SEA APPLICATION ACCEPTED: May 20, 2013
SEA APPLICATION AMENDED: November 8, 2013 & January 6, 2014
2232 APPLICATION ACCEPTED: December 12, 2013
PLANNING COMMISSION: February 27, 2014
BOARD OF SUPERVISORS: Not yet scheduled

County of Fairfax, Virginia

FEBRUARY 13, 2014

STAFF REPORT

SPECIAL EXCEPTION AMENDMENT SEA 80-L/V-061-02
APPLICATION 2232-V13-18

MOUNT VERNON DISTRICT

APPLICANT:	Furnace Associates, Inc.
ZONING:	R-1 (Residential, 1 du/ac)
PARCELS:	113-1 ((1)) part 5, 7, 8 113-3 ((1)) 1, 2, 4
ACREAGE:	249.82 acres
INTENSITY:	8,800 square feet
PLAN MAP:	Private Recreation and Private Open Space
SE CATEGORY:	Landfill and Electrical Generating Facilities (Category 2), Private Clubs (Radio Controlled Aircraft Field) (Category 3), Baseball Hitting Range and Golf Driving Range (Category 5)
PROPOSAL:	To amend SEA 80-L/V-061 to extend the landfill operation end date and to permit electrical generating facilities, a radio controlled aircraft field, a baseball hitting range, and/or golf driving range.

STAFF RECOMMENDATIONS:

Staff recommends that the Planning Commission find that the solar and wind electrical generating facilities proposed under 2232-V13-18 satisfies the conditions of location,

Mary Ann Tsai, AICP

Department of Planning and Zoning
Zoning Evaluation Division
12055 Government Center Parkway, Suite 801
Fairfax, Virginia 22035-5509
Phone 703-324-1290 FAX 703-324-3924
www.fairfaxcounty.gov/dpz/

character, and extent as specified in Section 15.2-2232 of the Code of Virginia, as amended, and is in accord with the Comprehensive Plan.

Staff recommends approval of SEA 80-L/V-061-02, subject to the approval of the proposed development conditions contained in Appendix 1.

Staff recommends approval of the following waivers and modifications:

- Modification of Par. 9 of Sect. 9-205 of the Zoning Ordinance to permit improvements less than 20 years after the termination of landfill operations;
- Waiver of Par. 11 of Sect. 11-102 of the Zoning Ordinance for a dustless surface;
- Waiver of the peripheral parking lot landscaping requirement pursuant to Par. 6 of Sect. 13-202 of the Zoning Ordinance;
- Waiver of the interior parking lot landscaping requirement pursuant to Par. 3 of Sect. 13-203 of the Zoning Ordinance;
- Modification of the transitional screening and waiver of the barrier requirements pursuant Sect. 13-305 of the Zoning Ordinance to permit the landscaping as shown on the SEA Plat;
- Waiver of Par. 2 of Sect. 17-201 of the Zoning Ordinance for an 8-foot wide major paved trail along the east side of Furnace Road, as shown on the Countywide Trails Plan; and
- Board of Supervisors' approval to permit off-site vehicular parking on Tax Map Parcels 113-1 ((1)) 12 and 13 for the Observation Point, pursuant to Sect. 11-102 of the Zoning Ordinance.

Staff recommends denial of the following requested waivers and modifications:

- Modification of the invasive species management plan requirement pursuant to Section 12-0404.2C of the Public Facilities Manual; and
- Modification of the submission requirements for a tree inventory and condition analysis pursuant to Section 12-0503.3 of the Public Facilities Manual.

It should be noted that it is not the intent of staff to recommend that the Board of Supervisors, in adopting any conditions, relieve the applicant/owner from compliance with the provisions of any applicable ordinances, regulations, or adopted standards.

It should be further noted that the content of this report reflects the analysis and recommendation of staff; it does not reflect the position of the Board of Supervisors.

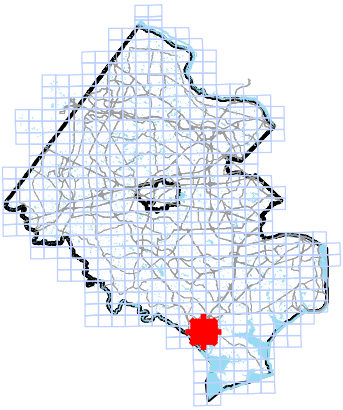
The approval of this application does not interfere with, abrogate or annul any easement, covenants, or other agreements between parties, as they may apply to the property subject to this application.

For information, contact the Zoning Evaluation Division, Department of Planning and Zoning, 12055 Government Center Parkway, Suite 801, Fairfax, Virginia 22035-5505, (703) 324-1290.

Americans with Disabilities Act (ADA): Reasonable accommodation is available upon 48 hours advance notice. For additional information on ADA call (703) 324-1334 or TTY 711 (Virginia Relay Center).

Special Exception Amendment

SEA 80-LV-061-02



Applicant: FURNACE ASSOCIATES, INC.
Accepted: 01/06/2014- AMENDED 05/20/2013 11/08/2013

Proposed: SEA to allow expanded operation of a construction debris landfill with no change in maximum elevation; green energy electrical generating facilities and quasi-public use - private club/public benefit associations - and/or golf driving range and/or outdoor baseball hitting range uses

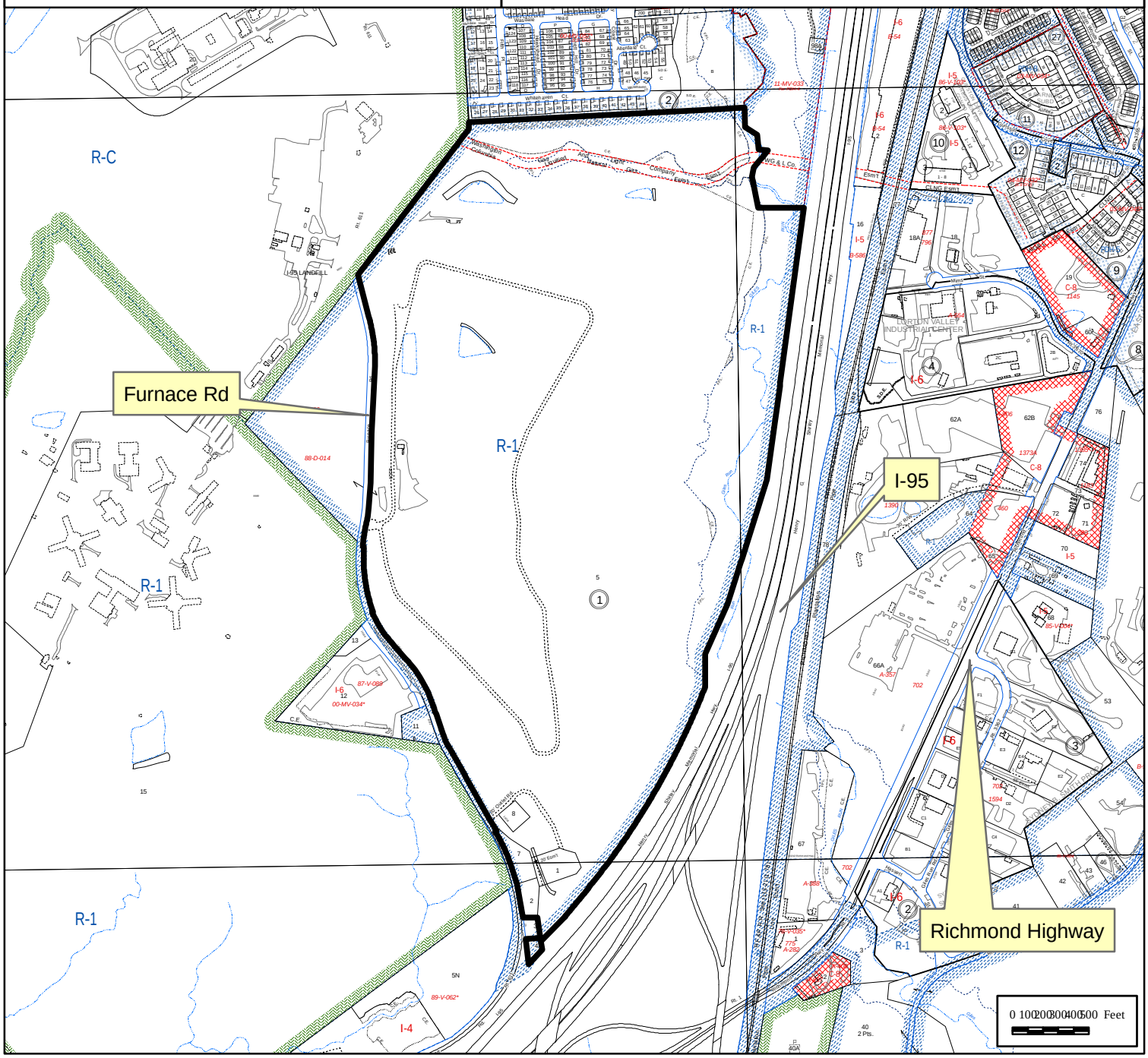
Area: 249.82 AC OF LAND; DISTRICT - MOUNT VERNON

Zoning Dist Sect: 03-010403-010403-010403-010403-010403-0104

Art 9 Group and Use: 2-01 2-03 5-39 3-07 3-07 5-37

Located: 10001, 10201, 10209, 10215, 10219 AND 10229 FURNACE ROAD, LORTON, VA 22079

Zoning: R- 1
Plan Area: 4,
Overlay Dist:
Map Ref Num: 113-1- /01/ /0005 (partial) /01/ /0007 /01/ /0008
113-3- /01/ /0001 /01/ /0002 /01/ /0004



LORTON GREEN ENERGY PARK
AND
DEBRIS LANDFILL

SPECIAL EXCEPTION AMENDMENT PLAT

SEA 80-L/V-061-2

FAIRFAX COUNTY, VIRGINIA

MARCH 22, 2013

REVISED MAY 14, 2013

REVISED SEPTEMBER 11, 2013

REVISED OCTOBER 7, 2013

REVISED NOVEMBER 1, 2013

REVISED DECEMBER, 10, 2013

REVISED JANUARY 22, 2014

OWNER/APPLICANT

FURNACE ASSOCIATES, INC.
11220 Assett Loop
Suite 201
Manassas, VA 20109
Telephone 703.378.0600
Fax 703.378.0800

ATTORNEY/AGENT

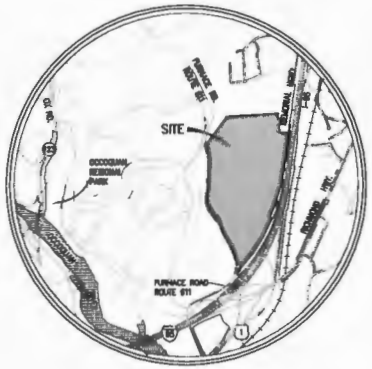
HUNTON & WILLIAMS LLP
1751 Pinnacle Drive
Suite 1700
McLean, VA 22102
Telephone 703.714.7400
Fax 703.714.7410

ENGINEER/LANDSCAPE ARCHITECT/PLANNER

THE BC CONSULTANTS
12600 Fair Lakes Circle
Suite 100
Fairfax, VA 22033
Telephone 703.449.8100
Fax 703.449.8108

ENGINEER/ENERGY CONSULTANTS

GEOSYNTEC CONSULTANTS
9211 Arboretum Parkway
Suite 200
Richmond, VA 23236
Telephone 804.767.2206
Fax 804.767.2182



VICINITY MAP
SCALE: 1" = 2,000'

SHEET INDEX

Sheet List Table

Sheet Number	Sheet Title
1	COVER SHEET
2	PHASING PLAN AND TABULATIONS
3	GENERAL NOTES AND COMMENTS
4	EXISTING CONDITIONS
5	EXISTING VEGETATION MAP
6	PHASE ONE OPERATIONS AREAS
7	PHASE TWO OPERATIONS AREAS
8	PHASE THREE OPERATIONS AREAS
9	PHASE FOUR OPERATIONS AREAS
10	PHASE FIVE OPERATIONS AREAS
11	PHASE FIVE - AT COMPLETION OF OPERATIONS
12	PHASE FIVE - AT COMPLETION OF OPERATIONS
13	PHASE FIVE - AT COMPLETION OF OPERATIONS
14	SITE DETAILS
15	SITE DETAILS
16	PHASE ONE LANDSCAPE PLAN
17	PHASE TWO LANDSCAPE PLAN
18	PHASE THREE LANDSCAPE PLAN
19	PHASE FOUR LANDSCAPE PLAN
20	PHASE FIVE LANDSCAPE PLAN
21	NORTHERN TRANSITIONAL SCREENING AREA
22	LANDSCAPE DETAILS
23	LANDSCAPE DETAILS
24	TREE PRESERVATION PLAN
25	TREE PRESERVATION DETAILS
26	QUEUING AREAS
27	BMP PLAN
28	OVERALL STORMWATER MANAGEMENT PLAN
29	OVERALL STORMWATER MANAGEMENT
30	STORMWATER MANAGEMENT POND 2
31	OUTFALL CROSS SECTIONS POND 2
32	STORMWATER MANAGEMENT POND 3
33	OUTFALL CROSS SECTIONS POND 3
34	STORMWATER MANAGEMENT POND 8
35	OUTFALL CROSS SECTIONS POND 8
36	STORMWATER MANAGEMENT POND 9
37	OUTFALL CROSS SECTIONS POND 9
38	OVERALL DRAINAGE AREA MAP
39	PHASE ONE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
40	PHASE TWO LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
41	PHASE THREE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
42	PHASE FOUR LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
43	PHASE FIVE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
44	SIGHT DISTANCE
45	PHASE SIX - CATEGORY 3 AND/OR 5 END USES

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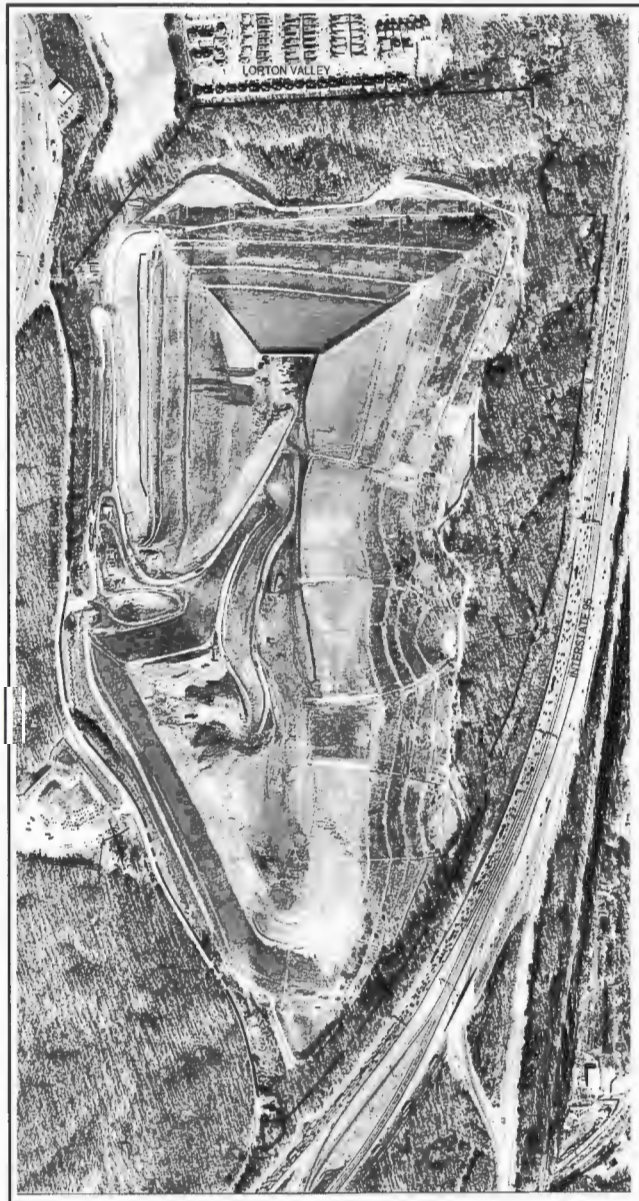


AERIAL PHOTOGRAPH

SCALE: 1"=300'

SITE TABULATIONS:

PARCELS:	FAIRFAX COUNTY TAX ASSESSMENT MAPS: 113-1 ((1)) PARCELS 7, 8 AND PART OF PARCEL 5; 113-3 ((1)) PARCELS 1, 2 AND 4
GROSS SITE AREA (G.S.A.):	249.82 Ac.± (10,882,058 s.f.±)
EXISTING ZONING:	R-1
EXISTING USE:	DEBRIS LANDFILL
PROPOSED USE (DURING LANDFILL OPERATIONS AND PRIOR TO "POST-CLOSURE PERIOD"):	CATEGORY TWO DEBRIS LANDFILL AND ELECTRIC GENERATING FACILITIES (1*); OBSERVATION POINT (1*)
PROPOSED USE (AFTER LANDFILL OPERATIONS, DURING "POST-CLOSURE PERIOD" AND CONTINUING PAST DEQ RELEASE) (8*):	CATEGORY 2 DEBRIS LANDFILL AND POTENTIAL ELECTRIC GENERATING FACILITIES (CATEGORY TWO USES), CATEGORY THREE QUASI-PUBLIC USES PRIVATE CLUB AND/OR PUBLIC BENEFIT ASSOCIATIONS (2*) AND/OR CATEGORY FIVE OUTDOOR BASEBALL HITTING RANGE (PHASES 5 AND 6) AND/OR GOLF DRIVING RANGE (2*); OBSERVATION POINT ONLY UNTIL RELEASE BY DEQ.
TOTAL GROSS FLOOR AREA OF EXISTING STRUCTURES:	5,000 s.f. ±
EXISTING FLOOR AREA RATIO:	0.00046
TOTAL GROSS FLOOR AREA OF PROPOSED STRUCTURES (ONE OPERATIONS TRAILER AT END OF PHASE 5; ONE BASEBALL HITTING RANGE MAINTENANCE AND OPERATIONS STRUCTURE):	2,600 s.f. ±
TOTAL GROSS FLOOR AREA OF PROPOSED STRUCTURES (TWO OPERATIONS/MAINTENANCE STRUCTURE FOR PHASE 6):	1,300 s.f. ± (3*)
PROPOSED FLOOR AREA RATIO (AT END OF PHASE 5):	0.00023
PROPOSED FLOOR AREA RATIO (PHASE 6):	0.00012
LOADING SPACES REQUIRED FOR PHASES 1-5 (FOR LANDFILL OPERATIONS AND GREEN ENERGY USES):	2 (4*)
LOADING SPACES PROVIDED FOR PHASES 1-5 (FOR LANDFILL OPERATIONS AND GREEN ENERGY USES):	2 (4*)
LOADING SPACES REQUIRED FOR PHASES 6 (FOR END USES AND MAINTENANCE):	0 (4*)
LOADING SPACES PROVIDED FOR PHASE 6 (FOR END USES AND MAINTENANCE):	0 (4*)
PARKING SPACES REQUIRED FOR PHASES 1-5 (FOR LANDFILL OPERATIONS, MAINTENANCE, BASEBALL HITTING RANGE AND GREEN ENERGY USES):	42 (4*)
PARKING SPACES PROVIDED FOR PHASES 1-5 (FOR LANDFILL OPERATIONS, MAINTENANCE, BASEBALL HITTING RANGE AND GREEN ENERGY USES):	42 (4*)
PARKING SPACES REQUIRED AT THE END OF PHASE FIVE:	34 (4*)
PARKING SPACES PROVIDED AT THE END OF PHASE FIVE:	34 (4*)
PARKING SPACES REQUIRED FOR PHASE 6 (FOR END USES AND MAINTENANCE):	78 (4*)
PARKING SPACES PROVIDED FOR PHASE 6 (FOR END USES AND MAINTENANCE):	78 (4*)
MAXIMUM HEIGHT OF STRUCTURE ALLOWED FOR ALL PHASES:	60'
MAXIMUM HEIGHT OF STRUCTURE PROPOSED FOR PHASES 1-5:	180' (5*)
MAXIMUM HEIGHT OF STRUCTURE PROPOSED FOR PHASE 6 (EXCEPT FOR ACCESSORY CONTAINMENT NETS AND POLES):	15' ±
OPEN SPACE REQUIRED/PROVIDED:	NOT APPLICABLE

(1) PHASES 1 THROUGH 5.
(2) PHASE 6 (AFTER LANDFILL CLOSURE AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) RELEASE. SEE SHEET 46 FOR ADDITIONAL INFORMATION.)
(3) PHASE 5 STRUCTURES TO BE REMOVED AT THE BEGINNING OF PHASE 6 (EXCEPT THE BASEBALL HITTING RANGE, IF ALLOWED BY DEQ DURING PHASE 5, MAY REMAIN IN PHASE 6).
(4) BASED ON A REVIEW BY THE DIRECTOR.
(5) THE THREE INITIAL WIND TURBINES DURING PHASES 1-4 ARE DEEMED "ACCESSORY USES". THE POTENTIAL 12 WIND TURBINES SHOWN DURING PHASE 5 ARE CONTINGENT UPON BOARD OF SUPERVISOR'S APPROVAL OF A ZONING ORDINACE AMENDMENT. PER ZONING ORDINANCE SECTION 9-807.
(6) USES SHOWN PRIOR TO DEQ RELEASE MAY BE PROVIDED ONLY AS MAY BE APPROVED BY DEQ.

NOTE: PER ZONING ORDINANCE SECTION 11-102, THE APPLICANT REQUESTS BOARD OF SUPERVISORS' APPROVAL OF OFFSITE PARKING FOR THE OBSERVATION POINT (ACCESSORY USE) ON TAX ASSESSMENT MAP NO. 113-1 ((1)), PARCELS 12 AND 13 SUBJECT TO PCA APPLICATION 2000-MV-034. SEE NOTE 21 ON SHEET 3.

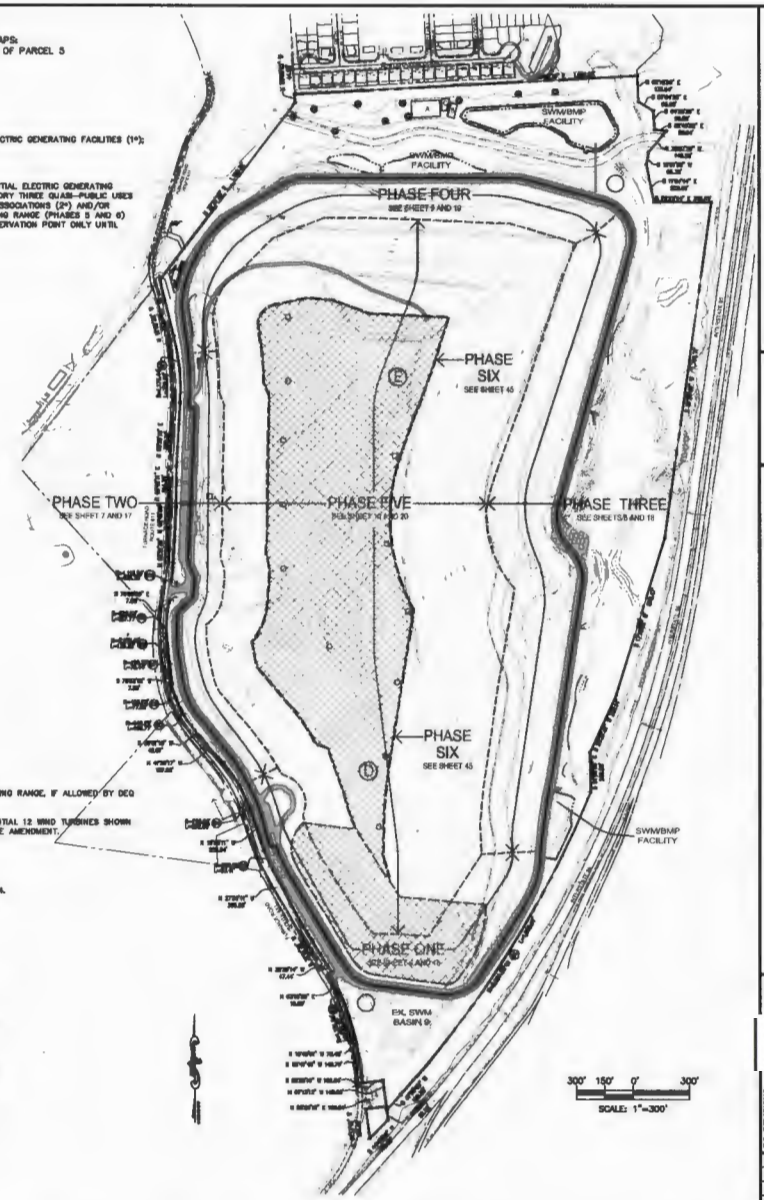
LEGEND:

- (A) APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- (B) APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- (C) APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- ○ APPROXIMATE LOCATION OF POTENTIAL WIND TURBINES (BY APPLICANT/OWNER AND/OR OTHERS)
- ◉ APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- 100-YR. FLOODPLAIN
- EQC/RPA
- APPROXIMATE LOCATION OF PROPOSED VEGETATED LANDFILL BERM
- POTENTIAL AREAS FOR SOLAR PANELS IN PHASE 5, AND FOR SOUTHERN 10 ACRES ONLY IN PHASES 4 AND 6 (BY APPLICANT/OWNER AND/OR OTHERS)
- (D) OBSERVATION POINT (PHASES 1 THROUGH 4)
- (E) OBSERVATION POINT** (PHASE 5 THROUGH POST CLOSURE)

** OBSERVATION POINT WILL BE RELOCATED AS REQUIRED DURING PHASE 5 TO ALLOW ONGOING LANDFILL OPERATIONS.

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	BEARING	CHORD	DELTA
C1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



LORTON GREEN ENERGY PARK AND DEBRIS LANDFILL PHASING PLAN

SCALE: 1"=300'

REFER TO SHEETS 6 THROUGH 13 AND SHEET 45 TO IDENTIFY THE FACILITIES PROVIDED DURING EACH PHASE.

BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
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(703)449-8100 (703)449-8106 (Fax)
www.bcccon.com

SPECIAL EXCEPTION AMENDMENT
PHASING PLAN AND TABULATIONS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 8-15-2013
REVISED 10-7-2013
REVISED 11-5-2013
REVISED 11-15-2013
REVISED 1-8-2014

PARKER & ASSOCIATES, INC.
11220 ASHETT LOOP
SUITE 201
FAIRFAX STATION, VIRGINIA 22039

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 2 OF 46
CO. NO. SEA 60-L/V-061-2
CAD NAME: SE5117COMP
LAYOUT: COMPOSITE
FILE NO. 05117.08-00

GENERAL NOTES:

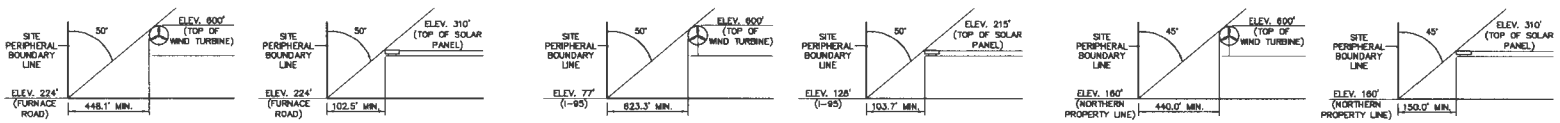
1. THIS APPLICATION SEEKS TO AMEND PREVIOUSLY APPROVED SPECIAL EXCEPTION SEA 80-L/V-081 PURSUANT TO SECTIONS 3-104, 9-200, 9-300 AND 9-500 OF THE ZONING ORDINANCE IN ORDER TO EXTEND THE USEFUL LIFE OF THE EXISTING CONSTRUCTION DEMOLITION AND DEBRIS (CDD) LANDFILL TO ALLOW THE ESTABLISHMENT OF RENEWABLE ENERGY ELECTRICAL GENERATING FACILITIES BY THE APPLICANT/OWNER AND/OR OTHERS, AND ALLOW CATERGORY 3-QUASI PUBLIC USE PRIVATE CLUB/ PUBLIC BENEFIT ASSOCIATIONS AND/OR CATEGORY 5-OUTDOOR BASEBALL HITTING RANGE AND/OR GOLF DRIVING RANGE USES. NO INCREASE IN THE MAXIMUM HEIGHT OF THE LANDFILL (FINAL DEBRIS ELEVATION) IS BEING REQUESTED IN THIS APPLICATION.
2. THE PROPERTY DELINEATED ON THIS SPECIAL EXCEPTION AMENDMENT PLAT IS IDENTIFIED AS FAIRFAX COUNTY TAX ASSESSMENT MAP #113-1 ((1)), PARCELS 7, 8 AND PART OF PARCEL 5, AND AS MAP #113-3 ((1)), PARCELS 1, 2 AND 4 AND IS ZONED R-1.
3. THE BOUNDARY INFORMATION SHOWN HEREON IS BASED UPON A BOUNDARY SURVEY PROVIDED BY WILLIAM H. GORDON ASSOCIATES, INC. (CHANTILLY, VA), DATED FEBRUARY 2004 AND FIELD VERIFIED BY BC CONSULTANTS IN APRIL 2007.
4. THE TOPOGRAPHIC INFORMATION SHOWN HEREON IS FROM AN AERIAL SURVEY CONDUCTED BY AERO-METRIC AND IS COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED MAY 3, 2012. THE SURVEY IS BASED UPON NAD 83 (NORTH ZONE) HORIZONTAL DATUM AND NGS MEAN SEA LEVEL VERTICAL DATUM. THE TOPOGRAPHY IS SHOWN AT TWO (2) FEET CONTOUR INTERVALS.
5. THE PROPERTY SHOWN ON THIS PLAT IS IN THE MOUNT VERNON MAGISTERIAL DISTRICT, OCCOQUAN SEWER SHED AND THE MILL BRANCH WATERSHED.
6. THIS DEVELOPMENT IS IN CONFORMANCE WITH THE RECOMMENDATIONS OF THE FAIRFAX COUNTY COMPREHENSIVE PLAN AND CONFORMS WITH THE PROVISIONS OF ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS AND CONDITIONS (INCLUDING SECTIONS 9-201 THROUGH 9-205, 9-300 AND 9-500 OF THE FAIRFAX COUNTY ZONING ORDINANCE) WITH THE EXCEPTION OF THE FOLLOWING WAIVER AND MODIFICATION REQUESTS. SEE "APPLICANT'S STATEMENT" AND "SE STANDARDS ANALYSIS" WHICH HAVE BEEN FILED UNDER SEPARATE COVER.
   - MODIFICATION AND/OR WAIVER OF THE TRANSITIONAL SCREENING AND BARRIER REQUIREMENTS TO THE NORTH, EAST, SOUTH AND WEST TO THAT AS SHOWN ON THE PLAT PURSUANT TO ARTICLE 13, SECTION 13-305, PARAGRAPHS 3, 5 7, 11 12 AND 14 OF THE FAIRFAX COUNTY ZONING ORDINANCE. SEE SHEET 21 FOR A DETAILED DEPICTION OF PROPOSED SCREENING TO BE PROVIDED TO THE NORTH.
   - WAIVER OF THE COUNTYWIDE TRAILS PLAN IS HEREBY REQUESTED. SEE GENERAL NOTE 7 BELOW.
   - WAIVER OF THE DUSTLESS SURFACE REQUIREMENTS FOR THE GRAVEL ACCESS ROADS AND PARKING AREAS IN ALL PHASES.
   - WAIVER OF PARAGRAPH 9 OF SECTION 9-205 OF THE ZONING ORDINANCE IS REQUESTED TO PERMIT IMPROVEMENTS AS DEPICTED ON THE SEA-2 PLAT WHICH ARE PROPOSED AFTER TERMINATION OF LANDFILL OPERATIONS AND PRIOR TO DEQ RELEASE. THESE IMPROVEMENTS SHALL INCLUDE ALL THOSE SHOWN ON THE PLAT, SUCH AS THE OBSERVATION POINT, TRAILER, GREEN ENERGY USES AND ACTIVE RECREATION USES, AS MAY BE APPROVED BY DEQ.
   - GIVEN THE UNUSUAL NATURE OF LANDFILL OPERATIONS, THE AMOUNT OF UNDISTURBED AREA AND THE SIZE OF THE SITE, THE APPLICANT REQUESTS THAT THE BOARD OF SUPERVISORS DIRECTS THE DIRECTOR OF DPWES TO MODIFY THE REQUIREMENTS OF PFM SECTION 12-0404.2C AND TO WORK WITH THE APPLICANT TO IMPLEMENT A REASONABLE INVASIVE SPECIES MANAGEMENT PLAN THAT IS COST EFFECTIVE AND LIMITED IN SCOPE.
   - PER ZONING ORDINANCE SECTION 11-102, THE APPLICANT REQUESTS BOARD OF SUPERVISORS' APPROVAL OF OFFSITE PARKING FOR THE OBSERVATION POINT (ACCESSORY USE) ON TAX ASSESSMENT MAP NO. 113-1 ((1)), PARCELS 12 AND 13, SUBJECT TO PCA APPLICATION 2000-MV-034.
   - MODIFICATION OF THE 35' TRANSITIONAL SCREENING TO THAT SHOWN ON PLAT AND WAIVER OF THE BARRIER REQUIREMENT FOR PHASES 5 AND 8 RECREATION USES PURSUANT TO PARAGRAPHS 3, 11 AND 12 OF SECTION 13-305 OF THE ZONING ORDINANCE.
   - WAIVER OF INTERIOR AND PERIPHERAL PARKING LOT LANDSCAPING REQUIREMENTS IN ALL PHASES GIVEN THE UNIQUE NATURE OF THE USES AND ELEVATION OF THE PROPOSED RECREATIONAL USES.
7. THE COUNTYWIDE TRAILS PLAN RECOMMENDS AN EIGHT FOOT (8') WIDE ASPHALT TRAIL ON THE EAST SIDE OF FURNACE ROAD. A WAIVER OF SAID TRAIL IS HEREBY REQUESTED, AS GRANTED PREVIOUSLY BY THE BOARD OF SUPERVISORS IN SEA 80-L/V-081-1, THE LIMITED SPACE AND ON-SITE VEHICULAR ACTIVITY BETWEEN THE RIGHT-OF-WAY AND THE LANDFILL BERM, BECAUSE SUCH IMPROVEMENT WOULD NOT CONNECT TO ANY PORTION OF AN ESTABLISHED TRAIL SYSTEM, AND A TRAIL HAS BEEN INSTALLED ON THE WEST SIDE OF FURNACE ROAD ALONG PARCELS 12 AND 13.
8. THE FAIRFAX COUNTY WATER AUTHORITY IS THE PUBLIC WATER SUPPLY AGENCY FOR THIS DEVELOPMENT. WATER WILL BE PROVIDED TO THE SITE BY CONNECTING TO AN EIGHT (8) INCH WATERLINE LOCATED IN FURNACE ROAD. THE COUNTY OF FAIRFAX IS THE SANITARY SEWER SUPPLY AGENCY FOR THIS DEVELOPMENT AND CURRENTLY PROVIDES SERVICE TO THE SITE.
9. THIS PLAT SHOWS ALL KNOWN (WITHOUT THE BENEFIT OF TITLE REPORT INFORMATION) EXISTING UNDERGROUND UTILITIES AND ALL EXISTING UTILITY EASEMENTS OF 25' OR MORE. THE LOCATIONS OF THE EASEMENTS SHOWN ARE FROM TAX RECORDS AND/OR DEEDS AND INFORMATION OF RECORD AND SHOULD NOT BE REGARDED AS CORRECT AND FINAL.
10. THIS PLAT DOES NOT SHOW PROPOSED UTILITIES. ALL NECESSARY PUBLIC UTILITIES ARE READILY ACCESSIBLE TO THE SITE AND WILL BE EXTENDED BY THE DEVELOPER OR UTILITY COMPANY. UTILITY PLANS AND PROFILES WILL BE SUBMITTED IN THE FUTURE FOR CONSTRUCTION PURPOSES. THE BC CONSULTANTS, INC. ASSUMES NO RESPONSIBILITY FOR CONSTRUCTION WITH THESE PLANS.
11. HAZARDOUS AND/OR TOXIC SUBSTANCES THAT ARE CURRENTLY STORED AND CONTAINED ON THE SITE ARE LIMITED TO HYPOCHLORITE, USED FOR LEACHATE TREATMENT AND DIESEL AND OTHER PETROLEUM PRODUCTS THAT ARE USED FOR THE GENERAL OPERATIONS OF THE LANDFILL AND FOR LANDFILL OWNED EQUIPMENT AND VEHICLES. THESE SUBSTANCES WILL BE REMOVED UPON RELEASE BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY. METHODS FOR THEIR REMOVAL AND/OR DISPOSAL SHALL ADHERE TO COUNTY, STATE AND/OR FEDERAL LAW.
12. THERE ARE NO KNOWN GRAVES OR PLACES OF BURIAL ON SITE.
13. THE PROPOSED LIMITS OF CLEARING AND GRADING ARE SHOWN ON THE PLAT. THESE LIMITS ARE APPROXIMATE AND SUBJECT TO ADJUSTMENT AT THE TIME OF FINAL GRADING AND ENGINEERING. WHERE THE LIMITS OF CLEARING AND GRADING ARE SHOWN ADJACENT TO A PROPERTY LINE, IT SHOULD BE ASSUMED THAT THE LIMITS EXTEND TO THE PROPERTY LINE.
14. PARKING SPACES ARE AS SHOWN ON THE PLAT AND WILL BE PROVIDED IN ACCORDANCE WITH THE PROVISIONS OF ARTICLE 11 OF THE ZONING ORDINANCE. SEE GENERAL NOTE 21 BELOW RE: OFF-SITE PARKING FOR "OBSERVATION POINT".
15. IN ACCORDANCE WITH PARAGRAPH 4 OF SECTION 9-004 OF THE ZONING ORDINANCE, MINOR MODIFICATIONS TO THE APPROVED SPECIAL EXCEPTION MAY BE PERMITTED WHICH IT IS DETERMINED BY THE ZONING ADMINISTRATOR THAT THEY ARE IN SUBSTANTIAL CONFORMANCE WITH THE APPROVED SPECIAL EXCEPTION AND ARE IN RESPONSE TO ISSUES OF TOPOGRAPHY, DRAINAGE, UNDERGROUND UTILITIES, STRUCTURAL OR OTHER SAFETY, LAYOUT, DESIGN, VEHICULAR CIRCULATION OR REQUIREMENTS OF DEQ, VDOT OR FAIRFAX COUNTY OR ARE ACCESSORY STRUCTURES, USES OR MINOR BUILDING ADDITIONS AS PERMITTED BY PARAGRAPH 4(A)7 OF SECTION 9-004. IT IS TO BE UNDERSTOOD THAT DEQ REGULATORY REQUIREMENTS SHALL SUPERSEDE THESE LIMITATIONS, AND THAT PRACTICES REQUIRED OR PERMITTED UNDER VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) REGULATIONS TO MITIGATE ENVIRONMENTAL, SAFETY OR OTHER CONCERNS SHALL, PER SE, BE PERMITTED UNDER THIS PROVISION.
16. PHASES 1 THROUGH 5 MAY OVERLAP ONE ANOTHER; THAT IS A SUBSEQUENT PHASE OR PHASES MAY BE INITIATED PRIOR TO COMPLETION OF A CURRENT PHASE OR PHASES. IMPROVEMENTS DEPICTED FOR EACH PHASE REPRESENT THOSE PROPOSED TO BE COMPLETED BY THE END OF SUCH PHASE. FINAL LANDSCAPING FOR EACH PHASE MAY NOT BE COMPLETED UNTIL SUBSEQUENT PHASE(S) HAVE BEGUN.
17. THE POTENTIAL "SOLAR PANEL FARM" MAY BE PROVIDED BY APPLICANT/OWNER AND/OR OTHERS IN PHASES 4, 5, AND/OR 6 AS GENERALLY SHOWN ON SHEETS 9, 10 AND 45.
18. THE APPLICANT RESERVES THE RIGHT TO RELOCATE UTILITY AND TRAIL CROSSINGS OF FURNACE ROAD AND TO ALTER THE INTERNAL CIRCULATION WITHIN EACH PHASE.
19. THE THREE (3) WIND TURBINES TO BE ERECTED IN PHASE ONE BY THE APPLICANT/OWNER SHALL REMAIN FOR THEIR USEFUL LIFE OR UNTIL THE BEGINNING OF PHASE 5, WHICHEVER FIRST OCCURS, AS DETERMINED BY THE APPLICANT. LOCATION OF SAID TURBINES MAY BE ADJUSTED BY THE APPLICANT BASED ON FINAL ENGINEERING AND DESIGN. THIS FINAL AREA IS TO BE FILLED AND CAPPED WHEN THESE TURBINES SHALL BE REMOVED. THE APPLICANT/OWNER SHALL NOT BE REQUIRED TO REPLACE AND/OR RELOCATE THESE TURBINES.
20. SEE SHEET 28 FOR TRUCK QUEUING AREAS FOR EACH PHASE.
21. PURSUANT TO PARAGRAPH 1 OF SECTION 11-102 OF THE ZONING ORDINANCE, IN THIS SPECIAL EXCEPTION AMENDMENT APPLICATION, THE APPLICANT REQUESTS AUTHORIZATION BY THE BOARD OF SUPERVISORS TO LOCATE VISITOR PARKING ASSOCIATED WITH THE LANDFILL "OBSERVATION POINT" OFF-SITE ON ITS I-6 PROPERTY, GENERALLY AS DEPICTED ON THE GDPA FILED IN PCA 2000-MV-034. THE ALTERNATIVE, OFF-SITE PARKING IS NEEDED DUE TO PUBLIC SAFETY CONCERNS ASSOCIATED WITH LANDFILL OPERATIONS AND THE REQUIREMENT THAT FURNACE ASSOCIATES, THE OWNER OF BOTH PROPERTIES, STRICTLY CONTROL PUBLIC ACCESS FOR VISITORS WHO ALL WOULD BE REQUIRED TO PRE-REGISTER AND EXECUTE A LIABILITY WAIVER AND RELEASE PRIOR TO TRAVELING TO THE ADJACENT LANDFILL VIA SHUTTLE SERVICE FROM THIS PARKING AREA. THESE VISITOR SPACES SHALL BE PERMANENTLY AVAILABLE TO SUPPORT THE OFF-SITE "OBSERVATION POINT" THROUGHOUT ITS OPERATION UNTIL THE END OF PHASE 5.
22. GATES AND SECURITY FENCING MAY BE PROVIDED ON-SITE AS DETERMINED BY THE APPLICANT.
23. A FIFTY FOOT-WIDE TREE TRANSITIONAL SCREEN SHALL BE PROVIDED ALONG THE ENTIRE NORTHERN PROPERTY BOUNDARY AND CONSIST OF A COMBINATION OF EXISTING, MATURE TREES AND SUPPLEMENTAL PLANTINGS WHICH SHALL BE INSTALLED AND MAINTAINED BY THE APPLICANT IN ACCORDANCE WITH THAT SHOWN ON SHEET 21. MINIMAL GRADING SHALL BE PERMITTED WITHIN THIS TRANSITIONAL SCREEN AREA, AS DETERMINED BY THE URBAN FOREST MANAGEMENT DIVISION, AS NECESSARY FOR INSTALLATION OF THE BELOW TRAIL AND/OR OTHER IMPROVEMENTS. ADJACENT TO THIS TRANSITIONAL SCREEN AREA, A NATURAL SURFACE (EXISTING SOIL) TRAIL AND ANY OFF-SITE TRAIL CONNECTION, EXERCISE STATIONS ALONG THE TRAIL, A MULTI-PURPOSE OPEN SPACE AREA, DOG PARK AND PICNIC TABLES SHALL BE PROVIDED AT THE SOLE OPTION OF AND AS DETERMINED BY THE LORTON VALLEY HOA, AT THE SOLE OPTION OF AND TO THE EXTENT DETERMINED BY THE LORTON VALLEY HOA. THE RECREATION USES SHOWN MAY BE ELIMINATED OR ADJUSTED, PROVIDED THAT THEY DO NOT ENCROACH INTO THE FIFTY FOOT TRANSITIONAL SCREEN AREA.
24. THE APPLICANT MAY PROVIDE A LEACHATE STORAGE TANK, RESPECTIVELY, IN THE SOUTHWEST AND NORTHEAST AREAS OF THE PROPERTY IN THE GENERAL LOCATIONS DEPICTED ON THE PLAN AND SHALL NOT EXCEED 20 FEET ABOVE GRADE AND A MAXIMUM 90 FEET IN DIAMETER. A SECOND SANITARY SEWER CONNECTION MAY BE INSTALLED BY THE APPLICANT SUBJECT TO DPWES APPROVAL AND THE AVAILABILITY OF OFF-SITE EASEMENTS.
25. THE LIMITS OF OPERATIONS AREAS ARE DEFINED AS THE WORKING FACE OF THE LANDFILL, AREAS OF CONSTRUCTION FOR THE SUBSEQUENT PHASE AND AREAS THAT ARE BEING FILLED AND/OR CAPPED AND LANDSCAPED AND SHALL INCLUDE BOTH "PRIMARY" AND "ANCILLARY" OPERATIONS SUCH AS STORMWATER AND EROSION AND SEDIMENT CONTROL BASINS AND STORMWATER CONVEYANCE SYSTEMS (i.e. INCLUDING SLOPE DOWNCHUTES AND STORM SEWER SYSTEMS), LEACHATE MANAGEMENT SYSTEMS, GAS COLLECTION AND DISTRIBUTION SYSTEMS, ENVIRONMENTAL MONITORING SYSTEMS AND WELLS, LANDFILL MAINTENANCE FACILITIES, LANDFILL STAGING AREAS AND SIMILAR AREAS AND FACILITIES.
26. RETAINING WALLS MAY BE ADJUSTED OR ADDED, AS NECESSARY, BASED ON FINAL ENGINEERING DESIGN.
27. FINAL WASTE DEBRIS ELEVATION SHALL NOT EXCEED 412 FEET.

ZONING ORDINANCE, ARTICLE 9, SECTION 9-011 COMMENTS:

1. APPLICATION TO BE SUBMITTED WITH THIS PLAT.
2. A. BOUNDARY INFORMATION AS SHOWN ON THE PLAT AND AS REFERENCED IN GENERAL NOTE 3.
   B. REFER TO THE SITE TABULATIONS ON SHEET 2 FOR SITE AREA AND GENERAL NOTE 2 ON SHEET 3 FOR THE ZONING.
   C. SCALE AND NORTH ARROW AS SHOWN ON THE PLAT.
   D. THE LOCATIONS, DIMENSIONS AND MAXIMUM HEIGHTS OF ALL PROPOSED STRUCTURES ARE SHOWN ON SHEETS 8 THROUGH 10 FOR PHASES 1 THROUGH 5 AND ON SHEET 45 FOR PHASE 6. THE LOCATIONS, DIMENSIONS AND MAXIMUM HEIGHTS OF ALL EXISTING STRUCTURES AND SIGNS ARE SHOWN ON SHEET 4. THE LOCATIONS, DIMENSIONS AND LIGHTING OF THE PROPOSED SIGN IS SHOWN ON SHEET 6. ALL EXISTING STRUCTURES ARE TO BE REMOVED/DEMOLISHED AT THE CONCLUSION OF PHASE 5, HOWEVER, THEY MAY BE MOVED AND/OR REPLACED IN KIND AS REQUIRED TO CONTINUE LANDFILL OPERATIONS UNTIL THE COMPLETION OF PHASE 5. STRUCTURES PROPOSED FOR PHASE 6 SHALL REMAIN THROUGH THE CONCLUSION OF PHASE 6.
   E. THE MINIMUM ANGLE OF BULK PLANE FOR THE WIND TURBINES AND SOLAR PANELS IS SHOWN BELOW. THE REQUIRED DISTANCES TO LOT LINES FOR THE PROPOSED STRUCTURES ARE SHOWN ON SHEETS 8 THROUGH 10 FOR PHASES 1 THROUGH 5 AND ON SHEET 45 FOR PHASE 6. THE DISTANCES TO LOT LINES FOR THE EXISTING STRUCTURES ARE SHOWN ON SHEET 4.
   F. NO PUBLIC RIGHT OF WAY DEDICATION IS PROPOSED WITH THIS SPECIAL EXCEPTION AMENDMENT. THE REQUIRED DIMENSIONS FOR THE EXISTING ROADS AND THE ENTRANCE IMPROVEMENTS ARE SHOWN ON SHEETS 11, 12 AND 13.
   G. MEANS OF INGRESS AND EGRESS FROM A PUBLIC STREET ARE AS SHOWN ON THE PLAT.
   H. PROPOSED PARKING SPACE LOCATIONS ARE SHOWN ON SHEETS 8 THROUGH 10 FOR PHASES 1 THROUGH 5 AND ON SHEET 45 FOR PHASE 6. THE REQUIRED DISTANCES FROM THE PROPOSED PARKING SPACES TO THE NEAREST BOUNDARY LINE ARE SHOWN ON SHEETS 8 THROUGH 10 AND SHEET 45. EXISTING PARKING SPACE LOCATIONS ARE AS SHOWN ON SHEET 4. THE REQUIRED DISTANCES FROM THE EXISTING PARKING SPACE LOCATIONS TO THE NEAREST BOUNDARY LINE ARE ALSO SHOWN ON SHEET 4. REFER TO THE SITE TABULATIONS FOR PARKING REQUIREMENTS.
   I. THERE ARE NO KNOWN WELLS USED FOR HUMAN WATER CONSUMPTION OR OTHER DOMESTIC PURPOSE ON THE SITE. ANY WELLS THAT ARE LOCATED ON THE SITE ARE USED STRICTLY FOR THE MONITORING OF GROUND WATER. THE PROPERTY IS SERVED BY PUBLIC SANITARY SEWER AND WILL BE SERVED BY PUBLIC WATER. REFER TO GENERAL NOTE 8 FOR ADDITIONAL INFORMATION.
   J. REFER TO SHEETS 27 THROUGH 38 FOR THE REQUIRED STORMWATER MANAGEMENT INFORMATION.
   K. THE TOTAL GROSS FLOOR AREAS OF EXISTING AND PROPOSED STRUCTURES ARE SHOWN IN THE SITE TABULATIONS ON SHEET 2. THE FLOOR AREA RATIOS FOR PHASES 1, 2, 3, 4 AND 5 ARE SHOWN ON SHEETS 8, 7, 8, 9 AND 10 RESPECTIVELY. THE FLOOR AREA RATIO FOR PHASE 6 IS SHOWN IN THE SITE TABULATIONS ON SHEET 2.
   L. REFER TO GENERAL NOTE 4 FOR TOPOGRAPHIC INFORMATION.
   M. THE LIMITS OF CLEARING AND GRADING ARE AS SHOWN ON THE PLAT AND MAY BE ADJUSTED PER GENERAL NOTES 13 AND 15. PROPOSED AND EXISTING LANDSCAPING AND TRANSITIONAL SCREENS AND BARRIERS, WHERE REQUIRED, MODIFIED AND/OR WAIVED FOR PHASES 1, 2, 3, 4, 5 AND 6 ARE SHOWN ON SHEETS 16, 17, 18, 19, 20 AND 45 RESPECTIVELY. REFER TO SHEET 21 FOR ADDITIONAL INFORMATION CONCERNING THE NORTHERN TRANSITIONAL SCREENING AREA. REFER TO SHEET 5 FOR ALL PRE-DEVELOPMENT EXISTING VEGETATION INFORMATION.
   N. A FLOODPLAIN, RESOURCE PROTECTION AREA AND AN ENVIRONMENTAL QUALITY CORRIDOR EXIST ON THE SITE AND ARE SHOWN ON THE PLAT. THE REMAINING AREA OF THE SITE IS DESIGNATED AS A RESOURCE MANAGEMENT AREA. THE REQUIRED DISTANCES FROM THE PROPOSED STRUCTURES TO THE NEAREST POINT OF THE FLOODPLAIN, RPA OR EQC ARE SHOWN ON SHEETS 8 THROUGH 10 AND ON SHEET 45. THE REQUIRED DISTANCES FROM THE EXISTING STRUCTURES TO THE CLOSEST POINT ON THE EQC ARE SHOWN ON SHEET 4.
   O. SHOWN ON PLAT WHERE APPLICABLE.
   P. NOT APPLICABLE.
   Q. REFER TO GENERAL NOTE 9 FOR INFORMATION CONCERNING EXISTING UTILITY EASEMENTS.
   R. REFER TO GENERAL NOTE 7 FOR COMPREHENSIVE PLAN TRAILS REQUIREMENTS.
   S. THERE ARE NO KNOWN GRAVES OR PLACES OF BURIAL ON THE SITE.
   T. SEAL AND SIGNATURE AS SHOWN ON THE PLAT.
3. ZONING MAP SUBMITTED WITH THIS APPLICATION.
4. SITE PHOTOGRAPHS SUBMITTED WITH THIS APPLICATION.
5. SOILS MAP NOT REQUIRED FOR THIS APPLICATION.
6. AFFIDAVIT SUBMITTED WITH THIS APPLICATION.
7. APPLICANT'S WRITTEN STATEMENT DESCRIBING THE PROPOSED USES SUBMITTED WITH THIS APPLICATION.
8. APPLICANT AND OWNER: FURNACE ASSOCIATES, INC.
   11220 ASSETT LOOP
   SUITE 201
   MANASSAS, VA 20109
9. THE SITE IS NOT WITHIN ANY OVERLAY DISTRICTS.
10. APPLICATION FEE SUBMITTED WITH THIS APPLICATION.

ZONING ORDINANCE, ARTICLE 9, SECTION 9-203 COMMENTS:

1. MAP AND WRITTEN STATEMENT CONCERNING UTILITY SYSTEM SUBMITTED UNDER SEPARATE COVER.
2. WRITTEN STATEMENT CONCERNING SELECTION OF THE SITE SUBMITTED UNDER SEPARATE COVER.
3. PURSUANT TO ARTICLE 9, SECTION 9-203, PARAGRAPH 3, THE REQUIREMENTS OF SECTION 8-011 OF THE ZONING ORDINANCE HAVE BEEN PROVIDED UNDER SEPARATE COVER AND APPLICABLE REQUIREMENTS ARE SHOWN ON THE PLAT.



