total remaining useable airspace) volume based on the design capacity.
- Estimate the remaining life expectancy of the landfill.

3. DISCUSSION

The July 3, 2013 topographic survey for the landfill is shown on Drawing 1. This survey is a composite survey as noted on Drawing 1. As noted in the Landfill Disposal Efficiency Report – September 2009, dated March 30, 2010, and the Landfill Disposal Efficiency Report – July 2011, dated June 28, 2012, the shelf (bench) located on the north side of the landfill at elevation 80 has not been constructed. This shelf is part of the permit drawings approved by the NC Division of Waste Management in November 2009. There are two potential options that should be considered to add the shelf. Option 1 would require the shelf be constructed at the current grade. Option 2 would require the shelf to be constructed at elevation 80 as shown on Supplement No. 9. We understand that the County is beginning to construct the shelf at the current grade, which is at approximately elevation 115. The addition of the shelf will greatly aid the County establish ground cover during landfill closure.

Also, differential settlement in excess of that typically observed is noted for the C&D debris landfill during this period. Similar differential settlement was noted in the Landfill Disposal Efficiency Report – July 2011, dated June 28, 2012. Differential settlement is expected and should continue to be monitored closely until the C&D debris landfill is closed.

3.1 C&D Debris Waste Stream Summary

The landfill tonnage reports for July 1, 2012 through June 30, 2013 are included in Appendix A. The categories of C&D debris, trailers, asbestos, and shingles are disposed into the landfill. The total C&D debris disposed into the C&D debris landfill for fiscal year 2012 – 2013 is estimated to be 8,145 tons. For the Landfill Disposal Efficiency Report period of July 20, 2012 through July 3, 2013 the total C&D debris disposed into the landfill is estimated to be 7,806 tons.

The total C&D debris received during the fiscal year of July 1, 2012 through June 30, 2013 was 18,986 tons. Of this total, 8,145 tons of C&D debris was disposed into the landfill and 10,841 tons of C&D debris was transferred to a permitted facility off-site. This represents a 15% increase in C&D debris received at the landfill, a 34% decrease in C&D debris disposed into the landfill, and a 159% increase in the C&D debris transferred to a permitted facility off-site compared to the fiscal year July 1, 2011 through June 30, 2012.

To determine the amount of airspace used, surfaces were developed using the July 20, 2012 survey and the July 3, 2013 survey. A three-dimensional comparison (Drawing 2) provided the volume of C&D debris and cover placed for the period between the July 20, 2012 survey and the July 3, 2013 survey. The landfill disposal efficiency was calculated using the July 20, 2012 survey and the July 3, 2013 survey.

To determine the remaining volume of the landfill, a surface was developed using the July 3, 2013 survey to compare against the surface developed from the final permitted grades for Phases 6A, 6B, and 6C. A three-dimensional comparison (Drawing 3) provided the remaining airspace in the landfill.

3.2 Occupied Airspace

From the comparison of surfaces from the July 20, 2012 survey and the July 3, 2013 survey, the total occupied airspace was 17,297 cubic yards (cy). This equates to approximately 1,504 cy/month fill rate for the period July 20, 2012 to July 3, 2013. This comparison is shown on Drawing 2.

3.3 Useable Airspace

From the comparison of surfaces of the July 3, 2013 survey and the final permitted grades of Phases 6A, 6B, and 6C 268,913 cy of total airspace remain. This comparison is shown on Drawing 3. The remaining airspace in Phase 6A and 6B, including the final cap, is approximately 168,865 cy. The remaining airspace in Phase 6C, excluding the final cap, is approximately 100,865 cy.