FRONT YARD MINIMUM ANGLE OF BULK PLANE AT FURNACE ROAD

FRONT YARD MINIMUM ANGLE OF BULK PLANE AT I-95

SIDE YARD MINIMUM ANGLE OF BULK PLANE AT THE NORTHERN PROPERTY LINE

REAR YARD ANGLE OF BULK PLANE NOT APPLICABLE

MINMIMUM ANGLE OF BULK PLANE

NO SCALE

NOTE: THE ELEVATIONS REFERENCED AT THE NORTHERN PROPERTY LINE, AT FURNACE ROAD AND AT I-95 ARE THE LOWEST ELEVATIONS RELATIVE TO THE ELEVATION OF EACH STRUCTURE NEAREST TO THAT RESPECTIVE PROPERTY LINE.

BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
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(703)449-8100 (703)449-8109 (Fax)
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SPECIAL EXCEPTION AMENDMENT
GENERAL NOTES AND COMMENTS

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 8-14-2013	REVISED 1-22-2014
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 11-19-2013	

APPLICANT:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.

SHEET 3 OF 45

CO. NO. SEA 80-L/V-081-2
CAD NAME: SE5117COMP
LAYOUT: NOTES
FILE NO. 05117.06-00

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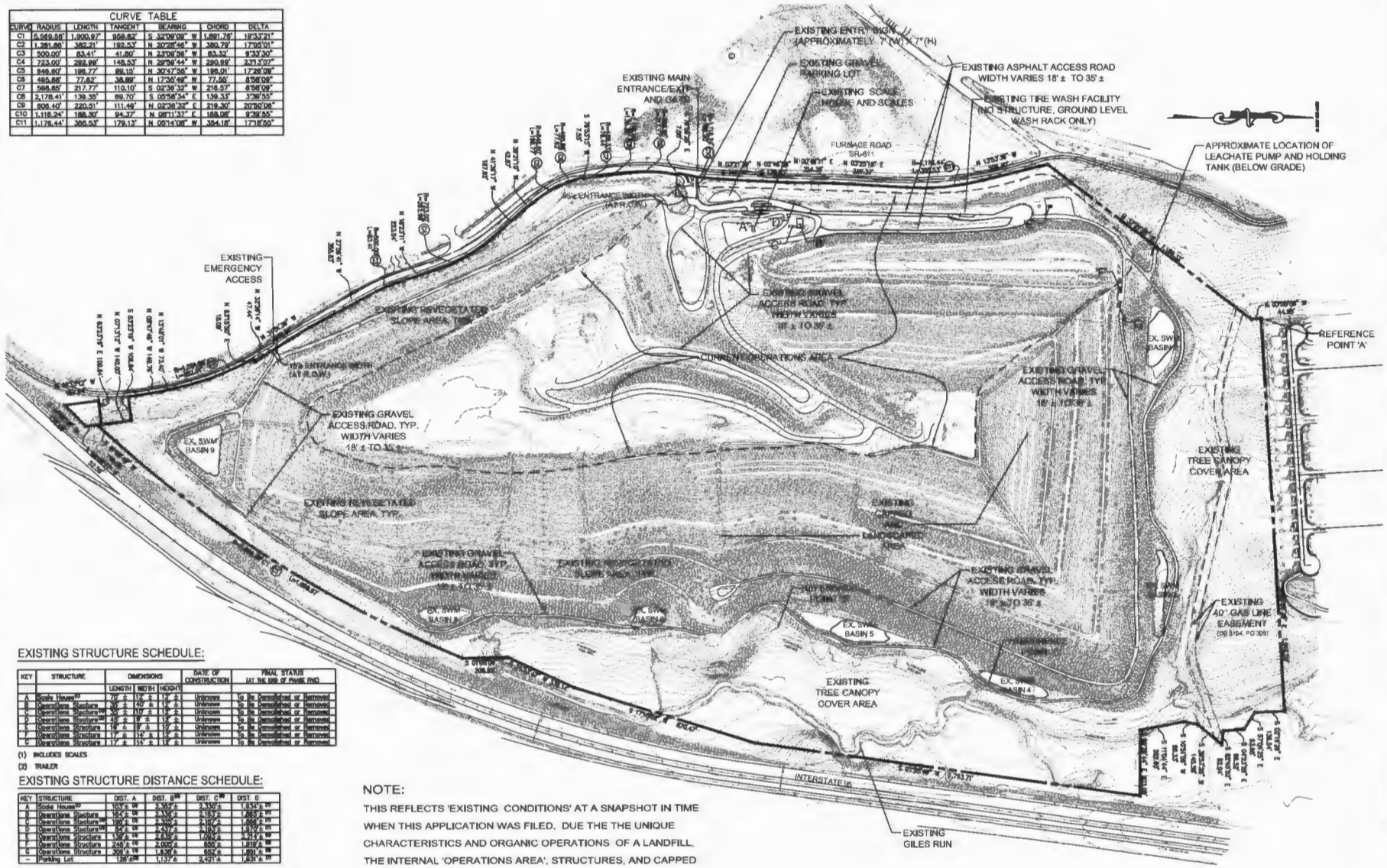
CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	BEARING	CHORD	DELTA
C1	5,569.58'	1,900.97'	959.62'	S 32°09'09" W	1,891.78'	19°33'21"
C2	1,281.86'	382.21'	192.53'	N 20°09'46" W	380.79'	17°05'01"
C3	500.00'	83.41'	41.80'	N 23°09'08" W	83.32'	9°33'30"
C4	723.00'	282.99'	146.53'	N 29°08'44" W	280.99'	23°31'07"
C5	846.60'	196.77'	99.15'	N 30°47'56" W	196.01'	17°28'09"
C6	495.86'	77.82'	38.99'	N 17°36'49" W	77.55'	8°58'09"
C7	598.85'	217.77'	110.10'	S 02°36'32" W	216.57'	8°58'09"
C8	2,178.41'	139.35'	69.70'	S 05°58'34" E	139.33'	3°39'55"
C9	606.40'	220.51'	111.49'	N 02°36'32" E	219.30'	20°50'06"
C10	1,118.24'	188.30'	94.37'	N 08°11'37" E	188.08'	9°39'55"
C11	1,178.44'	366.53'	179.13'	N 05°14'08" W	364.18'	17°18'55"



EXISTING STRUCTURE SCHEDULE:

KEY	STRUCTURE	DIMENSIONS			DATE OF CONSTRUCTION	FINAL STATUS (AT THE END OF PHASE FIVE)
		LENGTH	WIDTH	HEIGHT		
A	Scale House(1)	30' ±	16' ±	13' ±	Unknown	To Be Demolished or Removed
B	Operations Structure	30' ±	10' ±	13' ±	Unknown	To Be Demolished or Removed
C	Operations Structure(2)	30' ±	10' ±	13' ±	Unknown	To Be Demolished or Removed
D	Operations Structure(2)	40' ±	8' ±	13' ±	Unknown	To Be Demolished or Removed
E	Operations Structure	18' ±	18' ±	13' ±	Unknown	To Be Demolished or Removed
F	Operations Structure	17' ±	10' ±	13' ±	Unknown	To Be Demolished or Removed
G	Operations Structure	17' ±	15' ±	13' ±	Unknown	To Be Demolished or Removed

(1) INCLUDES SCALES

(2) TRAILER

EXISTING STRUCTURE DISTANCE SCHEDULE:

KEY	STRUCTURE	DIST. A	DIST. B(3)	DIST. C(4)	DIST. D
A	Scale House(5)	103' ± (6)	2,302' ±	2,130' ±	1,634' ± (7)
B	Operations Structure	154' ± (6)	2,330' ±	2,183' ±	1,683' ± (7)
C	Operations Structure(5)	190' ± (6)	2,325' ±	2,187' ±	1,686' ± (7)
D	Operations Structure(5)	62' ± (6)	2,437' ±	2,193' ±	1,679' ± (7)
E	Operations Structure	1,102' ± (6)	2,638' ±	1,093' ±	1,717' ± (8)
F	Operations Structure	248' ± (6)	2,005' ±	850' ±	1,918' ± (8)
G	Operations Structure	308' ± (6)	1,836' ±	852' ±	1,891' ± (8)
--	Parking Lot	126' ± (6)	1,137' ±	2,421' ±	1,631' ± (7)

(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST

(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST

(5) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST

(6) DISTANCE FROM STRUCTURE TO REFERENCE POINT 'A.' (CLOSEST PROPERTY LINE TO THE NORTH)

(7) REFERENCE POINT 'B' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EOC/RPA.

(8) REFERENCE POINT 'C' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EOC/RPA.

NOTE: THERE ARE NO EXISTING SWM BASINS NUMBERED 1 OR 7.

NOTE:

THIS REFLECTS 'EXISTING CONDITIONS' AT A SNAPSHOT IN TIME WHEN THIS APPLICATION WAS FILED. DUE THE THE UNIQUE CHARACTERISTICS AND ORGANIC OPERATIONS OF A LANDFILL, THE INTERNAL 'OPERATIONS AREA', STRUCTURES, AND CAPPED AREAS ARE ALL SUBJECT TO CHANGE DURING THE REVIEW PERIOD OF THE APPLICATION.

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STATE OF VIRGINIA
BRIAN L. BARR
Lic. No. 3068
1-22-2014

SPECIAL EXCEPTION AMENDMENT
EXISTING CONDITIONS

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

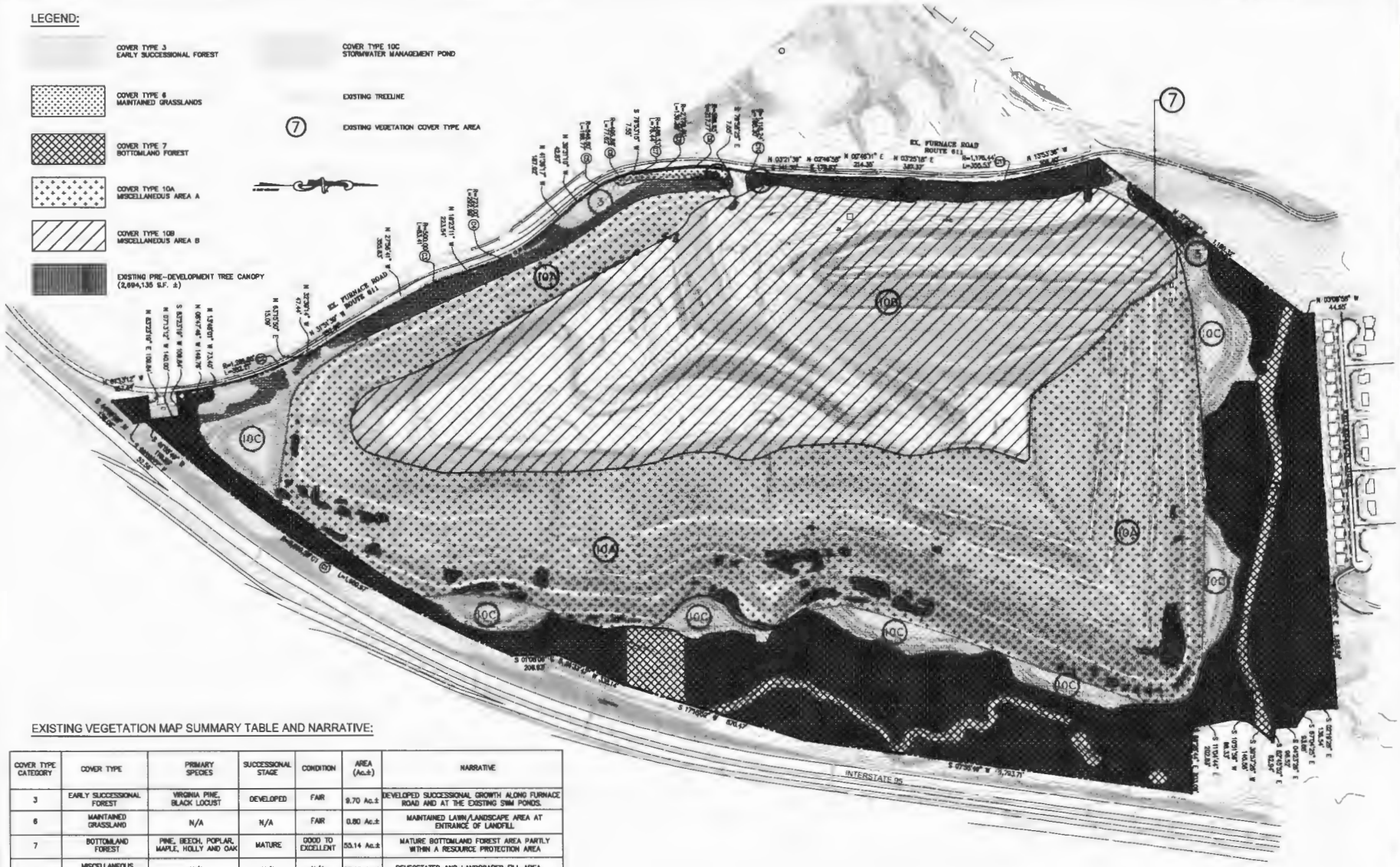
BC REVISIONS
REVISED 5-14-2013
REVISED 5-21-2013
REVISED 9-13-2013
REVISED 11-1-2013
REVISED 12-10-2013
REVISED 1-22-2014

FRANKLIN & ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"= 200' VERT. N/A
SHEET 4 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME: SE5117EX
LAYOUT: EXISTING
FILE NO. 05117.08-00

LEGEND:

- COVER TYPE 3 EARLY SUCCESSIONAL FOREST
- COVER TYPE 6 MAINTAINED GRASSLANDS
- COVER TYPE 7 BOTTOMLAND FOREST
- COVER TYPE 10A MISCELLANEOUS AREA A
- COVER TYPE 10B MISCELLANEOUS AREA B
- EXISTING PRE-DEVELOPMENT TREE CANOPY (2,694,135 S.F. ±)
- COVER TYPE 10C STORMWATER MANAGEMENT POND
- EXISTING TREELINE
- (7) EXISTING VEGETATION COVER TYPE AREA



EXISTING VEGETATION MAP SUMMARY TABLE AND NARRATIVE:

COVER TYPE CATEGORY	COVER TYPE	PRIMARY SPECIES	SUCCESSIONAL STAGE	CONDITION	AREA (Ac.±)	NARRATIVE
3	EARLY SUCCESSIONAL FOREST	VIRGINIA PINE, BLACK LOCUST	DEVELOPED	FAIR	9.70 Ac.±	DEVELOPED SUCCESSIONAL GROWTH ALONG FURNACE ROAD AND AT THE EXISTING SWM PONDS.
6	MAINTAINED GRASSLAND	N/A	N/A	FAIR	0.80 Ac.±	MAINTAINED LAWN/LANDSCAPE AREA AT ENTRANCE OF LANDFILL
7	BOTTOMLAND FOREST	PINE, BEECH, POPLAR, MAPLE, HOLLY AND OAK	MATURE	GOOD TO EXCELLENT	53.14 Ac.±	MATURE BOTTOMLAND FOREST AREA PARTLY WITHIN A RESOURCE PROTECTION AREA
10A	MISCELLANEOUS AREA A	N/A	N/A	N/A	95.13 Ac.±	REVEGETATED AND LANDSCAPED FILL AREA
10B	MISCELLANEOUS AREA B	N/A	N/A	N/A	78.05 Ac.±	ACTIVE LANDFILL OPERATIONS AREA
10C	STORMWATER MANAGEMENT AREA	N/A	N/A	N/A	13.00 Ac.±	STORMWATER MANAGEMENT AREA
Total: 249.82 Ac.±						

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BRIAN C. CUNNY Lic. No. 0402 1-22-2014

SPECIAL EXCEPTION AMENDMENT
EXISTING VEGETATION MAP

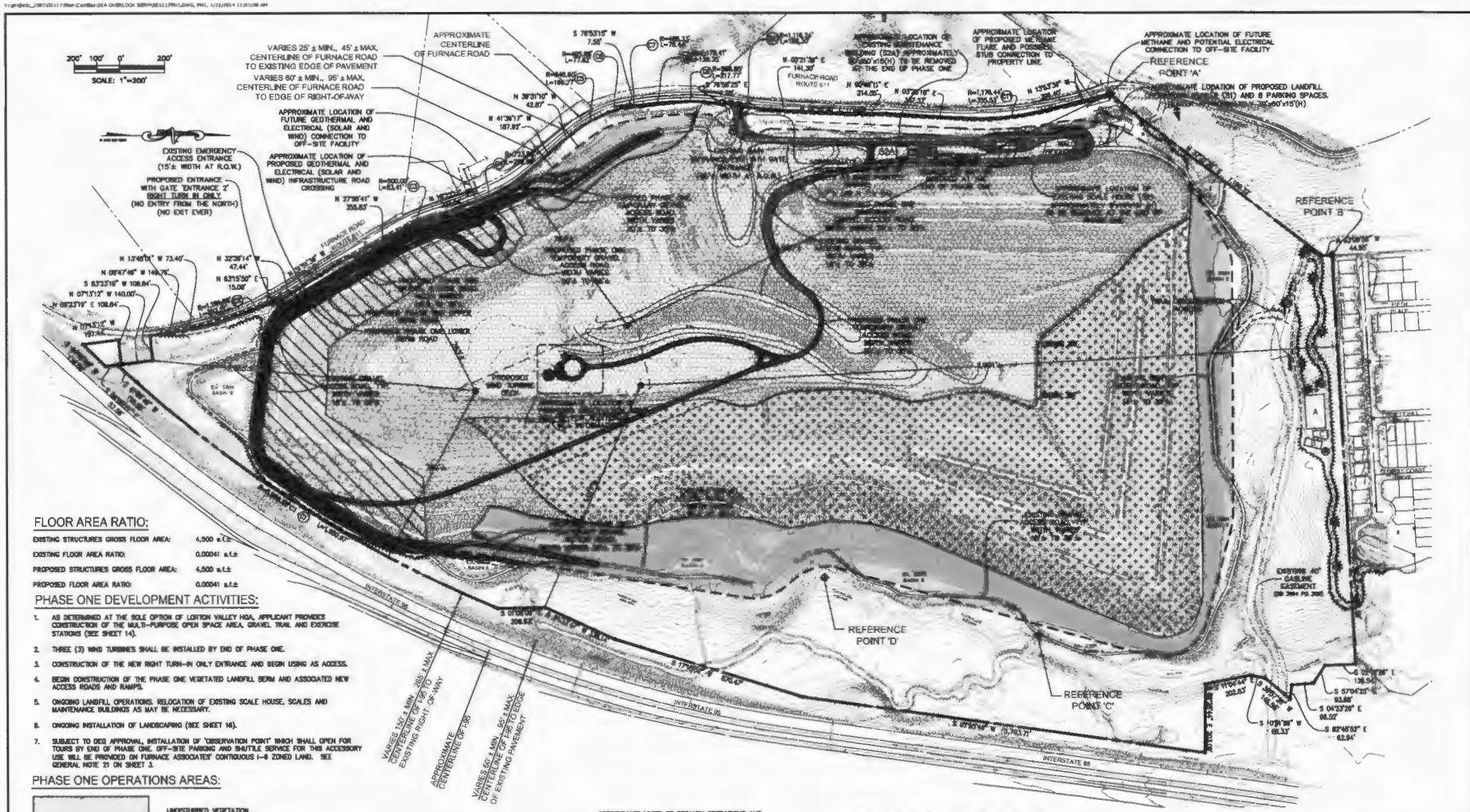
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 1-28-2014
REVISED 1-21-2014
REVISED 12-20-2013
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-10-2013

OWNER: LORTON FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.
SHEET 5 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME: SE5117EVM
LAYOUT: evm
FILE NO. 05117.06-00



FLOOR AREA RATIO:

EXISTING STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
EXISTING FLOOR AREA RATIO:	0.00041 s.f.±
PROPOSED STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
PROPOSED FLOOR AREA RATIO:	0.00041 s.f.±

PHASE ONE DEVELOPMENT ACTIVITIES:

1. AS DETERMINED AT THE SOLE OPTION OF LORTON VALLEY HOA, APPLICANT PROVIDES CONSTRUCTION OF THE MULTI-PURPOSE OPEN SPACE AREA, GRAVEL TRAIL AND EXERCISE STATIONS (SEE SHEET 14).
2. THREE (3) WIND TURBINES SHALL BE INSTALLED BY END OF PHASE ONE.
3. CONSTRUCTION OF THE NEW RIGHT TURN-IN ONLY ENTRANCE AND BEGIN USING AS ACCESS.
4. BEGIN CONSTRUCTION OF THE PHASE ONE VEGETATED LANDFILL BERM AND ASSOCIATED NEW ACCESS ROADS AND RAMPS.
5. ONGOING LANDFILL OPERATIONS. RELOCATION OF EXISTING SCALE HOUSE, SCALES AND MAINTENANCE BUILDINGS AS MAY BE NECESSARY.
6. ONGOING INSTALLATION OF LANDSCAPING (SEE SHEET 16).
7. SUBJECT TO DEQ APPROVAL, INSTALLATION OF "OBSERVATION POINT" WHICH SHALL OPEN FOR TOURS BY END OF PHASE ONE. OFF-SITE PARKING AND SHUTTLE SERVICE FOR THIS ACCESSORY USE WILL BE PROVIDED ON FURNACE ASSOCIATES' CONTIGUOUS I-4 ZONED LAND. SEE GENERAL NOTE 21 ON SHEET 3.

PHASE ONE OPERATIONS AREAS:

- UNDISTURBED VEGETATION
- EXISTING EVERGREEN AND EXISTING DECIDUOUS TREES, SHRUBS AND WILDFLOWERS (SEE SHEET 16 FOR LANDSCAPE INFORMATION)
- ONGOING LANDFILL OPERATIONS AND INTERIM VEGETATIVE COVER (SEE SHEET 16 FOR ADDITIONAL INFORMATION)
- PROPOSED LANDFILL OPERATIONS AND FUTURE LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 16 FOR LANDSCAPE INFORMATION)
- APPROXIMATE LIMITS OF PRIMARY OPERATIONS AND LANDSCAPE AREAS (SEE NOTE 25 ON SHEET 3)
- APPROXIMATE LOCATION OF PROPOSED PHASE ONE VEGETATED LANDFILL BERM (16)
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- ENVIRONMENTAL QUALITY CORRIDOR/ RESOURCE PROTECTION AREA (EQC/RPA)
- 100-YR. FLOODPLAIN
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- APPROXIMATE LOCATION OF PROPOSED WIND TURBINES (16)
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- DISING 307 + — EXISTING FILL SPOT ELEVATIONS

NOTE:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 26 FOR TRUCK QUEUING INFORMATION AND FOR ENTRANCE AND EXIT INFORMATION.
3. SEE SHEET 39 FOR PHASE ONE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING PHASE ONE OPERATIONS PHASE AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTES 16 AND 25 ON SHEET 3).
5. WIND TURBINE LOCATIONS AND OBSERVATION POINT MAY BE ADJUSTED DUE TO FINAL ENGINEERING AND DESIGN.

EXISTING STRUCTURE DISTANCE SCHEDULE:(10)

KEY	STRUCTURE	DIST. A	DIST. B	DIST. C
SI	Operations Trailer	297'±(1)	57'±(2)	2,327'±(3)
SI-P	Operations Trailer Parking	297'±(1)	57'±(2)	2,327'±(3)
SS	Scale House	121'±(4)	45'±(5)	2,101'±(6)
SOA	Maintenance Building	138'±(4)	923'±(5)	1,887'±(6)

(1) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST
(2) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST
(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST
(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTH
(5) DISTANCE FROM STRUCTURE TO REFERENCE POINT "A" (CLOSEST PROPERTY LINE TO THE WEST)
(6) DISTANCE FROM THE STRUCTURE TO REFERENCE POINT "B" (CLOSEST PROPERTY LINE TO THE NORTH)
(7) REFERENCE POINT "C" PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(8) REFERENCE POINT "D" PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(9) SUBJECT TO CHANGE BASED ON LANDFILL OPERATIONS.

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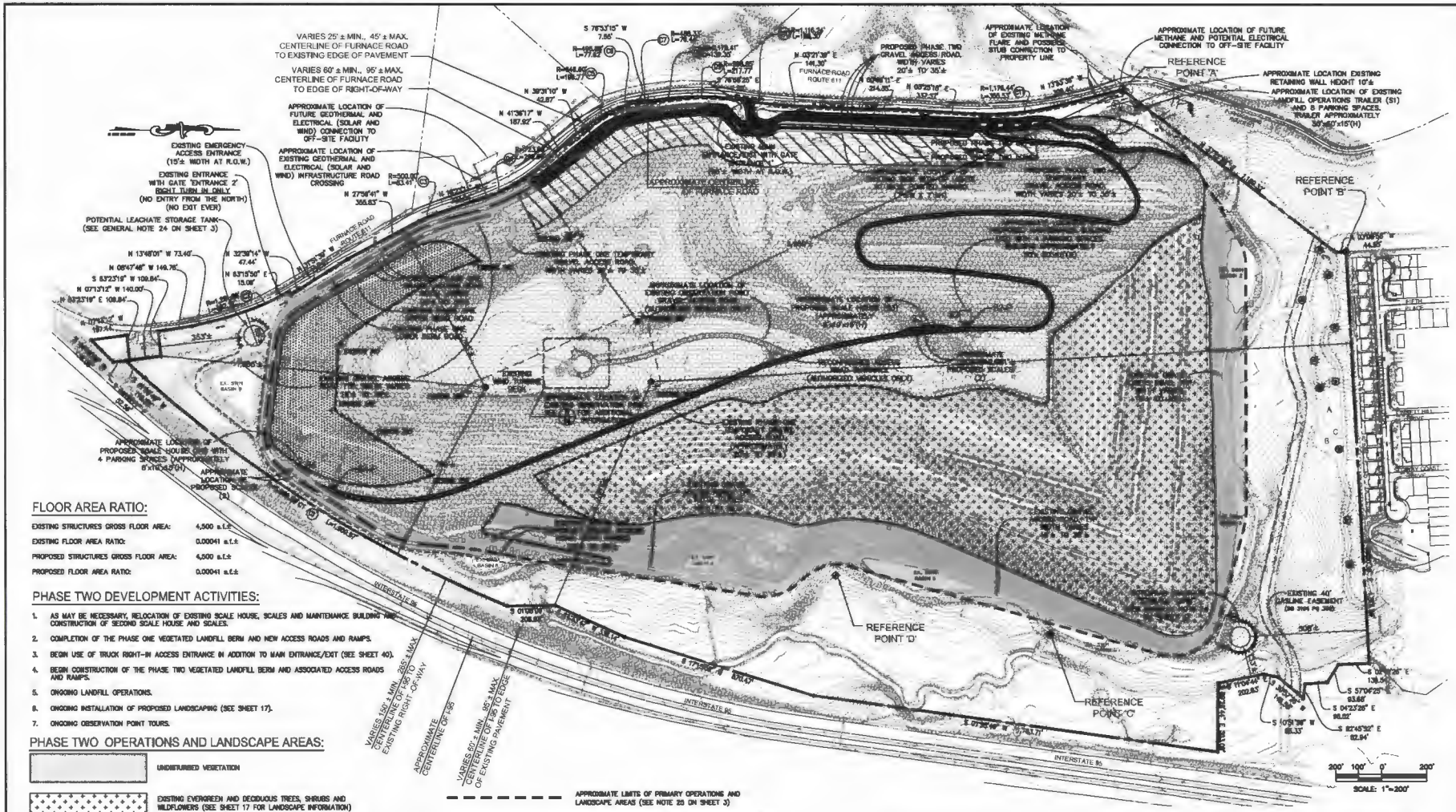
(703)449-8100 (703)449-8108 (fax)
www.bcconsl.com

SPECIAL EXCEPTION AMENDMENT
PHASE ONE OPERATIONS AREAS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	REVISED 1-15-2014
	REVISED 9-11-2013
	REVISED 7-1-2013
	REVISED 11-1-2013
	REVISED 10-15-2013
	FURNACE ASSOCIATES, INC. 11220 ASSETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 6 OF 46	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117PH1	
LAYOUT: PH1	
FILE NO. 05117.06-00	



FLOOR AREA RATIO:

EXISTING STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
EXISTING FLOOR AREA RATIO:	0.00041 s.f.±
PROPOSED STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
PROPOSED FLOOR AREA RATIO:	0.00041 s.f.±

PHASE TWO DEVELOPMENT ACTIVITIES:

1. AS MAY BE NECESSARY, RELOCATION OF EXISTING SCALE HOUSE, SCALES AND MAINTENANCE BUILDING AND CONSTRUCTION OF SECOND SCALE HOUSE AND SCALES.
2. COMPLETION OF THE PHASE ONE VEGETATED LANDFILL BERM AND NEW ACCESS ROADS AND RAMPS.
3. BEGIN USE OF TRUCK RIGHT-IN ACCESS ENTRANCE IN ADDITION TO MAIN ENTRANCE/EXIT (SEE SHEET 40).
4. BEGIN CONSTRUCTION OF THE PHASE TWO VEGETATED LANDFILL BERM AND ASSOCIATED ACCESS ROADS AND RAMPS.
5. ONGOING LANDFILL OPERATIONS.
6. ONGOING INSTALLATION OF PROPOSED LANDSCAPING (SEE SHEET 17).
7. ONGOING OBSERVATION POINT TOURS.

PHASE TWO OPERATIONS AND LANDSCAPE AREAS:

- UNDISTURBED VEGETATION
- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS (SEE SHEET 17 FOR LANDSCAPE INFORMATION)
- ONGOING LANDFILL OPERATIONS AND INTERIM VEGETATIVE COVER (SEE SHEET 17 FOR ADDITIONAL INFORMATION)
- ONGOING INSTALLATION OF PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 17 FOR ADDITIONAL LANDSCAPE INFORMATION)
- PROPOSED LANDFILL OPERATIONS AND FUTURE FINAL CAP LANDSCAPE AREAS

NOTES:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 26 FOR TRUCK QUEUING INFORMATION AND ENTRANCE AND EXIT INFORMATION.
3. SEE SHEET 39 FOR PHASE TWO LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTES 16 AND 25 ON SHEET 3).

- APPROXIMATE LIMITS OF PRIMARY OPERATIONS AND LANDSCAPE AREAS (SEE NOTE 25 ON SHEET 3)
- APPROXIMATE LOCATION OF PROPOSED PHASE TWO VEGETATED LANDFILL BERM (16)
- APPROXIMATE LOCATION OF EXISTING PHASE ONE VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- ENVIRONMENTAL QUALITY CORRIDOR/ RESOURCE PROTECTION AREA (EQC/RPA)
- 100-YR. FLOODPLAIN
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- APPROXIMATE LOCATION OF EXISTING WIND TURBINES
- EXISTING 300' — EXISTING FILL SPOT ELEVATIONS

PROPOSED STRUCTURE DISTANCE SCHEDULE: (9)

KEY	STRUCTURE	DIST. A	DIST. B	DIST. C
S1	Operations Trailer	25'± (1)	57'± (2)	2,322'± (3)
S1-P	Operations Trailer Parking	28'± (1)	59'± (2)	2,272'± (3)
S2	Maintenance Building	865'± (4)	1,671'± (5)	1,245'± (6)
S2-P	Maintenance Building Parking	921'± (4)	1,688'± (5)	1,224'± (6)
S3	Scale House	933'± (4)	1,681'± (5)	1,176'± (6)
S4	Scale House	742'± (4)	103'± (5)	2,302'± (6)
S4-P	Scale House Parking	102'± (4)	840'± (5)	2,228'± (6)

(1) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST
(2) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST
(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST
(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTH
(5) DISTANCE FROM STRUCTURE TO REFERENCE POINT 'A' (CLOSEST PROPERTY LINE TO THE WEST)
(6) DISTANCE FROM THE STRUCTURE TO REFERENCE POINT 'B' (CLOSEST PROPERTY LINE TO THE NORTH)
(7) REFERENCE POINT 'C' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(8) REFERENCE POINT 'D' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(9) SUBJECT TO CHANGE BASED ON LANDFILL OPERATIONS.

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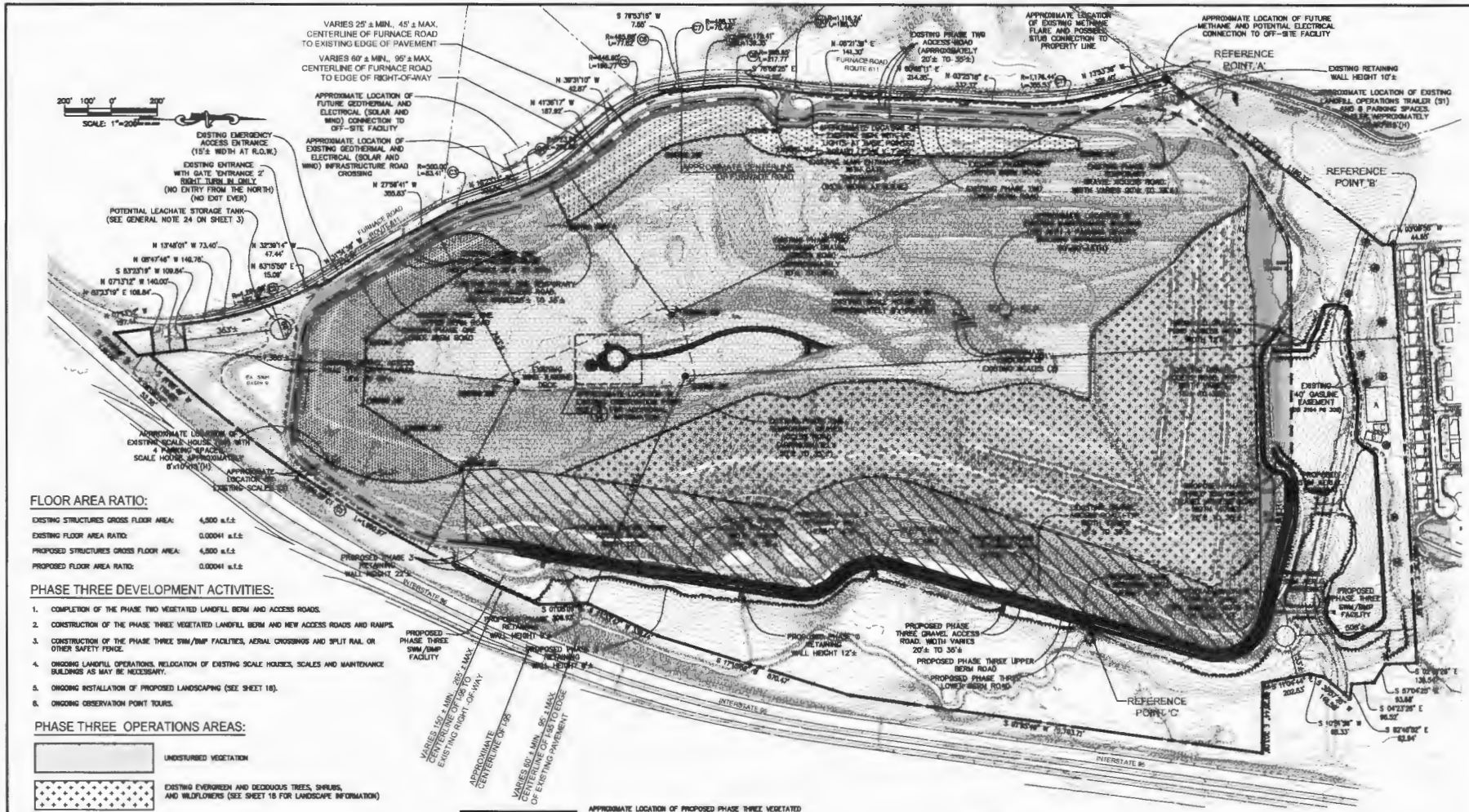
SPECIAL EXCEPTION AMENDMENT
PHASE TWO OPERATIONS AREAS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 3-13-2013	
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 11-15-2013	
REVISED 1-25-2014	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 7 OF 45	
CO. NO. SEA 80-L/V-061-2	
CAD NAME: SE5117PH2	
LAYOUT: PH2	
FILE NO. 05117.06-00	

LORTON VALLEY, LLC
FURNACE ASSOCIATES, INC.
11220 ASSET LOOP
SUITE 202
MANASSAS, VIRGINIA 20109



FLOOR AREA RATIO:

EXISTING STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
EXISTING FLOOR AREA RATIO:	0.00041 s.f.±
PROPOSED STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
PROPOSED FLOOR AREA RATIO:	0.00041 s.f.±

PHASE THREE DEVELOPMENT ACTIVITIES:

1. COMPLETION OF THE PHASE TWO VEGETATED LANDFILL BERM AND ACCESS ROADS.
2. CONSTRUCTION OF THE PHASE THREE VEGETATED LANDFILL BERM AND NEW ACCESS ROADS AND RAMPS.
3. CONSTRUCTION OF THE PHASE THREE SWM/BMP FACILITIES, AERIAL CROSSINGS AND SPLIT RAIL OR OTHER SAFETY FENCE.
4. ONGOING LANDFILL OPERATIONS, RELOCATION OF EXISTING SCALE HOUSES, SCALES AND MAINTENANCE BUILDINGS AS MAY BE NECESSARY.
5. ONGOING INSTALLATION OF PROPOSED LANDSCAPING (SEE SHEET 18).
6. ONGOING OBSERVATION POINT TOURS.

PHASE THREE OPERATIONS AREAS:

- UNDISTURBED VEGETATION
- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS, AND WILDFLOWERS (SEE SHEET 18 FOR LANDSCAPE INFORMATION)
- ONGOING LANDFILL OPERATIONS AND INTERIM VEGETATIVE COVER (SEE SHEET 18 FOR ADDITIONAL INFORMATION)
- EXISTING PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 18 FOR LANDSCAPE INFORMATION)
- ONGOING INSTALLATION OF PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 18 FOR LANDSCAPE INFORMATION)
- PROPOSED LANDFILL OPERATIONS AND FUTURE FINAL CAP LANDSCAPE AREAS

NOTE:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 28 FOR TRUCK QUEUING INFORMATION AND EXIT INFORMATION.
3. SEE SHEET 41 FOR PHASE THREE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTES 16 AND 25 ON SHEET 3).

- APPROXIMATE LOCATION OF PROPOSED PHASE THREE VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF EXISTING PHASES ONE AND TWO VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- ENVIRONMENTAL QUALITY CORRIDOR/ RESOURCE PROTECTION AREA (EQC/RPA)
- FLOODPLAIN
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- PROPOSED SPLIT RAIL OR OTHER SAFETY FENCE (36" MINIMUM HEIGHT)
- APPROXIMATE LIMITS OPERATIONS AND LANDSCAPE AREAS
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- APPROXIMATE LOCATION OF EXISTING WIND TURBINES
- EXISTING 300' + — EXISTING FILL SPOT ELEVATIONS

EXISTING STRUCTURE DISTANCE SCHEDULE: (9)

KEY	STRUCTURE	DIST. A	DIST. B	DIST. C
S1	Operations Trailer	25'±(1)	57'±(2)	2,322'±(3)
S1-P	Operations Trailer Parking	25'±(1)	57'±(2)	2,322'±(3)
S2	Maintenance Building	860'±(4)	1,371'±(5)	1,410'±(6)
S2-P	Maintenance Building Parking	821'±(4)	1,336'±(5)	1,374'±(6)
S3	Scale House	834'±(4)	1,361'±(5)	1,176'±(6)
S4	Scale House	742'±(4)	1,313'±(5)	2,307'±(6)
S4-P	Scale House Parking	102'±(4)	848'±(5)	2,228'±(6)

(1) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST
(2) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST
(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST
(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTH
(5) DISTANCE FROM STRUCTURE TO REFERENCE POINT 'A' (CLOSEST PROPERTY LINE TO THE WEST)
(6) DISTANCE FROM THE STRUCTURE TO REFERENCE POINT 'B' (CLOSEST PROPERTY LINE TO THE NORTH)
(7) REFERENCE POINT 'C' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(8) REFERENCE POINT 'D' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(9) SUBJECT TO CHANGE BASED ON LANDFILL OPERATIONS.

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SPECIAL EXCEPTION AMENDMENT
PHASE THREE OPERATIONS AREAS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

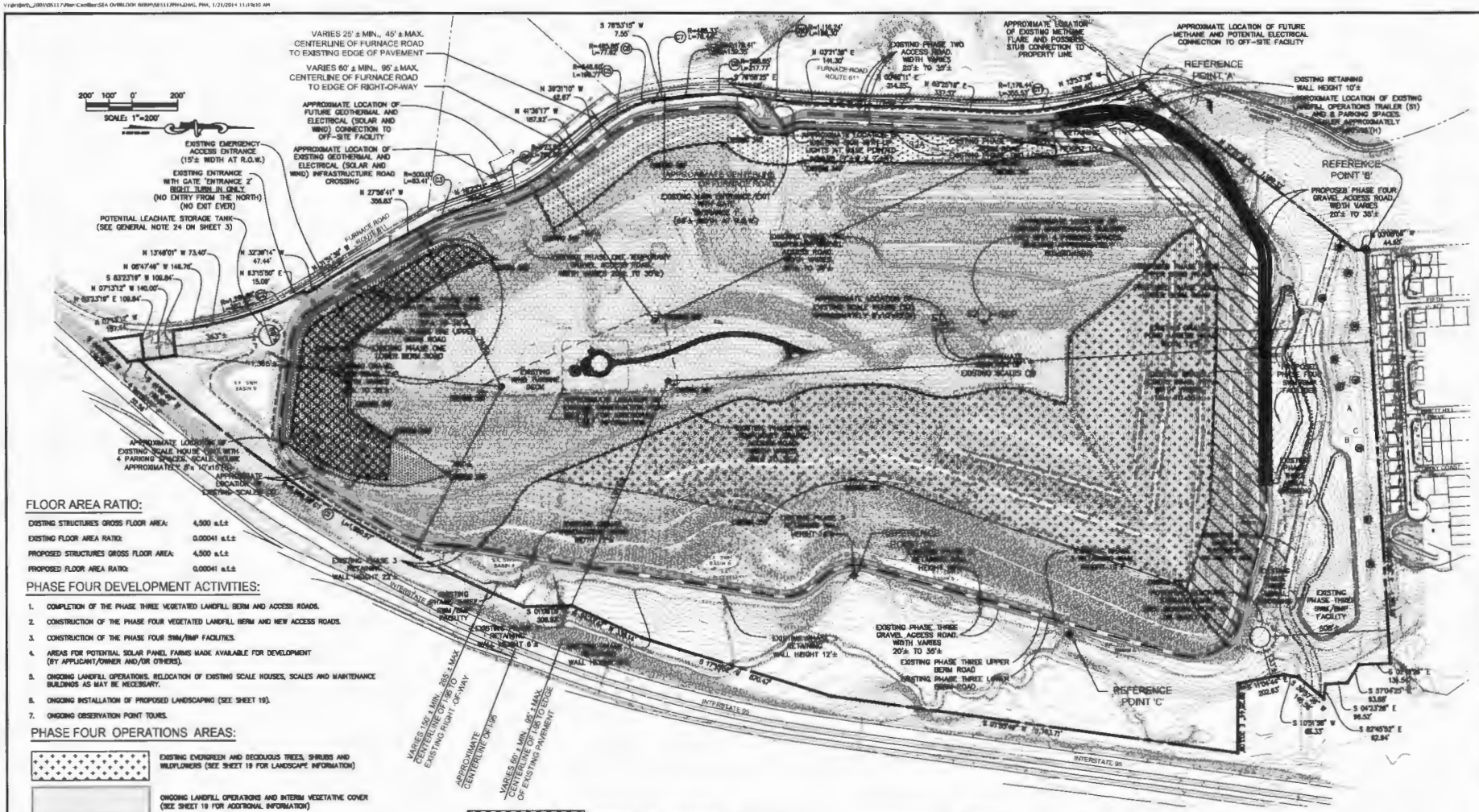
BC REVISIONS	
REVISED 8-14-2013	REVISED 1-23-2014
REVISED 9-5-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-6-2013	
REVISED 12-16-2013	

FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 202
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.

SHEET 8 OF 45

CO. NO. SEA 80-L/V-081-2
CAD NAME: SE0117PH3
LAYOUT: PH3
FILE NO. 05117.08-00



FLOOR AREA RATIO:

EXISTING STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
EXISTING FLOOR AREA RATIO:	0.00041 s.f.±
PROPOSED STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
PROPOSED FLOOR AREA RATIO:	0.00041 s.f.±

PHASE FOUR DEVELOPMENT ACTIVITIES:

1. COMPLETION OF THE PHASE THREE VEGETATED LANDFILL BERM AND ACCESS ROADS.
2. CONSTRUCTION OF THE PHASE FOUR VEGETATED LANDFILL BERM AND NEW ACCESS ROADS.
3. CONSTRUCTION OF THE PHASE FOUR SWM/BMP FACILITIES.
4. AREAS FOR POTENTIAL SOLAR PANEL FARMS MADE AVAILABLE FOR DEVELOPMENT (BY APPLICANT/OWNER AND/OR OTHERS).
5. ONGOING LANDFILL OPERATIONS, RELOCATION OF EXISTING SCALE HOUSES, SCALES AND MAINTENANCE BUILDINGS AS MAY BE NECESSARY.
6. ONGOING INSTALLATION OF PROPOSED LANDSCAPING (SEE SHEET 19).
7. ONGOING OBSERVATION POINT TOURS.

PHASE FOUR OPERATIONS AREAS:

- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS (SEE SHEET 19 FOR LANDSCAPE INFORMATION)
- ONGOING LANDFILL OPERATIONS AND INTERIM VEGETATIVE COVER (SEE SHEET 19 FOR ADDITIONAL INFORMATION)
- EXISTING PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 19 FOR LANDSCAPE INFORMATION)
- EXISTING PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 19 FOR LANDSCAPE INFORMATION)
- ONGOING INSTALLATION OF PHASE THREE FINAL LANDFILL CAP LANDSCAPE AREAS (SEE SHEET 19 FOR LANDSCAPE INFORMATION)
- PROPOSED LANDFILL OPERATIONS AND FUTURE FINAL LANDFILL CAP LANDSCAPING

NOTE:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 26 FOR TRUCK QUEUING INFORMATION AND EXIT INFORMATION.
3. SEE SHEET 42 FOR PHASE FOUR LANDFILL OPERATIONS TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTES 18 AND 23 ON SHEET 3).

- POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL FARM (BY APPLICANT/OWNER AND/OR OTHERS) (16)
- APPROXIMATE LOCATION OF PROPOSED PHASE FOUR VEGETATED LANDFILL BERM (18)
- APPROXIMATE LOCATION OF EXISTING PHASES ONE, TWO AND THREE VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- ENVIRONMENTAL QUALITY CORRIDOR/ RESOURCE PROTECTION AREA (EQC/RPA)
- 100-YR. FLOODPLAIN
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- EXISTING SPLIT RAIL OR OTHER SAFETY FENCE
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- APPROXIMATE LOCATION OF EXISTING WIND TURBINES TO BE REMOVED (REFER TO GENERAL NOTE 19 ON SHEET 3 FOR ADDITIONAL)
- EXISTING 380' + — EXISTING FILL SPOT ELEVATIONS

EXISTING STRUCTURE DISTANCE SCHEDULE: (9)

KEY	STRUCTURE	DIST. A	DIST. B	DIST. C
S1	Operations Trailer	257'±W	57'±W	2,322'±W
S1-P	Operations Trailer Parking	28'±W	52'±W	2,372'±W
S2	Maintenance Building	889'±W	1,071'±W	1,245'±W
S2-P	Maintenance Building Parking	831'±W	1,028'±W	1,242'±W
S3	Scale House	833'±W	1,081'±W	1,176'±W
S4	Scale House	743'±W	103'±W	2,363'±W
S4-P	Scale House Parking	102'±W	849'±W	2,228'±W

(1) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST
(2) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST
(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST
(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTH
(5) DISTANCE FROM STRUCTURE TO REFERENCE POINT 'A' (CLOSEST PROPERTY LINE TO THE WEST)
(6) DISTANCE FROM THE STRUCTURE TO REFERENCE POINT 'B' (CLOSEST PROPERTY LINE TO THE NORTH)
(7) REFERENCE POINT 'C' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(8) REFERENCE POINT 'B' PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(9) SUBJECT TO CHANGE BASED ON LANDFILL OPERATIONS.

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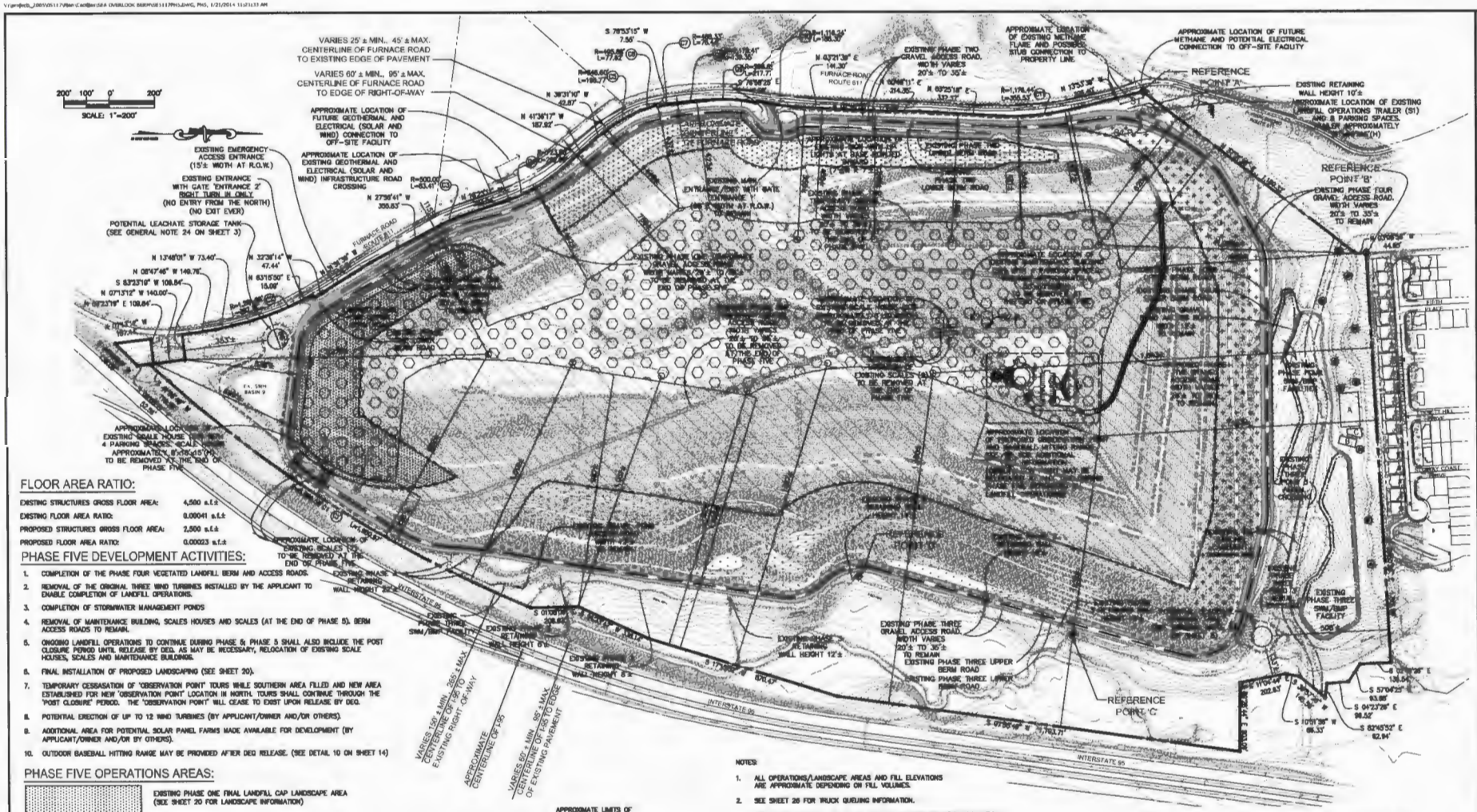
SPECIAL EXCEPTION AMENDMENT
PHASE FOUR OPERATIONS AREAS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC PROJECT NO.	05117.08-00
REVISED 1-22-2014	
REVISED 9-11-2013	
REVISED 10-2-2013	
REVISED 11-1-2013	
REVISED 11-15-2013	
REVISED 11-18-2013	
FURNACE ASSOCIATES, INC. 11220 ASHETT LOOP MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 9 OF 45	
CO. NO. SEA 80-L/V-061-2	
CAD NAME: SE5117PH4	
LAYOUT: PH4	
FILE NO. 05117.08-00	



FLOOR AREA RATIO:

EXISTING STRUCTURES GROSS FLOOR AREA:	4,500 s.f.±
EXISTING FLOOR AREA RATIO:	0.00041 s.f.±
PROPOSED STRUCTURES GROSS FLOOR AREA:	2,500 s.f.±
PROPOSED FLOOR AREA RATIO:	0.00023 s.f.±

PHASE FIVE DEVELOPMENT ACTIVITIES:

1. COMPLETION OF THE PHASE FOUR VEGETATED LANDFILL BERM AND ACCESS ROADS.
2. REMOVAL OF THE ORIGINAL THREE WIND TURBINES INSTALLED BY THE APPLICANT TO ENABLE COMPLETION OF LANDFILL OPERATIONS.
3. COMPLETION OF STORMWATER MANAGEMENT PONDS
4. REMOVAL OF MAINTENANCE BUILDING, SCALES HOUSES AND SCALES (AT THE END OF PHASE 5). BERM ACCESS ROADS TO REMAIN.
5. ONGOING LANDFILL OPERATIONS TO CONTINUE DURING PHASE 5; PHASE 5 SHALL ALSO INCLUDE THE POST CLOSURE PERIOD UNTIL RELEASE BY DEQ, AS MAY BE NECESSARY, RELOCATION OF EXISTING SCALE HOUSES, SCALES AND MAINTENANCE BUILDINGS.
6. FINAL INSTALLATION OF PROPOSED LANDSCAPING (SEE SHEET 20).
7. TEMPORARY CESSASATION OF "OBSERVATION POINT" TOURS WHILE SOUTHERN AREA FILLED AND NEW AREA ESTABLISHED FOR NEW "OBSERVATION POINT" LOCATION IN NORTH. TOURS SHALL CONTINUE THROUGH THE "POST CLOSURE" PERIOD. THE "OBSERVATION POINT" WILL CEASE TO EXIST UPON RELEASE BY DEQ.
8. POTENTIAL ERECTION OF UP TO 12 WIND TURBINES (BY APPLICANT/OWNER AND/OR OTHERS).
9. ADDITIONAL AREA FOR POTENTIAL SOLAR PANEL FARMS MADE AVAILABLE FOR DEVELOPMENT (BY APPLICANT/OWNER AND/OR BY OTHERS).
10. OUTDOOR BASEBALL HITTING RANGE MAY BE PROVIDED AFTER DEQ RELEASE. (SEE DETAIL 10 ON SHEET 14)

PHASE FIVE OPERATIONS AREAS:

- EXISTING PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREA (SEE SHEET 20 FOR LANDSCAPE INFORMATION)
- EXISTING PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREA (SEE SHEET 20 FOR LANDSCAPE INFORMATION)
- EXISTING PHASE THREE FINAL LANDFILL CAP LANDSCAPE AREA (SEE SHEET 20 FOR LANDSCAPE INFORMATION)
- ONGOING INSTALLATION OF PHASE FOUR FINAL LANDFILL CAP LANDSCAPE AREA (SEE SHEET 20 FOR LANDSCAPE INFORMATION)
- POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL FARM (BY APPLICANT/OWNER AND/OR BY OTHERS)
- PROPOSED PHASE FIVE LANDFILL OPERATIONS AND FINAL CAP LANDSCAPE AREA
- APPROXIMATE LOCATION OF EXISTING PHASES ONE, TWO, THREE AND FOUR VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- ENVIRONMENTAL QUALITY CORRIDOR/RESOURCE PROTECTION AREA (EQC/RPA)
- 100-YR. FLOODPLAIN
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- EXISTING SPLIT RAIL, OR OTHER SAFETY FENCE
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- APPROXIMATE LOCATION OF POTENTIAL WIND TURBINES (BY APPLICANT/OWNER AND/OR BY OTHERS)
- 397 — EXISTING FILL SPOT ELEVATIONS

NOTES:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 28 FOR TRUCK QUEUING INFORMATION.
3. SEE SHEET 43 FOR PHASE FIVE LANDFILL OPERATIONS TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE AND COMPLETE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE. (SEE GENERAL NOTES 16 AND 25 ON SHEET 3)
5. THE INFORMATION SHOWN ON THIS SHEET REFLECTS THE GREEN ENERGY PARK AND DEBRIS LANDFILL AS IT WILL EXIST AT THE END OF PHASE FIVE.
6. SEE SHEETS 16, 17, 18, 19 AND 20 FOR INTERIM AND FINAL LANDSCAPING PHASING INFORMATION.
7. THE ORIGINAL THREE WIND TURBINES INSTALLED IN PHASE ONE SHALL BE ENTIRELY REMOVED BY THE APPLICANT/OWNER DURING PHASE FIVE. NEW WIND TURBINES MAY BE ERECTED BY APPLICANT/OWNER AND/OR BY OTHERS PRIOR TO THE END OF PHASE FIVE, SUBSEQUENT TO CESSATION OF LANDFILL OPERATIONS, AS GENERALLY DEPICTED HEREON.
8. DURING PHASE 5, THERE WILL BE A GAP DURING WHICH NO "OBSERVATION POINT" WILL BE PROVIDED DUE TO THE NEED FOR FILLING, SETTLING AND CAPPING OF TOP PLATFORM.
9. WIND TURBINE, OBSERVATION POINT AND BASEBALL HITTING RANGE LOCATIONS MAY BE ADJUSTED DUE TO FINAL ENGINEERING AND DESIGN.
10. CONTOURS REPRESENT TOP OF FINAL COVER; FINAL WASTE DEBRIS MAY NOT EXCEED 412'.
11. OUTDOOR BASEBALL HITTING RANGE USE MAY BE PROVIDED IN PHASE 5. (SEE DETAIL ON SHEET 14)
12. PERSONAL AND MAINTENANCE VEHICLES SHALL BE ALLOWED TO MAKE LEFT TURNS IN AND RIGHT TURNS OUT AT MAIN ENTRANCE.