With the assumptions the final cap for the C&D debris landfill closure will be 3.5 feet deep consisting of intermediate cover, geocomposite liner (GCL), protective cover, and vegetative layer as described in “Supplement No. 9 to the Brunswick County Municipal Solid Waste Landfill Transition Plan” (Supplement No. 9) and the final design surface area is approximately 16 acres for 6A, 6B, and 6C only, the final cap volume for these areas will be approximately 90,740 cy. To determine the useable airspace for these phases, the final cap volume must be subtracted from the available airspace. This equates to 178,173 cy of useable airspace, assuming grades shown in Supplement No. 9 are the final grades. Final grades may have to be adjusted and a revised permit requested to account for any additional volume or other change prior to closure. A permit renewal package will be submitted to the NC Division of Waste Management in September 2013. Any adjustment to final grades will be made at this time and Dewberry will discuss these changes with Brunswick County.

Supplement No. 9, states the landfill will reach its ultimate capacity in 2008. However, the County has seen a mostly declining C&D debris waste stream over the past five to six years. It is important to note that the total C&D debris waste stream increased during fiscal year 2012 – 2013. The County has been transferring C&D debris waste since 2007 (currently through the MSW Transfer Station by Waste Industries). Assuming a flat rate of growth (25,000 tons/year) and no diversion, it is projected that the landfill will reach its ultimate capacity in 2017. Variables that will affect this capacity date include compaction, additional changes in the volume of the C&D debris stream, and operational changes such as C&D transfer and recycling.

3.4 Landfill Disposal Efficiency

The compaction rate for the period between July 20, 2012 and July 3, 2013 is determined by approximating the weight (pounds) of C&D debris per volume (cubic yards) of airspace occupied by C&D debris and daily cover. For the period between July 20, 2012 and July 3, 2013 a prorated weight of 7,806 tons of C&D debris disposed into the landfill will be used. From the comparison of the July 20, 2012 and July 3, 2013 surveys, it was determined 17,297 cy of airspace has been used.

The compaction rate for the period between July 20, 2012 and July 3, 2013 can then be determined as follows:

$$\text{Compaction Rate} = (7,806 \text{ tons} / 17,297 \text{ cy}) * 2,000 \text{ lbs/ton} = 903 \text{ lbs/cy}$$

The efficiency study analysis providing data used and assumptions made is included in Appendix B.

The compaction rate has declined since the Landfill Disposal Efficiency Report – July 2011, date June 28, 2012 (1,091 lbs/cy) and the C&D Debris Landfill Annual Survey, Tonnage and Airspace Analysis, Landfill Disposal Efficiency Analysis, and Annual Report for the Division of Waste Management Letter report, dated July 27, 2012 (1,129 lbs/cy). While the low tonnages being disposed in the C&D debris landfill can pose some operational issues, the County should strive to for a higher compaction rate during the upcoming fiscal year. This will ensure the greatest use is obtained from the remaining useable airspace.

3.5 Remaining Landfill Life

Figure 1 is a plot of total C&D debris received at the C&D debris landfill and the total C&D debris disposed into the C&D debris landfill by time period. The amount of C&D debris received and disposed increased roughly 20% each year between 2001-2002 and 2005-2006. However, for 2006-2007 the amount of C&D debris received and disposed remained almost constant. The amount of C&D debris received and disposed has declined significantly since 2006-2007. It is important to note that the C&D debris waste stream increased by approximately 15% during fiscal year 2012 – 2013. This is the first increase in the C&D debris waste stream observed since fiscal year 2005 – 2006. This increase can likely be attributed to improving economic conditions. However, the C&D debris landfill will remain open for a much longer period than predicted several years ago.