EXISTING STRUCTURE DISTANCE SCHEDULE: (9)

KEY	STRUCTURE	DIST. A	DIST. B	DIST. C
S1	Operations Trailer	22'±(1)	57'±(2)	2,122'±(3)
S1-P	Operations Trailer Parking	22'±(1)	50'±(2)	2,122'±(3)
S2	Maintenance Building	1,000'±(4)	1,000'±(5)	1,500'±(6)
S2-P	Maintenance Building Parking	1,000'±(4)	1,000'±(5)	1,500'±(6)
S3	Scale House	1,125'±(7)	1,125'±(8)	1,125'±(9)
S3	Scale House	1,125'±(7)	1,125'±(8)	1,125'±(9)
S4	Scale House	1,125'±(7)	1,125'±(8)	1,125'±(9)
S4-P	Scale House Parking	1,125'±(7)	1,125'±(8)	1,125'±(9)

(1) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTHWEST
(2) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE WEST
(3) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE EAST
(4) DISTANCE FROM STRUCTURE TO CLOSEST PROPERTY LINE TO THE NORTH
(5) DISTANCE FROM STRUCTURE TO REFERENCE POINT "A" (CLOSEST PROPERTY LINE TO THE WEST)
(6) DISTANCE FROM THE STRUCTURE TO REFERENCE POINT "B" (CLOSEST PROPERTY LINE TO THE NORTH)
(7) REFERENCE POINT "C" PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(8) REFERENCE POINT "B" PROVIDES THE DISTANCE FROM THE STRUCTURE TO THE CLOSEST POINT ON THE LIMITS OF THE EQC/RPA.
(9) SUBJECT TO CHANGE BASED ON LANDFILL OPERATIONS.

BC Consultants
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(703)449-8100, (703)449-8106 (fax)
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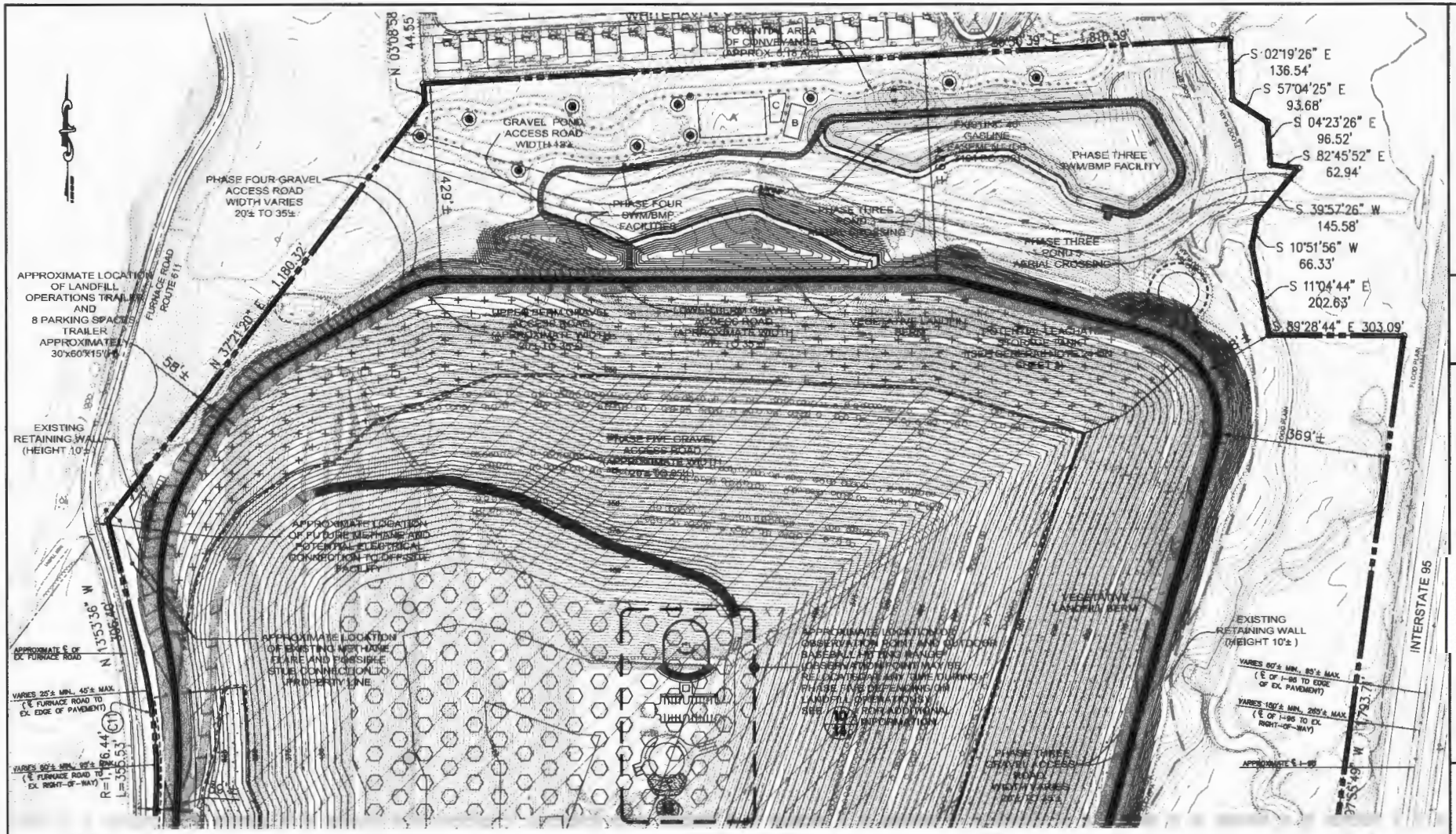
SPECIAL EXCEPTION AMENDMENT
PHASE FIVE OPERATIONS AREAS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 1-15-2014	REVISED 1-22-2014
REVISED 9-9-2013	REVISED 9-23-2013
REVISED 10-1-2013	REVISED 10-15-2013
REVISED 11-1-2013	REVISED 12-13-2013

LANDSCAPE ARCHITECTS
FURNACE ASSOCIATES, INC.
11220 ASBETT LOOP
SUITE 101
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.
SHEET 10 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME: SE5117PH5
LAYOUT: PH5
FILE NO. 05117.06-00



PHASE FIVE OPERATIONS AREAS:

- PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE THREE FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE FOUR FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE FIVE FINAL LANDFILL CAP LANDSCAPE AREA
- POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL ENERGY FARM – PHASES FOUR, FIVE, AND/OR SIX ONLY (BY APPLICANT/OWNER AND/OR BY OTHERS)
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS

MATCHLINE – SEE SHEET 12

- APPROXIMATE LOCATION OF POTENTIAL WIND TURBINES (BY APPLICANT/OWNER AND/OR BY OTHERS)
- EQC/RPA
- 100-YR. FLOODPLAIN
- APPROXIMATE LOCATION OF VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF SPLIT RAIL OR OTHER SAFETY FENCE
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- APPROXIMATE LIMITS OF CLEARING AND GRADING

NOTES:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 26 FOR TRUCK QUEUING INFORMATION.
3. SEE SHEET 43 FOR PHASE FIVE LANDFILL OPERATIONS TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE AND COMPLETE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE. (SEE GENERAL NOTES 18 AND 25 ON SHEET 3)
5. THE INFORMATION SHOWN ON THIS SHEET REFLECTS THE GREEN ENERGY PARK AND DEBRIS LANDFILL AS IT WILL EXIST AT THE END OF PHASE FIVE.
6. SEE SHEETS 16, 17, 18, 19 AND 20 FOR INTERIM AND FINAL LANDSCAPING PHASING INFORMATION.
7. THE ORIGINAL THREE WIND TURBINES INSTALLED IN PHASE ONE SHALL BE ENTIRELY REMOVED BY THE APPLICANT/OWNER DURING PHASE FIVE. NEW WIND TURBINES MAY BE ERECTED BY APPLICANT/OWNER AND/OR BY OTHERS PRIOR TO THE END OF PHASE FIVE, SUBSEQUENT TO CESSATION OF LANDFILL OPERATIONS, AS GENERALLY DEPICTED HEREON.
8. DURING PHASE 5, THERE WILL BE A GAP DURING WHICH NO "OBSERVATION POINT" WILL BE PROVIDED DUE TO THE NEED FOR FILLING, SETTLING AND CAPPING OF TOP PLATFORM.
9. WIND TURBINE, OBSERVATION POINT AND BASEBALL HITTING RANGE LOCATIONS MAY BE ADJUSTED DUE TO FINAL ENGINEERING AND DESIGN.
10. CONTOURS REPRESENT TOP OF FINAL COVER; FINAL WASTE DEBRIS MAY NOT EXCEED 412'.
11. OUTDOOR BASEBALL HITTING RANGE USE MAY BE PROVIDED IN PHASE 5. (SEE DETAIL ON SHEET 14)
12. PERSONAL AND MAINTENANCE VEHICLES SHALL BE ALLOWED TO MAKE LEFT TURNS IN AND RIGHT TURNS OUT AT MAIN ENTRANCE.

BC Consultants
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SPECIAL EXCEPTION AMENDMENT
PHASE FIVE – AT COMPLETION OF OPERATIONS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 5-14-2013	REVISED 1-28-2014
REVISED 8-21-2013	
REVISED 9-13-2013	
REVISED 11-1-2013	
REVISED 12-19-2013	

PARSONS BRINCKERHOFF ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=100' VERT.
SHEET 11 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME: SE51173PE
LAYOUT: PHASE FIVE A
FILE NO. 05117.08-00

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MATCHLINE – SEE SHEET 11

39'±

LOWER BERM GRAVEL ACCESS ROAD (APPROXIMATE WIDTH 20'± TO 35'±)

RAMP (DOWN) TO BOTTOM OF BERM GRAVEL ACCESS ROAD

PHASE TWO GRAVEL ACCESS ROAD WIDTH VARIES 20'± TO 35'±

UPPER BERM GRAVEL ACCESS ROAD (APPROXIMATE WIDTH 20'± TO 35'±)

VARIES 10'± MIN., 12'± MAX. (℄ FURNACE ROAD TO EDGE OF EX. PAVEMENT)

APPROXIMATE ℄ OF EX. FURNACE ROAD

VARIES 25'± MIN., 45'± MAX. (℄ FURNACE ROAD TO EX. RIGHT-OF-WAY)

N 03°25'18" E 337.37'

N 00°46'11" E 214.35'

N 02°46'58" E 179.63'

N 03°21'39" E 141.00'

FURNACE ROAD ROUTE 611

44'±

73'±

APPROXIMATE LOCATION OF PHASE ONE ENTRY SIGN

MAIN ENTRANCE/EXIT WITH GATE ENTRANCE

VEGETATIVE LANDFILL BERM

APPROXIMATE CENTERLINE OF FURNACE ROAD

42'±

30'±

VARIES 25'± MIN., 45'± MAX. CENTERLINE OF FURNACE ROAD TO EXISTING EDGE OF PAVEMENT

VARIES 60'± MIN., 95'± MAX. CENTERLINE OF FURNACE ROAD TO EDGE OF RIGHT-OF-WAY

R=1,116.24' L=188.30' (C10)

S 76°58'25" E 7.55'

R=598.85' L=217.77' (C9)

R=2,178.41' L=139.35' (C8)

R=488.33' L=76.44' (C7)

S 76°53'15" W 7.55'

R=495.88' L=77.62' (C6)

R=646.60' L=196.77' (C5)

N 39°31'10" W 42.87'

N 41°36'17" W 187.92'

EXISTING RETAINING WALL (HEIGHT 18'±)

PHASE THREE GRAVEL ACCESS ROAD. WIDTH VARIES 20'± TO 35'±

EXISTING RETAINING WALL (HEIGHT 14'±)

LOWER BERM GRAVEL ACCESS ROAD (APPROXIMATE WIDTH 20'± TO 35'±)

VEGETATIVE LANDFILL BERM

FLOOD PLAIN (EX. FP)

VARIES 60'± MIN., 95'± MAX. (℄ OF I-95 TO EDGE OF EX. PAVEMENT)

333'±

VARIES 150'± MIN., 200'± MAX. (℄ OF I-95 TO EX. RIGHT-OF-WAY)

870.47'

S 17°15'52"

INTERSTATE 95

APPROXIMATE ℄ I-95

EXISTING RETAINING WALL (HEIGHT 12'±)

257'±

S 24°33'41" W 338.14'

EXISTING RETAINING WALL (HEIGHT 15'±)

167'±

EXISTING RETAINING WALL (HEIGHT 14'±)

S 18°09'08" W 8.97'

100' 50' 0' 100'

SCALE: 1"=100'

MATCHLINE – SEE SHEET 13

PHASE FIVE OPERATIONS AREAS:

- PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE THREE FINAL LANDFILL CAP LANDSCAPE AREA
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- PHASE FOUR FINAL LANDFILL CAP LANDSCAPE AREA
- PHASE FIVE FINAL LANDFILL CAP LANDSCAPE AREA
- POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL ENERGY FARM – PHASES FOUR, FIVE AND/OR SIX ONLY (BY APPLICANT/OWNER AND/OR BY OTHERS) (7/14)
- APPROXIMATE LOCATION OF POTENTIAL WIND TURBINES (BY APPLICANT/OWNER AND/OR BY OTHERS) (9/14)
- A APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA (1/14)
- B APPROXIMATE LOCATION OF POTENTIAL DOG PARK (2/14)
- C APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA (3/14)
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS (3/14)
- EOC/RPA
- 100-YR. FLOODPLAIN
- APPROXIMATE LOCATION OF VEGETATED LANDFILL BERM (1/15)
- APPROXIMATE LOCATION OF SPLIT RAIL OR OTHER SAFETY FENCE (4/14)
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL (4/14)

NOTES:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 28 FOR TRUCK QUEUING INFORMATION.
3. SEE SHEET 43 FOR PHASE FIVE LANDFILL OPERATIONS TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND REMOVE AS REQUIRED TO CONTINUE AND COMPLETE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE. (SEE GENERAL NOTES 16 AND 25 ON SHEET 3)
5. THE INFORMATION SHOWN ON THIS SHEET REFLECTS THE GREEN ENERGY PARK AND GRAVEL LANDFILL AS IT WILL EXIST AT THE END OF PHASE FIVE.
6. SEE SHEETS 16, 17, 18, 19 AND 20 FOR INTERIM AND FINAL LANDSCAPING PHASING INFORMATION.
7. THE ORIGINAL THREE WIND TURBINES INSTALLED IN PHASE ONE SHALL BE ENTIRELY REMOVED BY THE APPLICANT/OWNER DURING PHASE FIVE. NEW WIND TURBINES MAY BE ERECTED BY APPLICANT/OWNER AND/OR BY OTHERS PRIOR TO THE END OF PHASE FIVE, SUBSEQUENT TO CESSATION OF LANDFILL OPERATIONS, AS GENERALLY DEPICTED HEREON.
8. DURING PHASE 5, THERE WILL BE A GAP DURING WHICH NO "OBSERVATION POINT" WILL BE PROVIDED DUE TO THE NEED FOR FILLING, SETTLING AND CAPPING OF TOP PLATFORM.
9. WIND TURBINE, OBSERVATION POINT AND BASEBALL HITTING RANGE LOCATIONS MAY BE ADJUSTED DUE TO FINAL ENGINEERING AND DESIGN.
10. CONTOURS REPRESENT TOP OF FINAL COVER; FINAL WASTE DEBRIS MAY NOT EXCEED 40'.
11. OUTDOOR BASEBALL HITTING RANGE USE MAY BE PROVIDED IN PHASE 5. (SEE DETAIL 08 SHEET 14)
12. PERSONAL AND MAINTENANCE VEHICLES SHALL BE ALLOWED TO MAKE LEFT TURNS IN AND RIGHT TURNS OUT AT MAIN ENTRANCE.

BC Consultants

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SPECIAL EXCEPTION AMENDMENT

PHASE FIVE – AT COMPLETION OF OPERATIONS

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT

FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 1-23-2013	REVISED 1-28-2014
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 11-15-2013	

FURNACE ASSOCIATES, INC.
11320 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR

DRAFTED BY: CAD

CHECKED BY: NB

DATE: MARCH 22, 2013

SCALE: HOR. 1"=100' VERT.

SHEET 12 OF 45

CO. NO. SEA 80-L/V-081-2

CAD NAME: SE5117SPE

LAYOUT: PHASE FIVE B

FILE NO. 05117.06-00

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MATCHLINE – SEE SHEET 12

APPROXIMATE LOCATION OF FUTURE GEOTHERMAL AND ELECTRICAL (SOLAR AND WIND) CONNECTION TO OFF-SITE FACILITY

R=723.00' (C4)
L=292.99'

APPROXIMATE LOCATION OF EXISTING GEOTHERMAL AND ELECTRICAL (SOLAR AND WIND) INFRASTRUCTURE ROAD CROSSING

N 18°23'11" W
223.54'

29'±

R=500.00' (C3)
L=83.41'

APPROXIMATE ℄ OF EX. FURNACE ROAD

N 27°56'41" W
355.83'

VARIES 20'± MIN., 45'± MAX. (℄ FURNACE ROAD TO EX. RIGHT-OF-WAY)

VARIES 10'± MIN., 12'± MAX. (℄ FURNACE ROAD TO EDGE OF EX. PAVEMENT)

N 31°51'39" W FURNACE ROAD (ROUTE 611)

RAMP (UP) TO TOP OF BERM GRAVEL ACCESS ROAD

N 32°39'14" W
47.44'

EXISTING EMERGENCY ACCESS ENTRANCE (15'± WIDTH AT R.O.W.)

N 63°15'50" E
15.09'

EXISTING ENTRANCE WITH GATE 'ENTRANCE 2' RIGHT TURN IN ONLY (NO ENTRY FROM THE NORTH) (NO EXIT EVER) (90'± WIDTH AT R.O.W.)

R=1,281.86' (C7)
L=362.47'

N 13°48'01" W 73.40'

N 08°47'46" W 149.76'

S 83°23'19" W 109.84'

N 07°13'12" W 140.00'

N 83°23'19" E 109.84'

S 07°13'12" W
157.44'

S 44°49'08" W
38.05'

479'±

S 41°53'49" W
110.33'

S 08°06'37" E
52.56'

EXISTING SWM BASIN 9

POTENTIAL LEACHATE STORAGE TANK (SEE GENERAL NOTE 24 ON SHEET 3)

VEGETATIVE LANDFILL BERM

GRAVEL ROAD ACCESS ROAD WIDTH 14'±

VEGETATIVE LANDFILL BERM

PHASE ONE GRAVEL ACCESS ROAD WIDTH VARIES 20'± TO 35'±

WIDE BERM GRAVEL ACCESS ROAD WITH GRADE WIDTH 20'±

L=1,900.97'

R=5,569.58' C1 (C1)

44'±

INTERSTATE 95

APPROXIMATE ℄ I-95

VARIES 80'± MIN., 90'± MAX. (℄ OF I-95 TO EDGE OF EX. PAVEMENT)

VARIES 150'± MIN., 265'± MAX. (℄ OF I-95 TO EX. RIGHT-OF-WAY)

PHASE THREE SWM/BMP FACILITY

EXISTING RETAINING WALL (HEIGHT 22'±)

100' 50' 0' 100'
SCALE: 1"=100'

FINAL PHASE FIVE OPERATIONS AREAS:

- PHASE ONE FINAL LANDFILL CAP LANDSCAPE AREAS
- PHASE TWO FINAL LANDFILL CAP LANDSCAPE AREAS
- PHASE THREE FINAL LANDFILL CAP LANDSCAPE AREAS
- PHASE FOUR FINAL LANDFILL CAP LANDSCAPE AREAS
- PHASE FIVE FINAL LANDFILL CAP LANDSCAPE AREAS
- POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL ENERGY FARM – PHASES FOUR, FIVE AND/OR SIX ONLY (BY APPLICANT/OWNER AND/OR BY OTHERS)
- EOC/RPA
- 100-YR. FLOODPLAIN
- APPROXIMATE LOCATION OF VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF SPLIT RAIL OR OTHER SAFETY FENCE
- APPROXIMATE LOCATION OF POTENTIAL NATURAL SURFACE (EXISTING SOIL) TRAIL
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- A — APPROXIMATE LOCATION OF POTENTIAL MULTI-PURPOSE OPEN SPACE AREA
- B — APPROXIMATE LOCATION OF POTENTIAL DOG PARK
- C — APPROXIMATE LOCATION OF POTENTIAL PICNIC AREA
- APPROXIMATE LOCATION OF POTENTIAL EXERCISE STATIONS
- APPROXIMATE LOCATION OF POTENTIAL WIND TURBINES (BY APPLICANT/OWNER AND/OR BY OTHERS)

NOTES:

1. ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.
2. SEE SHEET 28 FOR TRUCK QUEUING INFORMATION.
3. SEE SHEET 43 FOR PHASE FIVE LANDFILL OPERATIONS TRAFFIC CIRCULATION.
4. APPROXIMATE LOCATIONS OF LANDFILL OPERATIONAL FACILITIES ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE FACILITIES AND ROADS AS REQUIRED TO CONTINUE AND COMPLETE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE. (SEE GENERAL NOTES 16 AND 25 ON SHEET 3)
5. THE INFORMATION SHOWN ON THIS SHEET REFLECTS THE GREEN ENERGY PARK AND DEBRIS LANDFILL AS IT WILL EXIST AT THE END OF PHASE FIVE.
6. SEE SHEETS 16, 17, 18, 19 AND 20 FOR INTERIM AND FINAL LANDSCAPING PHASING INFORMATION.
7. THE ORIGINAL THREE WIND TURBINES INSTALLED IN PHASE ONE SHALL BE ENTIRELY REMOVED BY THE APPLICANT/OWNER DURING PHASE FIVE. NEW WIND TURBINES MAY BE ERECTED BY APPLICANT/OWNER AND/OR BY OTHERS PRIOR TO THE END OF PHASE FIVE, SUBSEQUENT TO CESSATION OF LANDFILL OPERATIONS, AS GENERALLY DEPICTED HEREON.
8. DURING PHASE 5, THERE WILL BE A GAP DURING WHICH NO "OBSERVATION POINT" WILL BE PROVIDED DUE TO THE NEED FOR FILLING, SETTLING AND CAPPING OF TOP PLATFORM.
9. WIND TURBINE, OBSERVATION POINT AND BASEBALL HITTING RANGE LOCATIONS MAY BE ADJUSTED DUE TO FINAL ENGINEERING AND DESIGN.
10. CONTOURS REPRESENT TOP OF FINAL COVER; FINAL WASTE DEBRIS MAY NOT EXCEED 412'.
11. OUTDOOR BASEBALL HITTING RANGE USE MAY BE PROVIDED IN PHASE 5. (SEE DETAIL ON SHEET 14)
12. PERSONAL AND MAINTENANCE VEHICLES SHALL BE ALLOWED TO MAKE LEFT TURNS IN AND RIGHT TURNS OUT AT MAIN ENTRANCE.

BC Consultants
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15800 Pelican Circle, Suite 100, Fairfax, VA 22033
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GEORGE L. BURR III
Lic. No. 002
1-23-2014

SPECIAL EXCEPTION AMENDMENT
PHASE FIVE – AT COMPLETION OF OPERATIONS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 1-23-2014	
REVISED 12-11-2013	
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 11-15-2013	
PREPARED FOR: FURNACE ASSOCIATES, INC. 11220 ASSETT LOOP SUITE 110 MANASSAS, VIRGINIA 20109	

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=100' VERT.