Figure 1.
Construction and Demolition Debris Tonnage

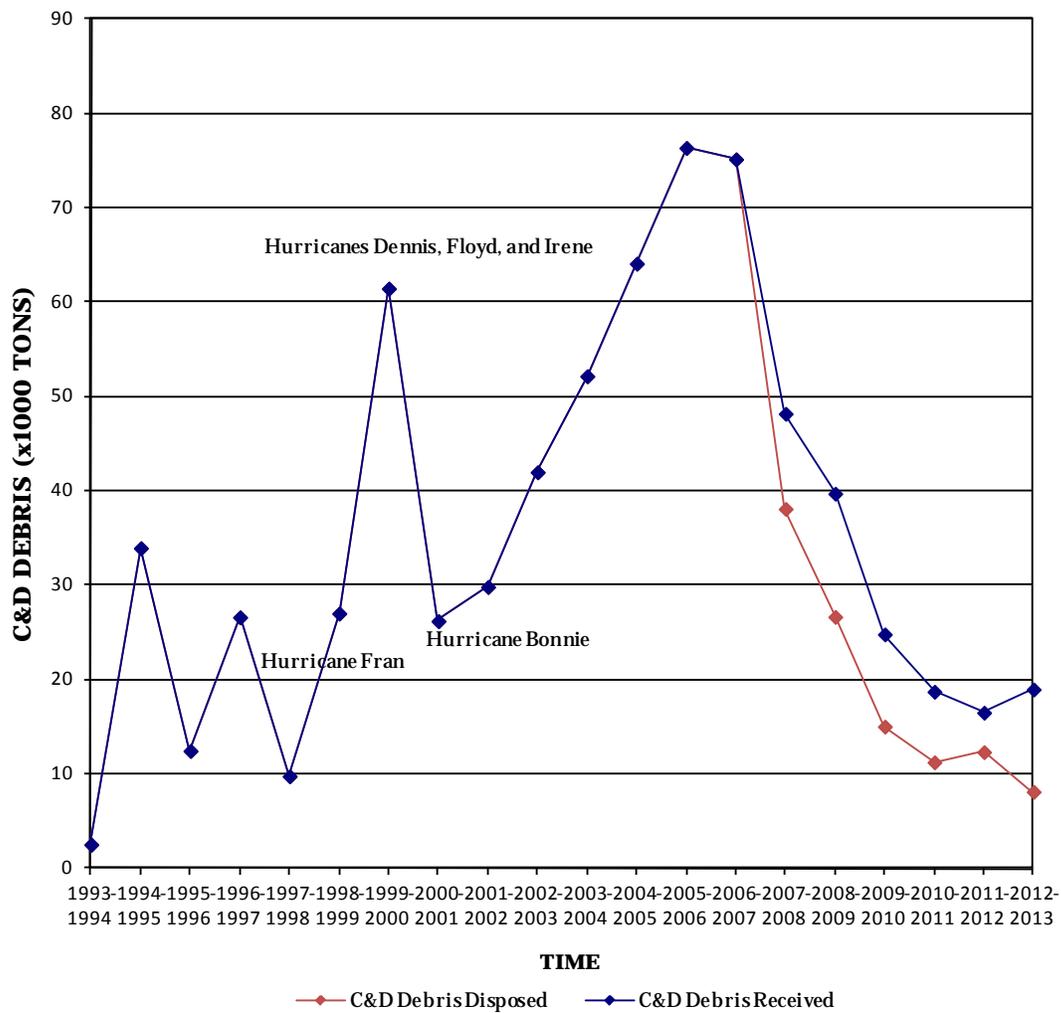


Table 1 provides three different scenarios for C&D debris disposal and a projection of the remaining capacity in the C&D Debris Landfill. A compaction rate of 1,100 lbs/cy and C&D debris disposal of approximately 25,000 tons/year being landfilled (45,500 cy/year) has been assumed.

**Table 1.
Projection of Remaining Capacity in C&D Debris Landfill**

Fiscal Year*	No Waste Stream Diversion (cy)	25% Waste Stream Diversion (cy)	50% Waste Stream Diversion (cy)
2013-2014	178,200	178,200	178,200
2014-2015	132,700	144,100	155,500
2015-2016	87,200	110,000	132,800
2016-2017	41,700	75,900	110,100
2017-2018		41,800	87,400
2018-2019		7,700	64,700
2019-2020			42,000
2020-2021			19,300

* All projections assume no growth in the C&D waste stream.