SHEET 13 OF 45

CO. NO. SEA 80-L/V-061-2
CAD NAME: SE51175PE
LAYOUT: PHASE FIVE C
FILE NO. 05117.06-00

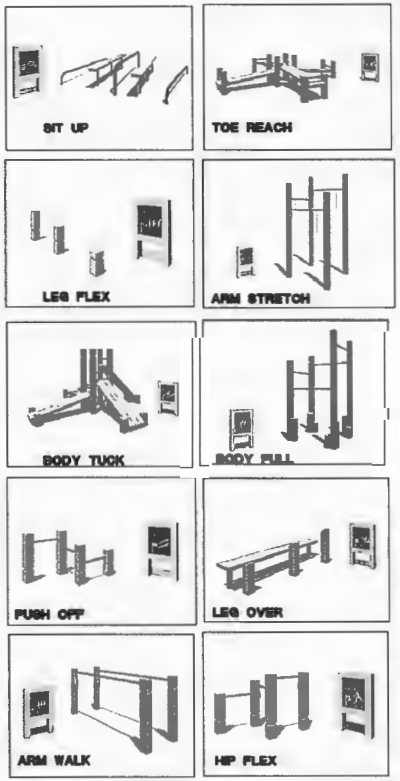
1/14 MULTI-PURPOSE OPEN SPACE
DESIGNATED MULTI-PURPOSE OPEN SPACE AREA APPROXIMATELY 12,750 s.f. NO SCALE

2/14 DOG PARK
FENCED AREA APPROXIMATELY 2,625 s.f. NO SCALE

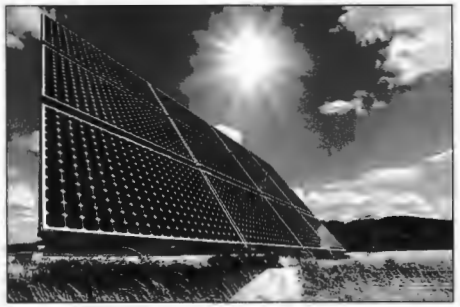
3/14 PICNIC AREA
DESIGNATED AREA OR INDIVIDUAL PICNIC TABLES MAY BE LOCATED THROUGHOUT THE RECREATION AREA. NO SCALE

4/14 NATURAL SURFACE (EXISTING SOIL) TRAIL
(MINIMUM 10' WIDE TRAIL) NO SCALE

NOTE: DETAILS 1 THROUGH 5 ARE POTENTIAL USES THAT MAY BE PROVIDED BY THE APPLICANT AS DETERMINED BY THE LORTON VALLEY HOMEOWNERS ASSOCIATION.

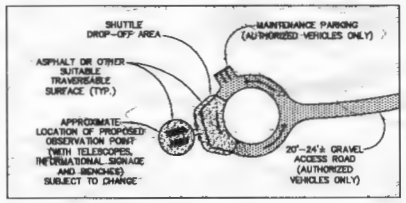


5/14 WIND TURBINE NO SCALE
TURBINE MANUFACTURER TO BE DETERMINED. 120' APPROXIMATE TOWER HEIGHT, 60' APPROXIMATE ROTOR RADIUS AND 10' APPROXIMATE TOWER BASE DIAMETER. MAXIMUM HEIGHT OF TOWER WITH ROTOR SHALL NOT EXCEED 180'±.

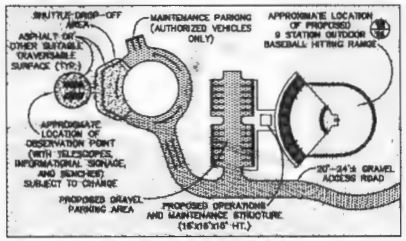


7/14 POTENTIAL SOLAR PANEL NO SCALE
APPROXIMATELY 40 ACRES ON TOP AND 10 ACRES ON THE SOUTHERN SLOPE ARE AREAS FOR DEVELOPMENT OF A SOLAR PANEL FARM (BY APPLICANT AND/OR OTHERS). SOLAR PANEL HEIGHT APPROXIMATELY 10', LENGTH APPROXIMATELY 50' AND WIDTH APPROXIMATELY 25'. FINAL SIZE MAY BE ADJUSTED DEPENDING ON THE PREVAILING TECHNOLOGY AT THE TIME OF INSTALLATION PROVIDED THAT THE MINIMUM SETBACK DISTANCES ARE NOT DIMINISHED.

8/14 SPLIT RAIL OR OTHER SAFETY FENCE NO SCALE
(36" MIN. HEIGHT WITH WIRE MESH BACKING)

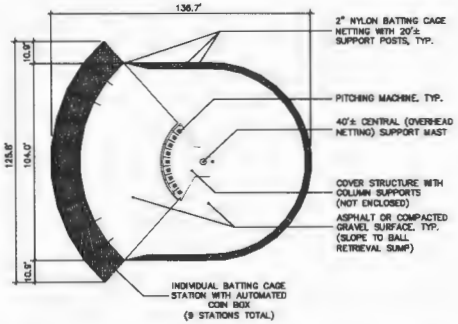


9/14 OBSERVATION POINT CONCEPT PLAN
PHASES 1 TO 4 FEATURES MAY BE ADJUSTED 1"=80'

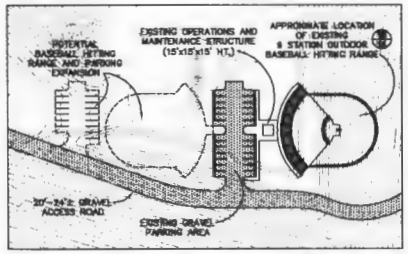


10/14 OBSERVATION POINT AND OUTDOOR BASEBALL HITTING RANGE CONCEPT LAYOUT - PHASE 5 1"=80'
OUTDOOR BASEBALL BATTING RANGE MAY BE PROVIDED AT THE END OF PHASE 5. LOCATION AND LAYOUT MAY BE ADJUSTED FROM THAT SHOWN.

6/14 EXERCISE STATIONS NO SCALE
AS MANUFACTURED BY COLUMBIA CASCADE (OR AN APPROVED EQUAL). SEE PLAN FOR APPROXIMATE STATION LOCATIONS. ALL EQUIPMENT IS MADE FROM RECYCLED PLASTIC.



12/14 9 STATION OUTDOOR BASEBALL HITTING RANGE NO SCALE
TYPICAL LAYOUT. MAY BE ADJUSTED AT FINAL ENGINEERING AND DESIGN.



11/14 OUTDOOR BASEBALL HITTING RANGE - PHASE 6
OUTDOOR BASEBALL BATTING RANGE MAY BE PROVIDED DURING PHASE 6 1"=80' AND MAY INCLUDE A SECOND, NINE STATION BATTING RANGE. LOCATION AND LAYOUT MAY BE ADJUSTED AT FINAL ENGINEERING AND DESIGN.

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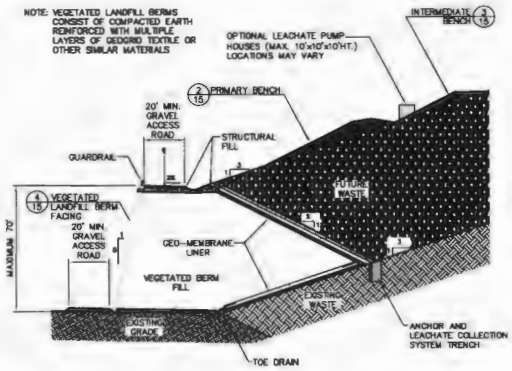
SPECIAL EXCEPTION AMENDMENT
SITE DETAILS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 5-14-2013	REVISED 1-22-2014
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 12-16-2013	

APPLICANT:
LORTON VALLEY LLC
12000 FAIR LAKES CIRCLE
SUITE 201
FAIRFAX, VIRGINIA 22033

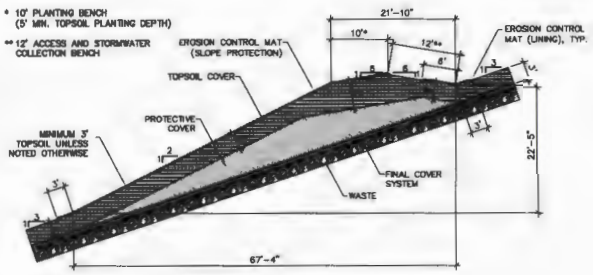
DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.

SHEET 14 OF 46
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE51170ET3
LAYOUT: DETAILS
FILE NO. 05117.08-00



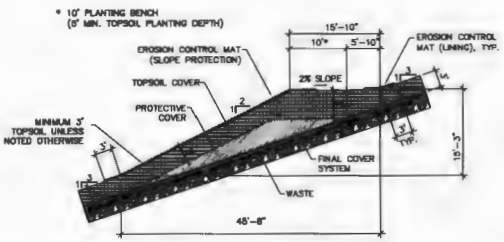
1/15 TYPICAL VEGETATED LANDFILL BERM SECTION

NO SCALE



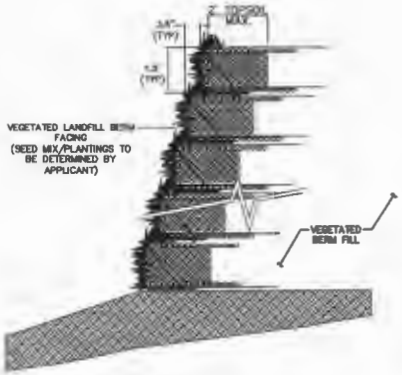
2/15 TYPICAL PRIMARY BENCH

SCALE: 1"=10'



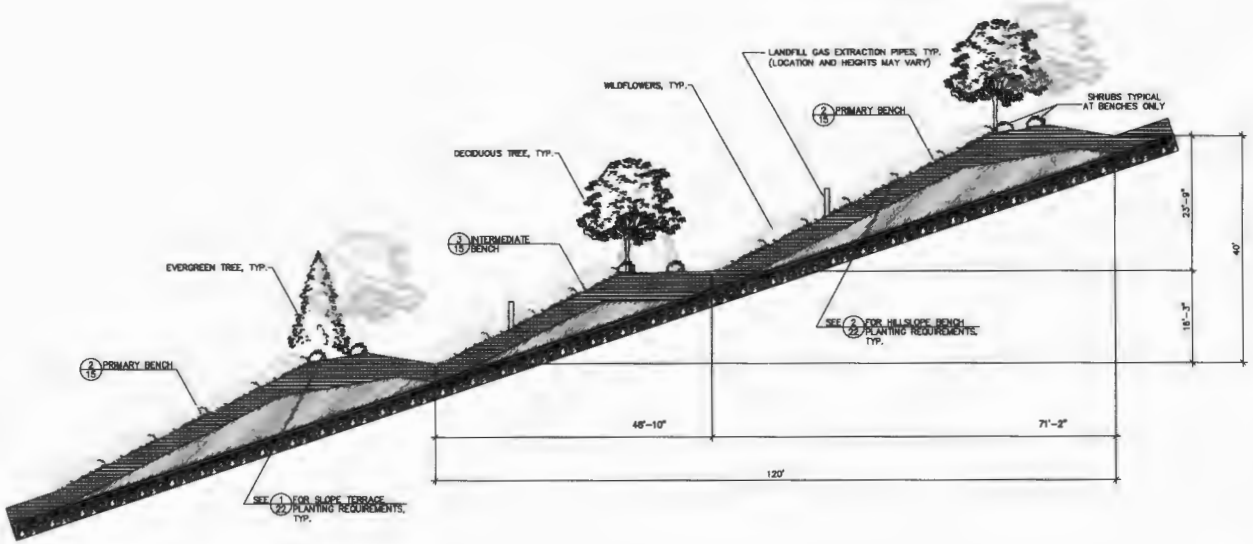
3/15 TYPICAL INTERMEDIATE BENCH

SCALE: 1"=10'



4/15 TYPICAL VEGETATED LANDFILL BERM FACING

NO SCALE



5/15 TYPICAL SIDE SLOPE TERRACE AND HILLSIDE SECTION

SCALE: 1"=10'

NOTE: THE DETAILS SHOWN ON THIS SHEET MAY BE ADJUSTED BY THE APPLICANT/OWNER AND/OR OTHERS DURING THE SITE PLAN PHASE AND/OR VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) REVIEW PHASE PURSUANT TO ENGINEERING AND LANDSCAPING DESIGN REQUIREMENTS.

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THOMAS A. BAKER Lic. No. 0402 1-22-2014

SPECIAL EXCEPTION AMENDMENT
SITE DETAILS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 1-22-2014
REVISED 8-14-2013
REVISED 8-31-2013
REVISED 11-1-2013
REVISED 12-10-2013

APPLICANT/OWNER: LORTON VENTURES, INC.
11320 ALLIETT LOOP
SUITE 201
LORTON, VIRGINIA 22079

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.

SHEET 15 OF 45

CG NO. SEA 80-L/V-061-2
CAD NAME: SE5117DET
LAYOUT: DETAILS
FILE NO. 05117.08-00

V:\projects_2005\05117\Plan\Cad\Dwg\SEA OVERLOOK BERM\SE5117LSC-PH1.DWG, LSC-PH1, 1/23/2014 11:39:18 AM

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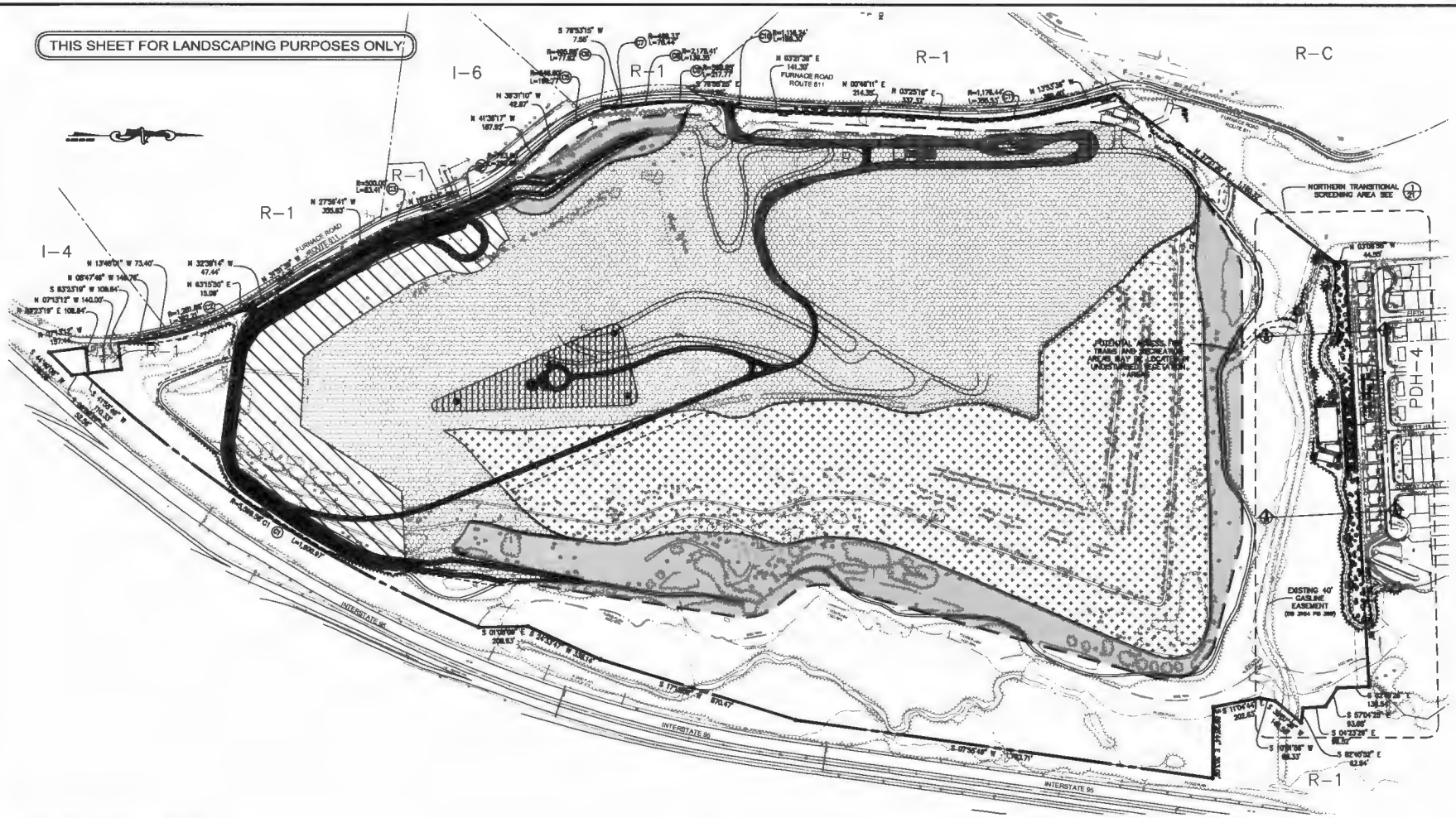

PHASE ONE LANDSCAPE AREAS:

- UNDISTURBED VEGETATION (EXCEPT FOR BERM ACCESS ROADS AND RAMPS)
- EXISTING VEGETATION PLUS PROPOSED EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS
- LANDFILL OPERATIONS AND PROPOSED INTERIM VEGETATIVE COVER
- LANDFILL OPERATIONS AREA AND PROPOSED WILDFLOWER LANDSCAPE AREA
- PROPOSED PHASE ONE FINAL CAP WILDFLOWER LANDSCAPE AREA
- APPROXIMATE LIMITS OF OPERATIONS AND LANDSCAPE AREAS
- APPROXIMATE LOCATION OF PROPOSED PHASE ONE VEGETATED LANDFILL BERM
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING TREELINE
- PROPOSED TREELINE
- ENVIRONMENTAL QUALITY CORRIDOR/ RESOURCE PROTECTION AREA (EQC/RAP)
- FLOODPLAIN
- EXISTING TREES
- PROPOSED DECIDUOUS AND EVERGREEN TREES AND SHRUBS

NOTE: ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE APPROXIMATE DEPENDING ON FILL VOLUMES.

200' 100' 0' 200'
SCALE: 1"=200'

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SPECIAL EXCEPTION AMENDMENT
PHASE ONE LANDSCAPE PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 4-5-2013	REVISED 1-23-2014
REVISED 8-11-2013	
REVISED 10-2-2013	
REVISED 11-1-2013	
REVISED 12-12-2013	

FURNACE ASSOCIATES, INC.
11220 ASHETT LOOP
SUITE 200
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.

SHEET 16 OF 45

CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117LSC-PH1
LAYOUT: LSC-PH
FILE NO. 05117.06-00

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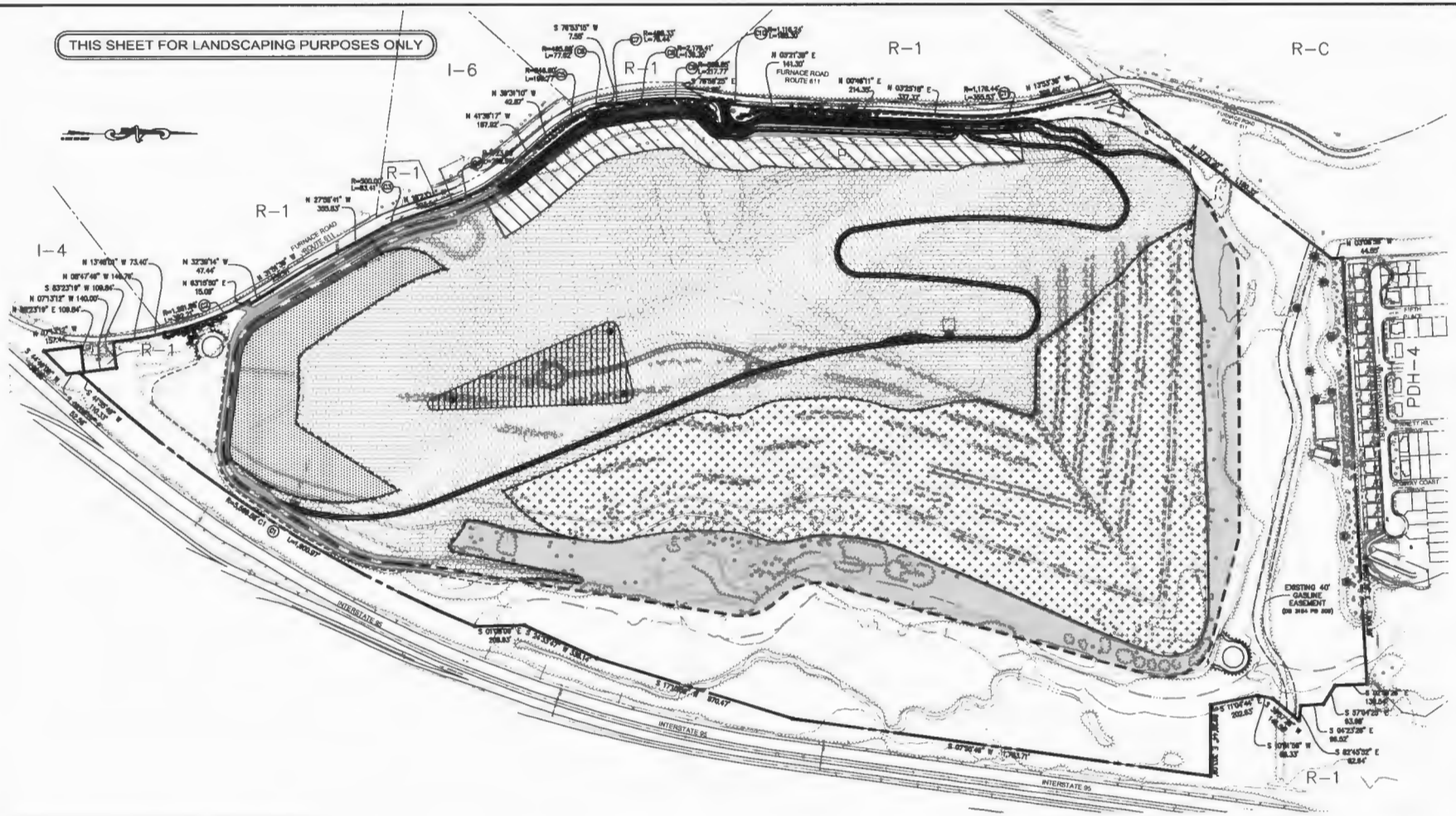

PHASE TWO OPERATIONS AND LANDSCAPE AREAS:

- UNDISTURBED VEGETATION (EXCEPT FOR BERM ACCESS ROADS AND RAMPS)
- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS LANDSCAPE AREA
- EXISTING LANDFILL OPERATIONS AND INTERIM LANDSCAPE AREAS
- EXISTING LANDFILL OPERATIONS AND WILDFLOWER LANDSCAPE AREA
- EXISTING PHASE ONE FINAL CAP WILDFLOWER LANDSCAPE AREA
- PROPOSED PHASE TWO FINAL CAP WILDFLOWER LANDSCAPE AREA
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- EXISTING DECIDUOUS AND EVERGREEN TREES AND/OR SHRUBS
- PROPOSED DECIDUOUS AND EVERGREEN TREES AND/OR SHRUBS
- EXISTING TREELINE
- PROPOSED TREELINE
- APPROXIMATE LIMITS OF PROPOSED PHASE TWO VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF EXISTING PHASE ONE VEGETATED LANDSCAPE BERM
- APPROXIMATE LIMITS OF OPERATIONS AND LANDSCAPE AREAS

NOTE: ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE ILLUSTRATIVE APPROXIMATE DEPENDING ON FILL VOLUMES.

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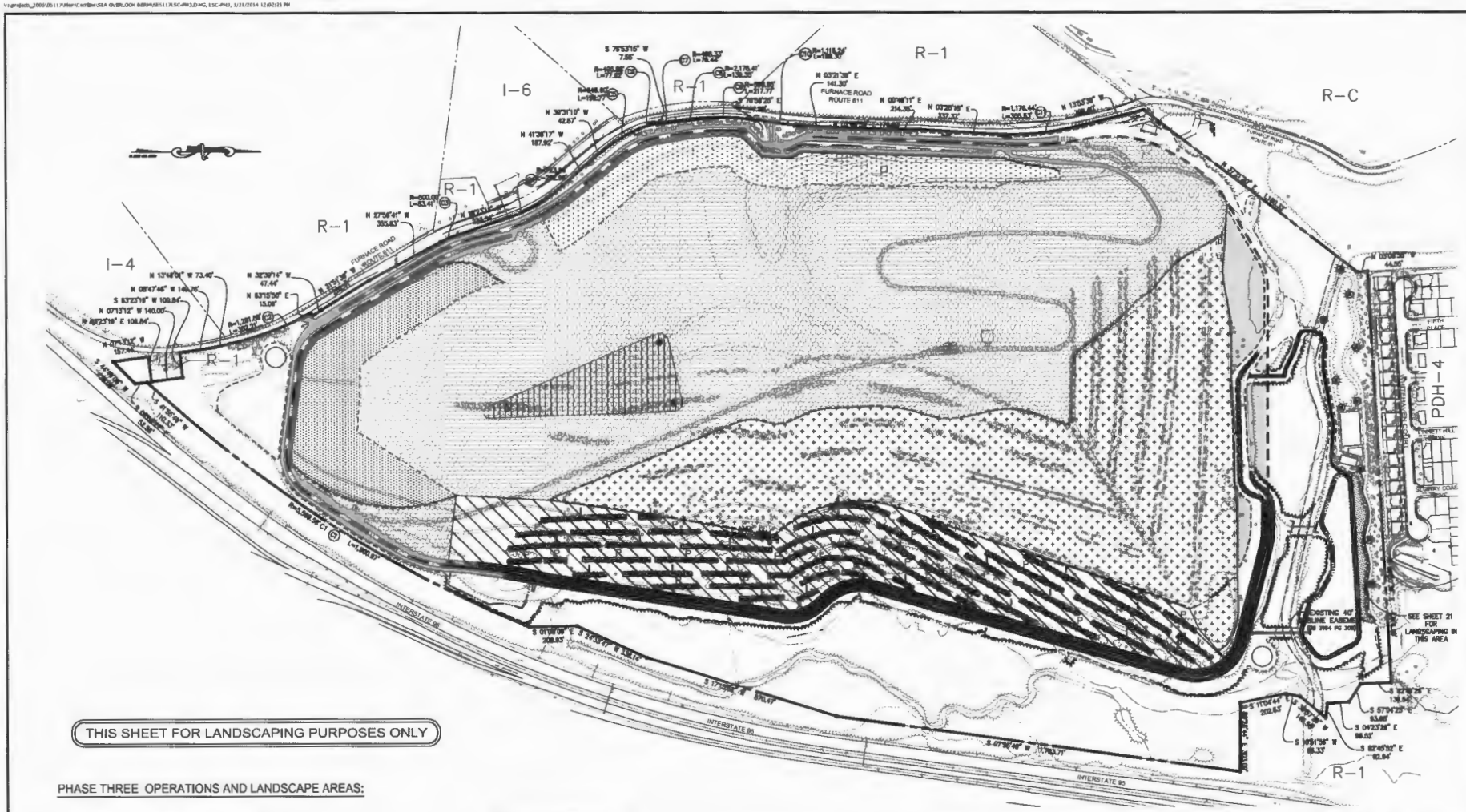
SPECIAL EXCEPTION AMENDMENT
PHASE TWO LANDSCAPE PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 3-11-2013	REVISED 1-23-2014
REVISED 5-11-2013	
REVISED 7-15-2013	
REVISED 11-1-2013	
REVISED 12-16-2013	
PREPARED BY: FRANCHOT ASSOCIATES, INC. 11220 ASSET LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 17 OF 45	
CO. NO. SEA 80-L/V-061-2	
CAD NAME: SE5117LSC-PH2	
LAYOUT: LSC-PH2	
FILE NO. 05117.08-00	



PHASE THREE OPERATIONS AND LANDSCAPE AREAS:

- UNDISTURBED VEGETATION (EXCEPT FOR BERM ACCESS ROADS AND RAMPS)
- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS LANDSCAPE AREA
- EXISTING LANDFILL OPERATIONS AND INTERIM LANDSCAPE AREAS
- EXISTING LANDFILL OPERATIONS AND WILDFLOWER LANDSCAPE AREA
- EXISTING PHASE ONE FINAL CAP WILDFLOWER LANDSCAPE AREA
- EXISTING PHASE TWO FINAL CAP WILDFLOWER LANDSCAPE AREA
- PROPOSED PHASE THREE FINAL CAP WILDFLOWER LANDSCAPE AREA (1/22)
- P — PROPOSED PHASE THREE PRIMARY SLOPE TERRACE PLANTING (3/15) (6/15) (1/22)
- I — PROPOSED PHASE THREE INTERMEDIATE SLOPE TERRACE PLANTING (3/15) (6/15) (1/22)
- EXISTING DECIDUOUS AND EVERGREEN TREES AND/OR SHRUBS
- APPROXIMATE LOCATION OF PROPOSED PHASE THREE VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF EXISTING PHASES ONE AND TWO VEGETATED LANDFILL BERM
- APPROXIMATE LIMITS OF OPERATIONS AND LANDSCAPE AREAS
- EXISTING TREELINE
- PROPOSED TREELINE
- APPROXIMATE LIMITS OF CLEARING AND GRADING

200' 100' 0' 200'
SCALE: 1"=200'

NOTE: ALL OPERATIONS/LANDSCAPE AREAS AND FILL ELEVATIONS ARE ILLUSTRATIVE AND APPROXIMATE DEPENDING ON FILL VOLUMES.