The remaining useable airspace in the C&D debris landfill is approximately 178,173 cy. It is estimated that the C&D debris landfill will reach its ultimate capacity sometime in 2017 if the C&D debris waste stream growth remains flat and no C&D debris is transferred. The County currently has an operation to divert a portion of the C&D debris waste stream. If 25% of the C&D debris waste stream is diverted and growth remains flat, the landfill will reach its ultimate capacity in 2018. If as much as 50% of the C&D debris waste stream can be diverted and growth remains flat, the landfill will reach its ultimate capacity in 2021.

Brunswick County has amended its C&D debris landfill permit to prohibit sources from outside the County from placing waste in the C&D Debris Landfill. The current facility is permitted through March 28, 2014. The current permit includes the operation of the C&D Debris Landfill, temporary transfer of C&D debris, and the C&D recycling pad. The County has not yet constructed the C&D recycling pad. The County will have to submit an application for a permit renewal no later than September 30, 2013. Additional information on remaining capacity will be provided to Brunswick County after the permit application is completed. Some grades will have to be updated as part of the permit renewal.

Appendix A

C&D Debris Tonnage Report



www.dewberry.com

Appendix A

C&D Tonnage Report for July 1, 2012 - June 30, 2013

MATERIAL	TICKETS	TONS
Trailers-Count	14	63
Trailers-Ton	4	12
C&D Debris	3,478	6,960
Asbestos	25	56
Shingles	683	1,339
Shingles Hauled	12	285
C&D Transferred Off-Site through Transfer Station	5,820	10,555

Total C&D Debris Received (tons)	18,986
Total C&D Debris Transferred Off-Site (tons)	10,841
Total C&D Debris Landfilled (tons)	8,145

	Denotes total C&D debris waste stream - C&D debris received.
	Denotes C&D debris waste stream transferred off-site.
	Denotes C&D debris received and transferred off-site. Must be added to compute total C&D received. Must be subtracted to compute total C&D debris transferred off-site.

Appendix B

Efficiency Study Analysis



Appendix B
Brunswick County Landfill Disposal Efficiency Report
Construction and Demolition Debris
Period: July 20, 2012 - July 3, 2013
Landfill Disposal Efficiency Analysis

	Total Received (Tons)	Hauled (Tons)	Total Landfilled (Tons)	Tons Landfilled per Month	% Hauled
FY 12-13	18,986	10,841	8,145	679	57%

July 20, 2012 - July 3, 2013 (Period evaluated for Landfill Disposal Efficiency Analysis)

11.5 Number of Months Considered for Efficiency Study
 Assume 11.5 month period using FY 12-13 Tonnages

18,195 Tons Received during Efficiency Study Period (July 20, 2012 - July 3, 2013)
 10,389 Tons Hauled during Efficiency Study Period (July 20, 2012 - July 3, 2013)
 7,806 Tons Landfilled during Efficiency Study Period (July 20, 2012 - July 3, 2013)

17,297 Total CY Landfilled during Landfill Disposal Efficiency Period (from volume calculations)

1,504 cy/month fill rate

903 lbs/cy - LANDFILL DISPOSAL EFFICIENCY for period of July 20, 2012 - July 3, 2013

Drawings



www.dewberry.com

REFERENCE NOTES:

- BOUNDARY INFORMATION SHOWN HEREON WAS TAKEN FROM A SURVEY ENTITLED "BRUNSWICK COUNTY LANDFILL" PERFORMED BY BRUNSWICK SURVEYING, INC., THOMAS W. MORGAN, R.L.S. DATED MARCH 21, 1994. THE COMPLETE BOUNDARY IS NOT SHOWN HEREON.
- TOPOGRAPHIC SURVEY SHOWN HEREON FOR PHASE 6A AND PHASE 6B AREAS, PERFORMED BY DEWBERRY ENGINEERS INC. ON JULY 3, 2013. THE YARD WASTE AREA FACILITY AND THE LCID FACILITY TAKEN FROM SURVEY BY DEWBERRY & DAVIS, INC. PERFORMED IN FEBRUARY 2002. TOPOGRAPHIC DATA SHOWN HEREON FOR AREA "B" TAKEN FROM PLAN TITLED "VEGETATIVE COVER AS OF 06-03-99," DATED JUNE, 1999 BY THE ROSE GROUP. THE TOPOGRAPHY FOR ALL LANDFILL AREAS IS NOT SHOWN ON THIS DRAWING.
- THE LOCATION OF THE SWAP SHOP, LCID, SCRAP TIRE COLLECTION FACILITY, WASTE OIL AND ANTIFREEZE COLLECTION FACILITY, AND WHITE GOODS COLLECTION FACILITY ARE APPROXIMATE.
- THE APPROXIMATE LIMITS OF WASTE PLACEMENT IN AREA B WERE TAKEN FROM HAND AUGER BORINGS PERFORMED BY LAW ENGINEERING TO VERIFY THE APPROXIMATE LIMITS.
- LOCATIONS OF SLOPE DRAINS ON MSWLF ARE NOT AS-BUILT.
- LOCATIONS OF MONITORING WELLS ARE NOT AS-BUILT.
- ALL DRAINAGE BASINS, DRAINAGE DITCHES, GRAVEL ROADS, BUILDINGS/STRUCTURES, SEDIMENT TRAPS, CULVERT/DRAINAGE PIPES, SLOPE DRAINS, AND STORMWATER DISCHARGE OUTFALLS ARE SHOWN IN AN APPROXIMATE MANNER ONLY.

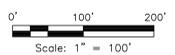
**BRUNSWICK COUNTY
CONSTRUCTION AND DEMOLITION
DEBRIS LANDFILL
2013 LANDFILL DISPOSAL EFFICIENCY REPORT**