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SPECIAL EXCEPTION AMENDMENT
PHASE THREE LANDSCAPE PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

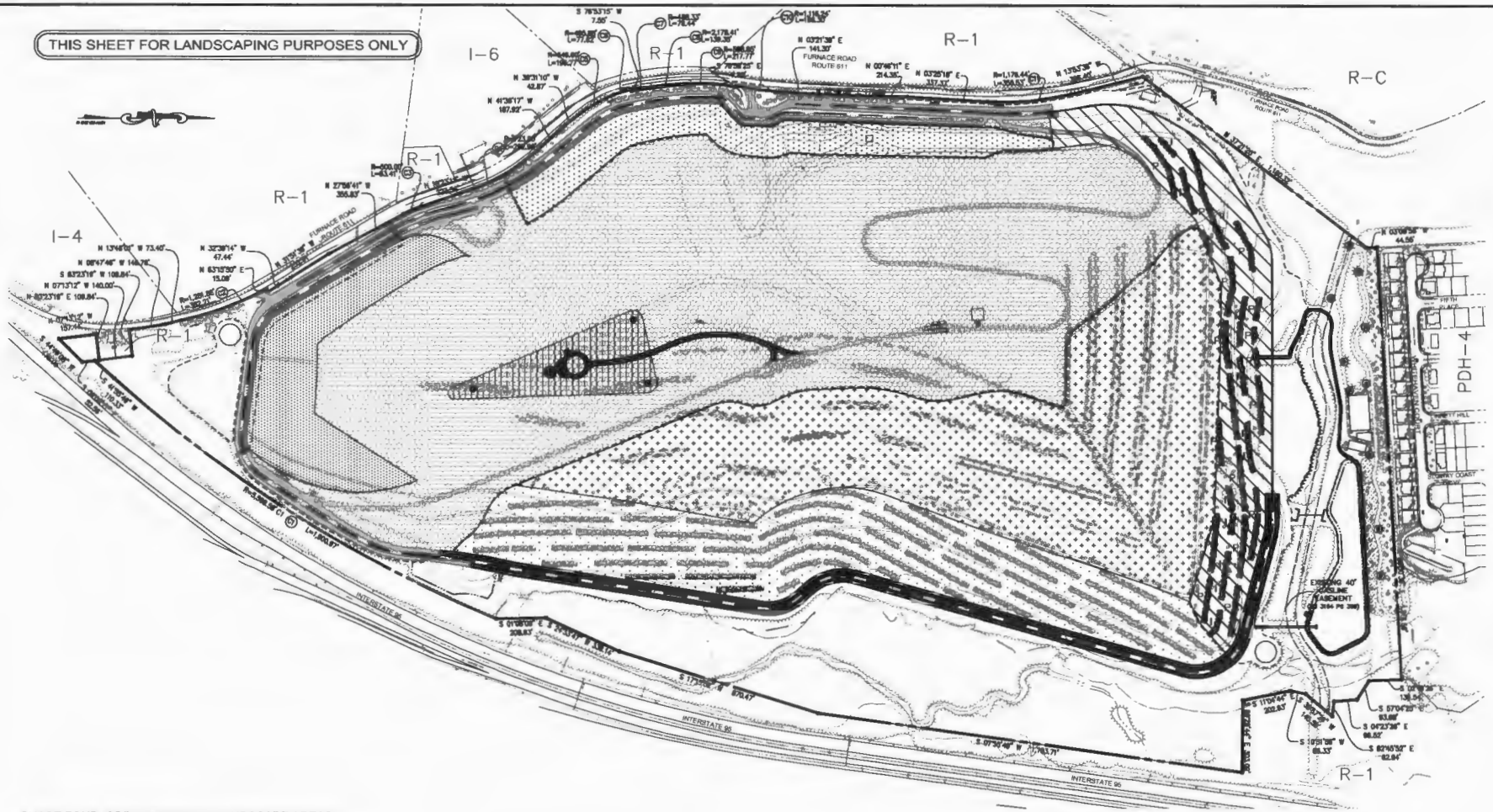
FAIRFAX COUNTY, VIRGINIA

BC REV. DATES	
REVISED	3-14-2013
REVISED	4-11-2013
REVISED	6-11-2013
REVISED	10-3-2013
REVISED	11-14-2013
REVISED	12-12-2013

PORTAL ENGINEERING ASSOCIATES, INC.
11250 ROSEMARY LANE
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HORZ. 1"=200' VERT.
SHEET 18 OF 46
CO. NO. SEA 80-L/Y-08
CAD NAME: SE5117LSC-PH3
LAYOUT: LSC-PH3
FILE NO. 05117.08-00

THIS SHEET FOR LANDSCAPING PURPOSES ONLY



PHASE FOUR OPERATIONS AND LANDSCAPE AREAS:

- EXISTING EVERGREEN AND DECIDUOUS TREES, SHRUBS AND WILDFLOWERS LANDSCAPE AREA
- EXISTING LANDFILL OPERATIONS AND INTERIM LANDSCAPE AREAS
- EXISTING LANDFILL OPERATIONS AND WILDFLOWER LANDSCAPE AREA
- EXISTING PHASE ONE FINAL CAP WILDFLOWER LANDSCAPE AREA
- EXISTING PHASE TWO FINAL CAP LANDSCAPE AREA
- EXISTING PHASE THREE FINAL CAP LANDSCAPE AREA
- PROPOSED PHASE FOUR FINAL CAP WILDFLOWER LANDSCAPE AREA (3/22)
- EXISTING TREELINE
- PROPOSED TREELINE
- EXISTING PHASE THREE PRIMARY AND INTERMEDIATE SLOPE TERRACE PLANTING
- PROPOSED PHASE FOUR PRIMARY SLOPE TERRACE PLANTING (6/16) (5/15) (1/22)
- PROPOSED PHASE FOUR INTERMEDIATE SLOPE TERRACE PLANTING (3/15) (3/15) (1/22)
- EXISTING DECIDUOUS AND EVERGREEN TREES AND/OR SHRUBS
- APPROXIMATE LOCATION OF EXISTING PHASES ONE, TWO & THREE VEGETATED LANDFILL BERM
- APPROXIMATE LOCATION OF PROPOSED PHASE FOUR VEGETATED LANDFILL BERM (1/15)
- APPROXIMATE LIMITS OF CLEARING AND GRADING

200' 100' 0' 200'
SCALE: 1"=200'

NOTE:
1. ALL OPERATIONS AND LANDSCAPE AREAS AND FILL ELEVATIONS ARE ILLUSTRATIVE AND APPROXIMATE DEPENDING ON FILL VOLUME.
2. SEE SHEET 9 FOR POTENTIAL PHASE FOUR SOLAR PANEL FARM

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SPECIAL EXCEPTION AMENDMENT
PHASE FOUR LANDSCAPE PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	REVISED 1-22-2014
	REVISED 8-14-2013
	REVISED 8-11-2013
	REVISED 7-1-2013
	REVISED 12-19-2013
	REVISED 12-2-2013
FORTUNE ASSOCIATES, INC. 11250 ASBETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 19 OF 45	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117LSC-PH4	
LAYOUT: LSC-PH4	
FILE NO. 05117.08-00	

THIS SHEET FOR LANDSCAPING PURPOSES ONLY

I-6

R-1

R-C

I-4

PDH-4

FURNACE ROAD ROUTE 611

INTERSTATE 95

EXISTING 40' GASLINE EASEMENT

EXISTING PHASE TWO FINAL LANDFILLCAP WILDFLOWER LANDSCAPE AREA

EXISTING PHASE THREE FINAL LANDFILL CAP WILDFLOWER LANDSCAPE AREA

EXISTING PHASE FOUR FINAL LANDFILL CAP WILDFLOWER LANDSCAPE AREA

-OTENTIAL PHASE FIVE SOLAR PANEL FARM

PROPOSED PHASE FIVE FINAL LANDFILL CAP WILDFLOWER LANDSCAPE AREA (3/24)

PROPOSED PHASE FIVE FINAL LANDFILL CAP MEADOW LANDSCAPE AREA (3/12)

PROPOSED PHASE FIVE PRIMARY SIDE SLOPE TERRACE PLANTINGS (3/15) (1/22)

PROPOSED PHASE FIVE INTERMEDIATE SLOPE TERRACE PLANTINGS (3/15) (1/22)

EXISTING PHASE THREE AND FOUR PRIMARY & INTERMEDIATE SLOPE TERRACE PLANTING

EXISTING VEGETATED LANDFILL BERM

APPROXIMATE LIMITS OF CLEARING AND GRADING

EXISTING TREELINE

PROPOSED TREELINE

EXISTING DECIDUOUS AND EVERGREEN TREES AND/OR SHRUBS

BC Consultants

Planners · Engineers · Surveyors · Landscape Architects

12800 Fair Lakes Circle, Suite 100, Fairfax, VA 22033

(703)449-8100, (703)449-8106 (Fax)

www.bcconsl.com

COMMONWEALTH OF VIRGINIA — BRIAN S. CRUZ — Lic. No. 002 — 1-22-2014

SPECIAL EXCEPTION AMENDMENT
PHASE FIVE LAND
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 1-22-2014	REVISED 1-22-2014
REVISED 8-5-2013	
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

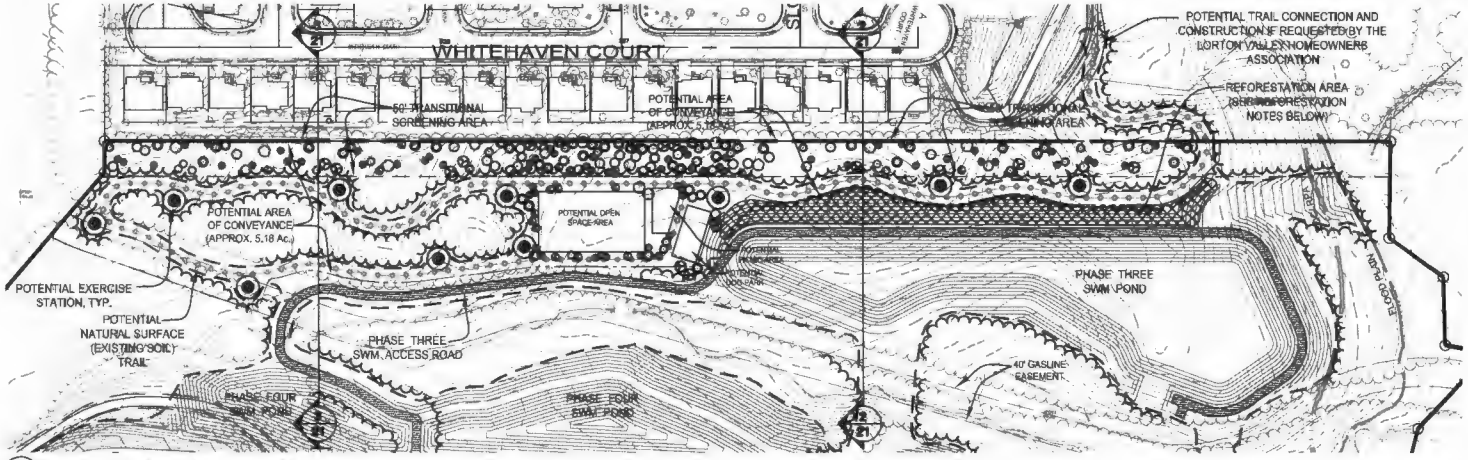
FURNACE ASSOCIATES, INC.
11320 ASHETT LOOP
P.O. BOX 2
MANASSAS, VIRGINIA 20108

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: MB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.

SHEET 20 OF 45

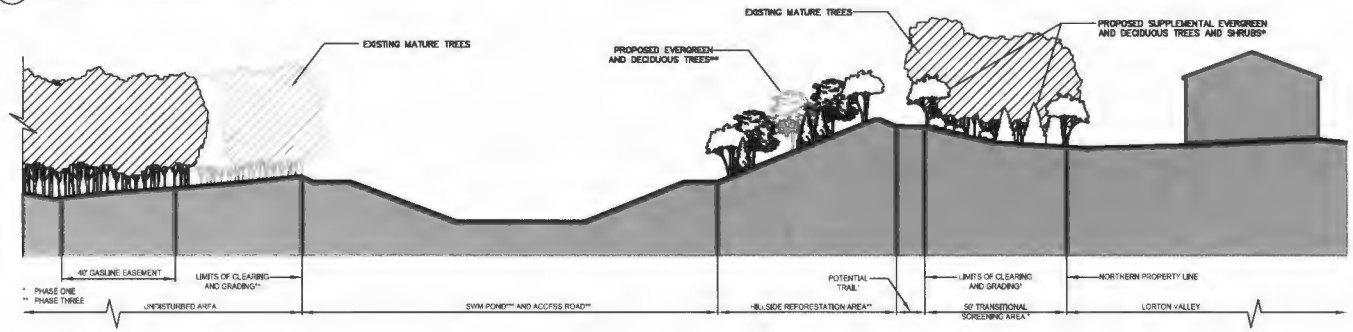
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117LSC-PH5
LAYOUT: LSC-PH5
FILE NO. 05117.09-00

THIS SHEET FOR LANDSCAPING PURPOSES ONLY



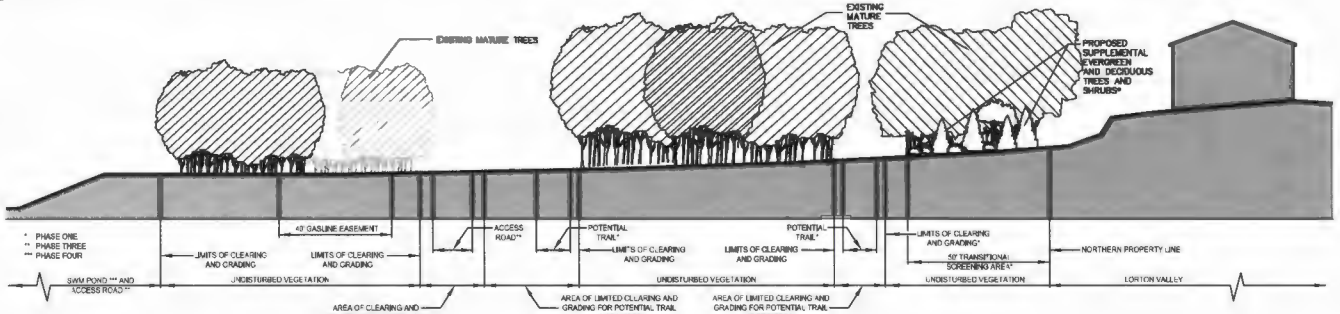
1/21 NORTHERN TRANSITIONAL SCREENING PLAN
PLAN

SCALE 1" = 80'



2/21 NORTHERN TRANSITIONAL SCREENING SECTION
SECTION

SCALE 1" = 20'



3/21 NORTHERN TRANSITIONAL SCREENING SECTION
SECTION

SCALE 1" = 20'

NORTHERN TRANSITIONAL SCREENING 1/21
SEE THIS SHEET

KEY MAP
NO SCALE

LEGEND:

- LIMITS OF CLEARING AND GRADING
- CATEGORY IV DECIDUOUS TREES
- CATEGORY III OR II DECIDUOUS TREES
- CATEGORY IV EVERGREEN TREES
- CATEGORY III OR II EVERGREEN TREES
- REFORESTATION AREA (SEE REFORESTATION NOTES BELOW)

GENERAL NOTES:

1. MINIMAL GRADING SHALL BE PERMITTED WITHIN THE 50' TRANSITIONAL SCREENING AREA, AS DETERMINED BY THE URBAN FOREST MANAGEMENT DIVISION (UFMD), AS NECESSARY FOR INSTALLATION OF THE POTENTIAL TRAIL AND/OR OTHER IMPROVEMENTS.
2. LOCATION OF THE POTENTIAL TRAIL IS APPROXIMATE. FINAL LOCATION SHALL BE DETERMINED IN THE FIELD UNDER THE DIRECTION OF UFMD TO AVOID EXISTING TREES AND UNDERSTOREY VEGETATION WHERE POSSIBLE.
3. SUPPLEMENTAL DECIDUOUS AND EVERGREEN TREES ARE SHOWN WITHIN THE 50' TRANSITIONAL SCREENING AREA. THEIR FINAL LOCATIONS MAY CHANGE SUBJECT TO UFMD APPROVAL. DECIDUOUS AND EVERGREEN SHRUBS ARE NOT SHOWN WITHIN THE 50' TRANSITIONAL SCREENING AREA BUT WILL BE PROVIDED. THE FINAL QUANTITY, LOCATIONS AND TYPE OF SHRUBS PROVIDED SHALL BE SUBJECT TO UFMD APPROVAL.
4. PROPOSED TREES LOCATED OUTSIDE THE LIMITS OF CLEARING AND GRADING AND THOSE LOCATED WITHIN THE 50' TRANSITIONAL SCREENING AREA SHALL BE PLANTED MANUALLY. NO HEAVY EQUIPMENT SHALL BE USED.

REFORESTATION NOTES:

1. REFORESTATION AREA (APPROXIMATELY 23,970 s.f.±) TO BE PLANTED WITH A MIX OF DECIDUOUS AND EVERGREEN OVERSTORY AND UNDERSTORY TREES AND STABILIZED WITH A SEED MIX OF NATIVE PERENNIALS AND GRASSES.
2. OVERSTORY TREES SHALL BE PLANTED AT A RATE OF 100 TREES PER ACRE OF REFORESTATION AREA.
3. UNDERSTORY TREES SHALL BE PLANTED AT A RATE OF 200 TREES PER ACRE OF REFORESTATION AREA.
4. DECIDUOUS TREES SHALL BE A MINIMUM OF TWO (2) INCHES IN CALIPER AND EVERGREEN TREES SHALL BE A MINIMUM OF SIX (6) TO EIGHT (8) FEET IN HEIGHT AT THE TIME OF PLANTING.
5. FINAL SEED MIX TO BE DETERMINED IN CONSULTATION WITH UFMD.

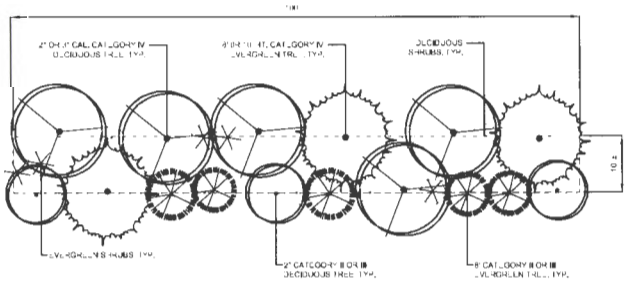
BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
18500 Fair Lakes Circle, Suite 100, Fairfax, VA 22033
(703)449-8100 (703)449-8106 (fax)
www.bcconsl.com

SPECIAL EXCEPTION AMENDMENT
NORTHERN TRANSITIONAL SCREENING AREA
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-16-2013
REVISED 1-23-2014

APPLICANT:
FURNACE ASSETT LLC
11232 20th ST.
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 21 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117TRANSCRE
LAYOUT: TRANSCREENING
FILE NO. 05117.08-00



TYPICAL BENCH PLANTING:
(Per 100 l.f. of Terrace)

5 - CATEGORY IV DECIDUOUS TREES
3 - CATEGORY II OR III DECIDUOUS TREES
3 - CATEGORY IV EVERGREEN TREES
5 - CATEGORY II OR III EVERGREEN TREES
10 - EVERGREEN OR DECIDUOUS SHRUBS

1/22 TYPICAL BENCH PLANTING (Per 100 l.f. of Bench)

SCALE: 1"=10'

PLANT LIST AND 10-YEAR TREE CANOPY CALCULATIONS:

Phase	Deciduous Shrubs	Deciduous Tree Selection Breakdown									Total 10-Year Tree Canopy (Deciduous Trees)								Deciduous Tree Final 10-Year Tree Canopy (s.f.)
		Category IV Deciduous Trees (3" Cal.)	Category IV Deciduous Trees (3" Cal.)*	Category IV Deciduous Trees (2" Cal.)	Category IV Deciduous Trees (2" Cal.)*	Category III Deciduous Trees (2" Cal.)	Category III Deciduous Trees (2" Cal.)*	Category II Deciduous Trees (2" Cal.)	Category II Deciduous Trees (2" Cal.)*	Total All Deciduous Trees	Category IV Deciduous 3" Cal. Trees (250 s.f./Tree)	Category IV Deciduous 3" Cal. Trees (375 s.f./Tree)*	Category IV Deciduous 2" Cal. Trees (200 s.f./Tree)	Category IV Deciduous 2" Cal. Trees (300 s.f./Tree)*	Category III Deciduous 2" Cal. Trees (150 s.f./Tree)	Category III Deciduous 2" Cal. Trees (225 s.f./Tree)*	Category II Deciduous 2" Cal. Trees (100 s.f./Tree)	Category II Deciduous 2" Cal. Trees (200 s.f./Tree)*	
Phase One**	0	0	0	79	0	10	0	10	0	99	0	0	0	0	0	0	0	0	0
Phase Two	0	11	0	11	0	15	0	15	0	52	2,750	0	2,200	0	2,250	0	1,500	0	8,700
Phase Three	670	223	263	86	126	137	178	76	76	1,165	55,750	98,625	17,200	37,900	20,550	40,050	7,600	15,200	292,775
Phase Four	268	74	104	34	59	41	63	27	27	427	18,500	39,000	6,800	16,500	6,450	14,175	2,700	5,400	109,525
Phase Five	1,651	519	579	256	296	315	355	144	186	2,650	129,750	217,125	51,200	88,800	47,250	79,875	14,400	37,200	665,600
Subtotal	2,589	827	946	466	477	520	596	272	289	4,393	206,750	354,750	77,400	143,100	76,500	134,100	26,200	57,800	1,076,600

Phase	Evergreen Shrubs	Evergreen Tree Selection Breakdown									Evergreen Total 10-Year Tree Canopy								Evergreen Tree Final 10-Year Tree Canopy (s.f.)
		Category IV Evergreen Trees (3" Cal.)	Category IV Evergreen Trees (3" Cal.)*	Category IV Evergreen Trees (2" Cal.)	Category IV Evergreen Trees (2" Cal.)*	Category III Evergreen Trees (2" Cal.)	Category III Evergreen Trees (2" Cal.)*	Category II Evergreen Trees (2" Cal.)	Category II Evergreen Trees (2" Cal.)*	Total All Evergreen Trees	Category IV Evergreen 3" Cal. Trees (250 s.f./Tree)	Category IV Evergreen 3" Cal. Trees (375 s.f./Tree)*	Category IV Evergreen 2" Cal. Trees (200 s.f./Tree)	Category IV Evergreen 2" Cal. Trees (300 s.f./Tree)*	Category III Evergreen 2" Cal. Trees (150 s.f./Tree)	Category III Evergreen 2" Cal. Trees (225 s.f./Tree)*	Category II Evergreen 2" Cal. Trees (100 s.f./Tree)	Category II Evergreen 2" Cal. Trees (200 s.f./Tree)*	
Phase One**	0	0	0	26	0	44	0	44	0	113	0	0	0	0	0	0	0	0	0
Phase Two	0	10	0	10	0	10	0	10	0	40	2,500	0	2,000	0	1,500	0	1,000	0	7,000
Phase Three	670	133	173	92	71	237	258	120	120	1,164	33,250	64,875	18,400	21,300	35,550	58,050	12,000	24,000	259,425
Phase Four	268	38	68	22	32	79	99	44	45	427	9,500	25,500	4,400	9,600	11,850	22,275	4,400	9,000	96,525
Phase Five	1,651	300	360	144	186	534	574	256	296	2,650	75,000	135,000	28,800	55,800	80,100	129,150	25,600	59,200	588,650
Subtotal	2,589	481	601	253	289	904	931	474	461	4,394	120,250	225,375	45,600	86,700	129,000	209,475	43,000	92,200	951,600
Total	5,178	1,308	1,547	719	766	1,424	1,527	746	750	8,787	327,000	580,125	123,000	224,600	206,500	343,675	69,200	150,000	2,028,200

* THE PHASE ONE TREE PLANTINGS ARE PROPOSED AS SUPPLEMENTAL UNDERSTORY PLANTINGS IN AND BELOW THE EXISTING TREE CANOPY IN THE NORTHERN TRANSITIONAL SCREENING AREA. AS UNDERSTORY PLANTINGS NO TREE CANOPY CREDIT IS TAKEN.

** BONUS MULTIPLIER OF 1.5 TAKEN FOR WILDLIFE BENEFIT FOR 10-YEAR TREE CANOPY CREDIT. ADDITIONAL BONUS MULTIPLIERS MAY BE TAKE AS MAY BE APPLICABLE WITH UFMD APPROVAL.

PLANT SELECTION GENERAL NOTES:

1. FINAL TREE GENUS AND SPECIES TO BE DETERMINED BY THE APPLICANT AT THE SITE PLAN PHASE. TREES WILL BE SELECTED BY THE APPLICANT FROM THE FAIRFAX COUNTY PUBLIC FACILITIES MANUAL, TABLE 12.10 TREE SELECTION AND CANOPY COVER GUIDE OR IN CONSULTATION WITH THE URBAN FOREST MANAGEMENT DIVISION.