1759 MARCH 19, 1756 DRIVE NE
BOLTON, NORTH CAROLINA 28602

SEAL

KEY PLAN

SCALE



No.	DATE	BY	Description

REVISIONS

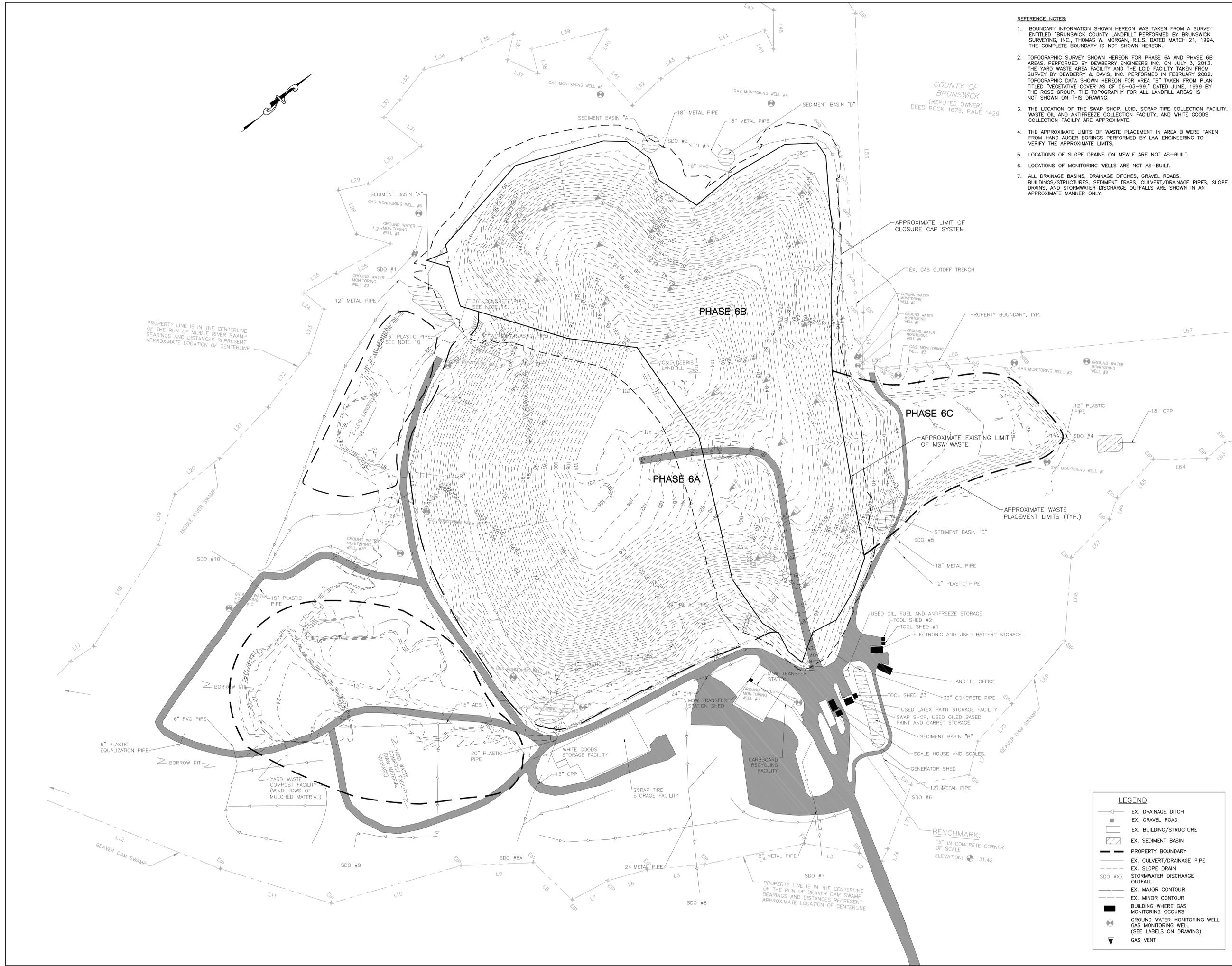
DRAWN BY: BWK
APPROVED BY: MBW
CHECKED BY: MBW
DATE: JULY 2013

TITLE
**TOPOGRAPHIC
SURVEY
PERFORMED
JULY 3, 2013**

PROJECT NO. 50060147

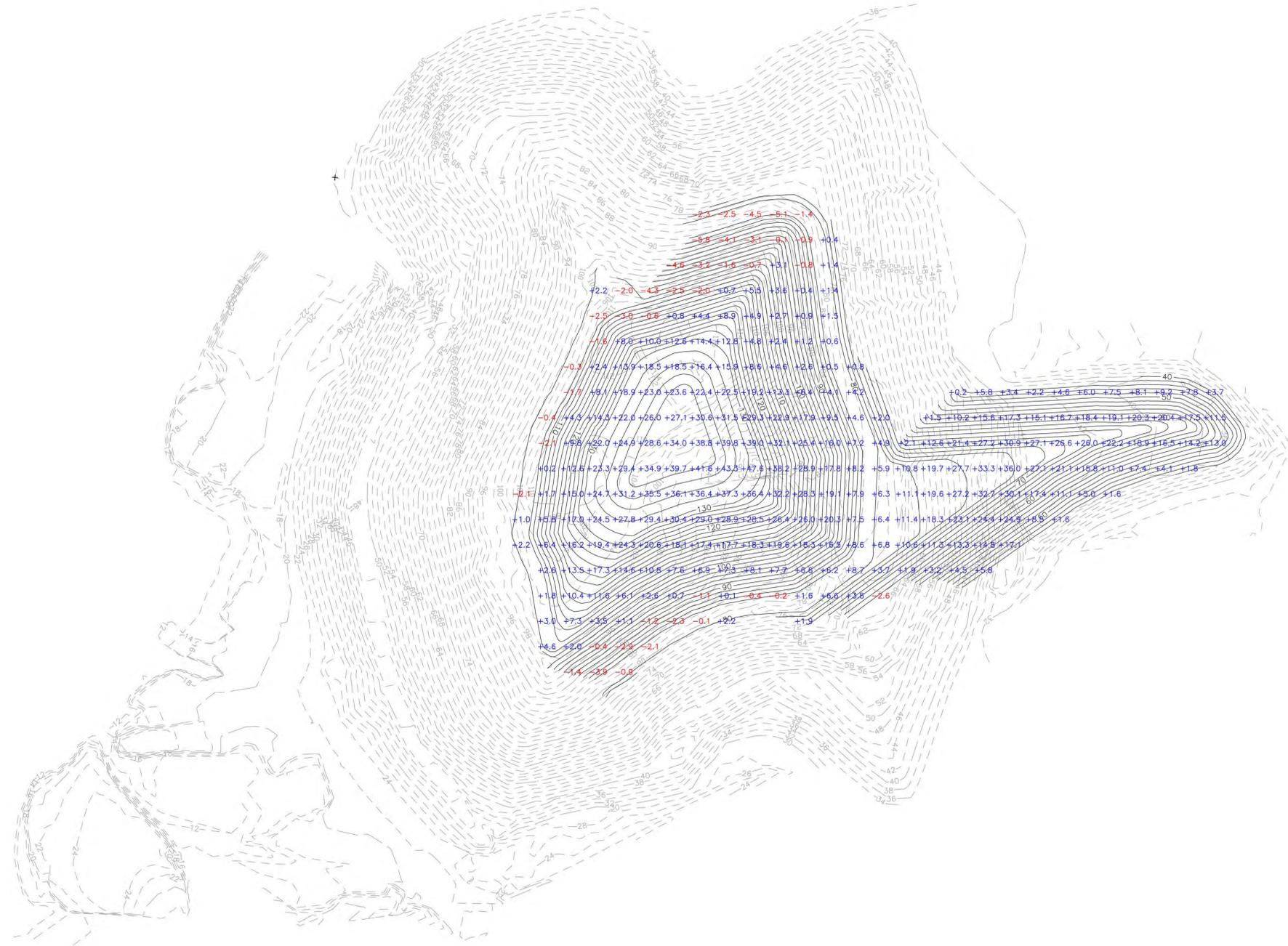
DRAWING 1

SHEET NO. 1 OF 3



LEGEND

- EX. DRAINAGE DITCH
- EX. GRAVEL ROAD
- EX. BUILDING/STRUCTURE
- EX. SEDIMENT BASIN
- PROPERTY BOUNDARY
- EX. CULVERT/DRAINAGE PIPE
- EX. SLOPE DRAIN
- STORMWATER DISCHARGE OUTFALL
- EX. MAJOR CONTOUR
- EX. MINOR CONTOUR
- BUILDING WHERE GAS MONITORING OCCURS
- GROUND WATER MONITORING WELL (SEE LABELS ON DRAWING)
- GAS VENT



LEGEND:
 --- CONTOURS FROM JULY 3, 2012 SURVEY
 --- PROPOSED FINAL CONTOURS
 +/- DIFFERENCE IN ELEVATION (FT)

NOTE: VOLUME CALCULATIONS BASED ON 10'x10' GRID AREA.
 GRID LABELS SHOWN ON THIS DRAWING ARE BASED ON 50'x50'
 GRID AREA FOR CLARITY PURPOSES ONLY.

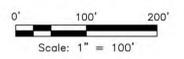
**BRUNSWICK COUNTY
 CONSTRUCTION AND DEMOLITION
 DEBRIS LANDFILL
 2013 LANDFILL DISPOSAL EFFICIENCY REPORT**

179 MARCH 9, 1754 DRIVE NE
 BOLIVIA, NORTH CAROLINA 28022

SEAL

KEY PLAN

SCALE



No.	DATE	BY	Description
REVISIONS			

TITLE

**COMPARISON OF
 JULY 3, 2012 SURVEY TO
 PROPOSED FINAL GRADES
 (PHASE 6A, 6B, AND 6C)**

PROJECT NO. 50060147

DRAWING 3