NATIVE UPLAND WILDLIFE FORAGE AND COVER MEADOW MIX
(ERNST SEEDS MIX ERMMX-123 OR AN APPROVED EQUIVALENT)

%	BOTANICAL NAME	COMMON NAME
20.00%	Elymus virginicus	Virginia Wild Rye
20.00%	Schizachyrium scoparium, PA Ecotype	Little Bluestem, PA Ecotype
20.00%	Sorghastrum nutans, PA Ecotype	Indiangrass, PA Ecotype
10.00%	Dichanthelium clandestinum	Deertongue
5.00%	Coreopsis tripteris	Tall Coreopsis
5.00%	Coreopsis verticillata	Threadleaf Coreopsis
5.00%	Andropogon virginicus	Broomsedge Bluestem
4.00%	Tripsacum dactyloides	Eastern Gamma Grass
4.00%	Chamaecrista fasciculata	Partridge Pea
3.00%	Rudbeckia hirta	Black-eyed Susan
2.00%	Desmodium paniculatum	Narrow-leaf Tick Trefoil
2.00%	Helianthus helianthoides	Ox Eye Sunflower
100.00%	Total	

Seeding Rate: 20 lbs. per acre or 1/2 lb. per 1,000 s.f.

2/22 WILDLIFE FORAGE AND COVER MEADOW SEED MIX

ALL SEED SHALL BE OBTAINED FROM ERNST SEED, 9006 MERCER PIKE, MEADVILLE, PA 16335 (1-800-873-3321). THE FAIRFAX COUNTY URBAN FOREST MANAGEMENT DIVISION MAY ALLOW SUBSTITUTIONS WITH THEIR APPROVAL.

SHOWY NORTHEAST NATIVE WILDFLOWER AND GRASS MIX
(ERNST SEEDS MIX ERMMX-153 OR AN APPROVED EQUIVALENT)

%	BOTANICAL NAME	COMMON NAME
28.00%	Schizachyrium scoparium	Little Bluestem
10.00%	Bouteloua curtipendula	Sideoats Grama
10.00%	Elymus virginicus	Virginia Wildrye
10.00%	Sorghastrum nutans	Indiangrass
4.00%	Chamaecrista fasciculata	Partridge Pea
4.00%	Rudbeckia hirta	Blackeyed Susan
4.00%	Senna hebecarpa	Wild Senna
3.00%	Penstemon digitalis	Tall White Beardtongue
2.00%	Andropogon gerardi	Big Bluestem
2.00%	Asclepias syriaca	Common Milkweed
2.00%	Baptisia australis	Blue False Indigo
2.00%	Liatris spicata	Marsh (Dense) Blazing Star
2.00%	Monarda fistulosa	Wild Bergamot
2.00%	Penstemon laevigatus	Appalachian Beardtongue
2.00%	Senna marilandica	Maryland Senna
2.00%	Solidago nemoralis	Gray Goldenrod
2.00%	Tradescantia ohiensis	Ohio Spiderwort
2.00%	Zizia aurea	Golden Alexanders
1.00%	Aster laevis	Smooth Blue Aster
1.00%	Aster novae-angliae	New England Aster
1.00%	Aster prenanthoides	Zigzag Aster
1.00%	Helianthus helianthoides	Oxeye Sunflower
1.00%	Rudbeckia fulgida var.fulgida	Orange Coneflower
1.00%	Silphium trifoliatum	Whorled Rosinweed
1.00%	Solidago juncea	Early Goldenrod
100.00%	Total	

Seeding Rate: 20 lbs. per acre or 1/2 lb. per 1,000 s.f.

3/22 HILLSIDE WILDFLOWER AND GRASS SEED MIX

BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
18000 Fair Lakes Circle, Suite 100, Fairfax, VA 22033
(703)449-8100 (703)449-8106 (Fax)
www.bccon.com

COMMONWEALTH OF VIRGINIA
BRIAN S. BOOK
LICENSED
No. 3-2014
1-22-2014

SPECIAL EXCEPTION AMENDMENT
LANDSCAPE DETAILS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 5-14-2013	
REVISED 8-11-2013	
REVISED 9-13-2013	
REVISED 11-1-2013	
REVISED 12-19-2013	
REVISED 1-22-2014	

FAIRFAX ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN
VERT.
SHEET 22 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME:SE5117LSC-DET2
LAYOUT: LSC-DET2
FILE NO. 05117.08-00

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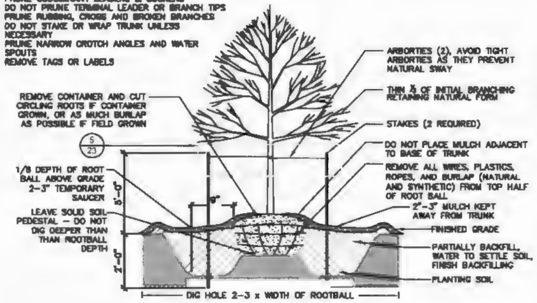
FINAL (PHASE FIVE) TREE PRESERVATION TARGET AND STATEMENT
(10-YEAR TREE CANOPY CALCULATIONS)

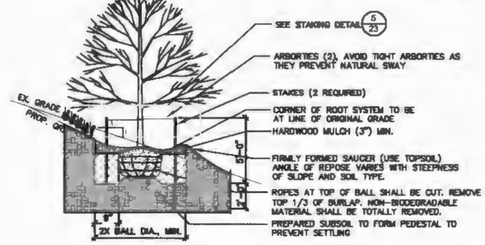
A.	TREE PRESERVATION TARGET CALCULATIONS AND STATEMENT	Totals (s.f.)
A1	Pre-development Area of Existing Tree Canopy	2,662,285
A2	Percentage of Gross Site Area Covered by Existing Tree Canopy (A1/B1)	24.5%
A3	Percentage of 10-year Tree Canopy Required for the Site (R-1 Zone)	30%
A4	Percentage of the 10-Year Tree Canopy Requirement That Should be Met Through Tree Preservation	24.5%
A5	Proposed Percentage of Canopy Requirement That Will be Met Through Tree Preservation (C10/B7)	53.1%
A6	Has the Tree Preservation Target Minimum Been Met?	No
A7	If A6 is no, then a request to deviate from the Tree Preservation Target shall be provided on the plan that states one or more of the justifications listed in §12-0508.3 along with a narrative that provides a site-specific explanation of why the Tree Preservation Target cannot be meet. Provide sheet number where deviation request is located. The narrative shall be prepared in accordance with §12-0507.4.	No (See General Note 1 Below)
B.	**TREE CANOPY REQUIREMENT**	
B1	Identify Gross Area	10,882,058
B2	Subtract Areas Dedicated to Parks, and Road Frontage	
B3	Subtract Area of Exemption	0
B4	Adjusted Gross Site Area B1- (B2+B3)	10,882,058
B5	Identify Site's Zoning and/or Use	R-1
B6	Percentage of 10-Year Tree Canopy Required	30%
B7	Area of 10 Year Tree Canopy Required (B4xB6)	3,264,617
B8	Modification of 10-Year Tree Canopy Requirements Requested	No
B9	If B8 is Yes, Then List Plan Sheets Where Modification Request is Located	N/A
C.	**TREE CANOPY PRESERVATION**	
C1	Tree Preservation Target Area (B7 x A4)	798,686
C2	Total Canopy Area Meeting Standards of §12-0200	597,512
C3	C2 x 1.25	746,890
C3.1	Total Canopy Area Meeting Standards of §12-0200 But Does Not Qualify for Bonus Multiplier	0
C3.2	C3.1 x 1.00	0
C4	Total Canopy Area Provided by Unique or Valuable Forest or Woodland Community	0
C5	C4 x 1.5	0
C6	Total Canopy Area Provided Through Tree Transplantation (See General Note 2 Below)	0
C7	C6 x 1.0	0
C8	Canopy Area of Trees Within Resource Protection Areas and 100-Year Floodplains	987,638
C9	C8 x 1.0	987,638
C10	Totals of C3, C3.2, C5, C7 and C9	1,734,528
D.	**TREE PLANTING**	
D1	Area of Canopy to be Met Through Tree Planting (B7-C10)	1,530,089
D2	Area of Canopy Planted for Air Quality Benefits	0
D3	D2 x 1.5	0
D4	Area of Canopy Planted for Energy Conservation	0
D5	D4 x 1.5	0
D6	Area of Canopy Planted for Water Quality Benefits	0
D7	D6 x 1.25	0
D8	Area of Canopy Planted for Wildlife Benefits	869,000
D9	D8 x 1.5	1,303,500
D10	Area of Canopy Provided by Native Species	0
D11	D10 x 1.5	0
D12	Area of Canopy Provided by Improved Cultivars and Varieties	0
D13	D12 x 1.25	0
D14	Area of Canopy Provided Through Tree Seedling	0
D14.1	D14 x 1.0	0
D15	Area of Canopy Provided Through Native Shrubs or Wood Seed Mix	0
D15.1	D15 x 1.0	0
D16	Percentage of D14 Represented by D15 (D15/D14) Must not exceed 33% of D14	0
D16.1	Area of Canopy Planted With No Multiplier	724,700
D17	Total Canopy Area Provided Through Tree Planting (Totals of D3, D5, D7, D9, D11, D13, D14.1, D15.1 and D16.1)	2,028,200
D18	Is an Offsite Planting Relief Requested?	No
D19	Tree Bank or Tree Fund	N/A
D20	Canopy Area Requested to be Provided Through Offsite Banking or Tree Fund	0
D21	Amount to be Deposited into the Tree Preservation and Planting Fund	0
E.	**TOTAL OF 10-YEAR TREE CANOPY PROVIDED**	
E1	Total of Canopy Area Provided Through Tree Preservation (C10)	1,734,528
E2	Total of Canopy Area Provided Through Tree Planting (D17)	2,028,200
E3	Total of Canopy Area Provide Through Offsite Mechanism (D20)	0
E4	Total of 10-Year Tree Canopy Provided (Totals of E1, E2 and E3)	3,762,728

NOTES:
1. PRUNE CODOMINANT LEADERS & SUCKERS
2. DO NOT PRUNE TERMINAL LEADER OR BRANCH TIPS
3. PRUNE RUBBING, CROSS AND BROKEN BRANCHES
4. DO NOT STAKE OR WRAP TRUNK UNLESS NECESSARY
5. PRUNE NARROW CROTCH ANGLES AND WATER SPOUTS
6. REMOVE TAGS OR LABELS



1/23 TREE PLANTING GUIDELINE — NOT TO SCALE
SECTION

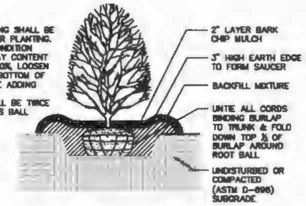
NOTES:
1. PRUNE CODOMINANT LEADERS & SUCKERS
2. DO NOT PRUNE TERMINAL LEADER OR BRANCH TIPS
3. PRUNE RUBBING, CROSS AND BROKEN BRANCHES
4. DO NOT STAKE OR WRAP TRUNK UNLESS NECESSARY
5. PRUNE NARROW CROTCH ANGLES AND WATER SPOUTS
6. REMOVE TAGS OR LABELS



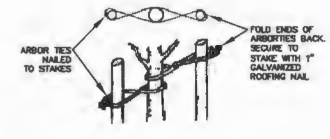
2/23 TREE PLANTING GUIDELINE ON SLOPE — NOTE TO SCALE
SECTION — 12-3103 DECDSLOPE_1

3/23 EVERGREEN PLANTING GUIDELINE — NOT TO SCALE

NOTES:
1. ALL PRUNING SHALL BE DONE AFTER PLANTING.
2. IN SOIL CONDITION WHERE CLAY CONTENT EXCEEDS 50%, LOOSEN EARTH IN BOTTOM OF PIT BEFORE ADDING BACKFILL.
3. HOLE SHALL BE TWICE AS WIDE AS BALL DIAMETER



4/23 SHRUB PLANTING GUIDELINE
SECTION — 12-3103 DECDSLOPE_1 NOT TO SCALE



5/23 STAKING DETAIL — NOT TO SCALE

THIS SHEET FOR LANDSCAPING PURPOSES ONLY

LANDSCAPE PROCEDURES:

LANDSCAPE MAINTENANCE:

1. EXISTING TREES SHALL BE INSPECTED BY THE OWNER'S PROJECT ARBORIST ("ARBORIST"). THE INSPECTION SHALL IDENTIFY DEAD OR DAMAGED TREES, IDENTIFY TREES IN NEED OF CORRECTIVE MEASURES TO ENSURE THEIR SURVIVAL AND RECOMMEND TREATMENTS AND PREVENTATIVE MEASURES TO FACILITATE THEIR CONTINUING HEALTH AND VITALITY.
2. DEAD TREES SHALL BE REMOVED. TREES THAT ARE EVALUATED BY THE ARBORIST AS HAVING LITTLE CHANCE OF SURVIVAL SHALL ALSO BE REMOVED AND REPLACED.
3. TREES SHALL BE PRUNED TO REMOVE DEAD OR DAMAGED BRANCHES AS DEEMED NECESSARY BY THE ARBORIST. PRUNING SHALL CONFORM TO THE REQUIREMENTS OF ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE) A300 PART 1 – PRUNING STANDARDS.
4. SUPPLEMENTAL WATERING SHALL BE REQUIRED DURING PERIODS OF DROUGHT OR EXTREME HEAT. TO PREVENT OVER-WATERING OR UNDER-WATERING, SOIL MOISTURE CONTENT SHOULD BE MONITORED BY THE FOLLOWING 'FEEL AND APPEARANCE' METHOD ON A REGULAR BASIS: (I) WALNUT-SIZED SOIL SAMPLES SHALL BE TAKEN AT VARIOUS LOCATIONS ON THE SITE AT A DEPTH OF SIX (6) TO TWELVE (12) INCHES; (II) WATERING SHOULD BE AVOIDED IF FREE WATER CAN BE HAND SQUEEZED FROM THE SAMPLE OR IF IT FORMS A BALL THAT IS VERY PLIABLE AND STICKS READILY TO THE SKIN; (III) WATER SHOULD BE PROVIDED IF THE SOIL IS CRUMBLY OR DRY AND DOES NOT READILY HOLD TOGETHER UNDER PRESSURE.
5. ALL TAGS AND/OR BAMBOO OR WOODEN SUPPORT STAKES (OTHER THAN OFFSET TREE STAKES) SHALL BE REMOVED. A TREE MAY BE REFUSED OR REMOVED IF IT IS NOT SELF-SUPPORTING WHEN BAMBOO OR WOODEN SUPPORT STAKES ARE REMOVED.
6. TREES THAT HAVE SURVIVED THROUGH ONE (1) GROWING SEASON SHOULD HAVE ALL (OFFSET) TREE STAKES WITH STRAPS AND/OR GUY WIRES REMOVED. TREES STAKES WITH STRAPS AND/OR GUY WIRES MAY REMAIN ON CERTAIN TREES THAT ARE SUBJECTED TO EXTREME ENVIRONMENTAL CONDITIONS AS DETERMINED BY THE ARBORIST BUT NO LONGER THAN TWO (2) GROWING SEASONS.
7. WHERE DEEMED NECESSARY BY THE ARBORIST: (I) COMPETING GROUND VEGETATION GROWING WITHIN ONE (1) FOOT OF EXISTING SHRUBS SHALL BE CUT OR MOWED AS CLOSE TO THE GROUND AS POSSIBLE AND CARE SHALL BE TAKEN TO PREVENT DAMAGE TO THE EXISTING PLANT; (II) THE ONE (1) FOOT AREA SURROUNDING THE PLANT SHALL THEN BE MULCHED WITH THREE (3) INCHES OF SHREDDED HARDWOOD MULCH OR COVERED WITH A BIODEGRADABLE MULCH MAT; (III) THE MULCHED AREA SHALL BE ROUTINELY MONITORED DURING THE ACTIVE GROWING SEASON; (IV) REGROWTH OF ANY OTHERWISE UNDESIRABLE PLANT MATERIAL SHALL BE REMOVED; AND (V) CONTINUOUS BEDS OF MU LCH SHALL BE PROVIDED FOR GROUP PLANTINGS OF SHRUBS AND PERENNIALS. MONITORING SHALL CONTINUE THROUGH TWO (2) GROWING SEASONS. APPROPRIATELY SIZED WOOD CHIPS MAY BE USED IN LIEU OF SHREDDED HARDWOOD MULCH WHEN THE WOOD CHIPS ORIGINATE FROM THE ON-SITE GRINDING OF ACCEPTABLE WOOD DEBRIS.
8. DETRIMENTAL ENVIRONMENTAL OR MECHANICAL CONDITIONS AFFECTING CERTAIN SURVIVING PLANTS SHALL BE IDENTIFIED BY THE ARBORIST AND CORRECTED AS NEEDED. CORRECTIVE MEASURES MAY INCLUDE RE-MULCHING, RE-STAKING, RE-SETTING OF ROOT BALLS, SUPPLEMENTING SOIL AND SEDIMENT AND EROSION CONTROL.
9. PLANT MATERIAL SHALL BE MONITORED BY THE ARBORIST TO IDENTIFY NEW OR CONTINUING ADVERSE CONDITIONS AND RECOMMEND CORRECTIVE MEASURES. PLANTS EXHIBITING UNUSUAL STRESS OR DAMAGE SHALL BE IDENTIFIED AND TREATED. TREE AND SOIL PROTECTION MEASURES WHERE DEEMED APPROPRIATE BY THE ARBORIST MAY BE EMPLOYED TO PREVENT FUTURE ADVERSE CONDITIONS. TREE MAINTENANCE DEVICES MAY BE INSTALLED TO HELP MAINTAIN AND IMPROVE THE HEALTH OF DISTRESSED TREES.
10. PLANT MAINTENANCE SHALL BEGIN AT PLANT INSTALLATION AND CONTINUE THROUGH BOND RELEASE FOR RESPECTIVE LANDSCAPE AREAS.

PLANT MATERIALS:

1. TREES AND SHRUBS TO BE PLANTED SHALL BE OF THE SPECIES AND SIZE AS SPECIFIED AND APPROVED BY THE URBAN FOREST MANAGEMENT DIVISION ("UFMD"). THERE SHALL BE NO DEVIATIONS FROM THE APPROVED MINIMUM SIZES SPECIFIED EXCEPT AS APPROVED BY UFMD.
2. ALL TREES AND SHRUBS SHALL MEET THE STANDARDS FOR SIZES AND QUALITY SPECIFIED IN THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION'S AMERICAN STANDARD FOR NURSERY STOCK, 2004.
3. PLANTS WILL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ARBORIST FOR CONFORMITY TO SPECIFICATION REQUIREMENTS AS TO QUALITY, SIZE AND VARIETY.
4. ALL PROPOSED PLANT SUBSTITUTIONS MUST BE APPROVED IN WRITING BY UFMD.

PLANTING:

1. ALL LANDSCAPE MATERIAL SHALL BE PLANTED ACCORDING TO THE PLANTING DETAILS AS SHOWN HEREON.
2. PLANT INSTALLATION SHALL BE DONE UNDER THE GENERAL SUPERVISION OF THE ARBORIST.

STAGING AREA:

1. ANY PLANT THAT IS NOT REPLANTED IMMEDIATELY UPON ARRIVAL AT THE SITE SHALL BE STORED IN A DESIGNATED STAGING AREA.
2. THE STAGING AREA SHALL BE RELATIVELY FLAT AND PROVIDE GOOD SURFACE DRAINAGE.
3. PROPERLY BALLED PLANTS SHALL BE COVERED WITH LOOSE, DAMP MEDIUM TO KEEP THE ROOT BALL MOIST SUCH AS COMPOSED WOOD, SHREDDED HARDWOOD MULCH, SAWDUST OR WOOD CHIPS.
4. PLANTS SHALL BE WATERED DAILY.
5. NO PLANT SHALL BE STORED ON THE SITE FOR A PERIOD LONGER THAN TWO (2) WEEKS EXCEPT AS APPROVED BY THE ARBORIST DUE TO UNFORESEEN EVENTS SUCH AS INCLEMENT WEATHER.

SOIL TESTING:

1. SOIL TESTING MAY BE REQUESTED BY UFMD.
2. SOIL TESTING SHOULD BE PERFORMED BY THE VIRGINIA COOPERATIVE EXTENSION.
3. SOIL MAY BE AMENDED BASED ON THE RESULTS OF THE SOIL TEST.

LANDSCAPE INSPECTION PROCEDURES:

1. AT THE END OF EACH PLANTING CYCLE OR AS AGREED TO BY UFMD AND THE ARBORIST, A LANDSCAPE INSPECTION SHALL BE SCHEDULED WITH UFMD.
2. PRIOR TO THE INSPECTION, THE ARBORIST SHALL SUBMIT TO UFMD A PLANT INVENTORY LISTING THE QUANTITIES AND SPECIES OF ALL LANDSCAPE MATERIAL PLANTED WITHIN THE INSPECTION AREA.
3. PRIOR TO THE INSPECTION, THE LIMITS OF THE BENCH PLANTING AREA SHALL BE STAKED OUT WITH A CONTINUOUS LINE OF FLAGGING.

URBAN FOREST MANAGEMENT
POLICY ON LANDSCAPE IMPLEMENTATION
November 17, 2010

[illegible]

Tree Species and Size

1. [illegible] (PFM 12-0705.1A)
2. [illegible] (PFM 12-0705.1B)

Species Substitutions

3. [illegible] (PFM 12-0705.1C)
   a. *Plant Diversity* - [illegible] (PFM 12-0515.1L)
   b. *Authorization* - [illegible] (PFM 12-0705.1C(2))
   c. *Substitutions Outside of Tree Category* - [illegible] (PFM 12-0705.1C(3))
   d. *Species Suitability* - [illegible] (PFM 12-0601.1E)
   e. *Additional Tree Cover Credit* - [illegible] Air Quality, PFM 12-0510.4B(1); Energy Conservation, PFM 12-0510.4B(2); Water Quality, PFM 12-0510.4B(3); Wildlife Benefits, PFM 12-0510.4B(4); Native Trees, PFM 12-0510.4B(5)

Planting Locations

4. [illegible]
   a. *Planting Area* - [illegible] (PFM 12-0601.1B)
   b. *Environmental Conditions* - [illegible] (PFM 12-0601.1E)
   c. *Compacted Soil* - [illegible] (PFM 12-0702.3B)
   d. *Restrictive Barriers* - [illegible] (PFM 12-0510.4B(5))
   e. *Spacing* - [illegible] (PFM 12-0510.4B(8))
   f. *Easements* - [illegible] (PFM 12-0515.6B)

Staking and Guying

5. [illegible] (PFM 12-0705.3C)

Seasonal Landscape Deferrals

6. [illegible]
7. [illegible]
8. [illegible]

Requirements Prior to Approval of RUP/Non-RUP

9. [illegible] (ZO 18-704.3) See Seasonal Landscape Deferrals above.

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COMMONWEALTH OF VIRGINIA — LANDSCAPE ARCHITECT — Lic. No. 862 — 1-22-2014

SPECIAL EXCEPTION AMENDMENT
LANDSCAPE DETAILS

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 5-14-2013	REVISED 1-22-2014
REVISED 9-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

APPLICANT: FURNACE ASSOCIATES, INC. 11220 ASSETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE:	HOR. N/A VERT. N/A
SHEET 23 OF 45	
CO. NO. SEA 80-L/V-061-2	
CAD NAME: SE05117NEW-LSC-DET	
LAYOUT: LSC-DET	
FILE NO. 05117.08-00	

V:\projects_2005\05117\Allen K.Miller\SEA OVERLOOK BBPP\SE51177PP-A.DWG, TREE PRESER (5), 1/23/2014 12:09:01 PM

POTENTIAL LEACHATE STORAGE TANK (SEE GENERAL NOTE 24 ON SHEET 3)

FURNACE ROAD SOUTHBOUND

FURNACE ROAD ROUTE 611

INTERSTATE 95

INTERSTATE 95

INTERSTATE 95

PHASE FIVE TREE PRESERVATION PLAN:

APPROXIMATE LIMITS OF CLEARING AND GRADING

ROOT PRUNE (RP) 7/25 AND/OR TREE PROTECTION FENCE (TP) 1/25

SEE SHEET 25 FOR TREE PRESERVATION DETAILS AND NARRATIVE.

EXISTING TREELINE

PROPOSED TREELINE

POSSIBLE MULCH AREA 1/25

POST-DEVELOPMENT 10-YEAR TREE CANOPY CREDIT AREA

SCALE: 1"=200'

200' 100' 0' 200'

SCALE: 1"=200'

CERTIFIED ARBORIST

International Society of Arboriculture CERTIFIED ARBORIST

Dennis Dale Dixon

Certificate Number: MA-0133

Expiration Date: Dec 31, 2014

BC Consultants

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SPECIAL EXCEPTION AMENDMENT

PHASE 5 TREE PRESERVATION PLAN

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT

FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 1-23-2014
REVISED 5-14-2013
REVISED 5-11-2013
REVISED 3-13-2013
REVISED 11-1-2013
REVISED 10-10-2013

FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR

DRAFTED BY: CAD

CHECKED BY: HB

DATE: MARCH 22, 2013

SCALE: HOR. 1"=200' VERT.

SHEET 24 OF 45

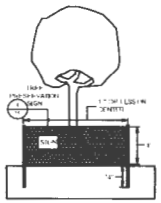
CO. NO. SEA 80-L/V-081-2

CAD NAME: SE51177PP-5

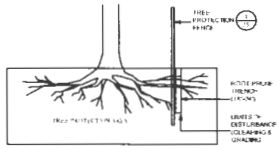
LAYOUT: TREE PRESER (5)

FILE NO. 05117.08-00

- PRIOR TO ANY CONSTRUCTION ACTIVITY, ALL INDIVIDUAL AND GROUPS OF TREES MARKED FOR PRESERVATION SHALL BE PROTECTED WITH TREE PROTECTION FENCING.
- TREE PROTECTION FENCE SHALL BE POSITIONED DIRECTLY IN THE ROOT PRUNING TRENCH AND INSTALLED FOR STABILITY OR JUST OUTSIDE THE TRENCH WITHIN THE DISTURBED AREA.
- TREE PROTECTION FENCING SHALL CONSIST OF FOUR FOOT (4') CHAIN WELDED WIRE FENCE ATTACHED TO SIX FOOT (6') FIBERGLASS OR WOOD 1" INCHES INTO THE GROUND. POSTS SHALL BE NO FURTHER THAN 10 FEET APART.
- WHERE APPROPRIATE BASED ON EROSION AND SEDIMENT CONTROL PLANS SUPERSILT FENCING MAY BE USED AS TREE PROTECTION FENCING WITH THE APPROVAL OF FAIRFAX COUNTY.
- TREE PROTECTION FENCING SHALL BE MADE CLEARLY VISIBLE TO ALL CONSTRUCTION PERSONNEL. SIGNS IN ENGLISH AND SPANISH WHICH STATES "TREE PRESERVATION AREA - KEEP OUT" SHALL BE INSTALLED ON TREE PROTECTION FENCING EVERY 50 FEET.
- A CERTIFIED ARBORIST SHALL MONITOR THE INSTALLATION OF TREE PROTECTION FENCING.

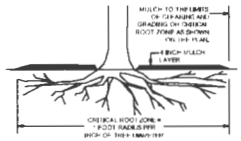


1 / 25 TREE PROTECTION FENCE
NOT TO SCALE



- PRIOR TO ANY CONSTRUCTION ACTIVITY, ALL TREES MARKED FOR PRESERVATION ALONG THE LIMITS OF CLEARING AND GRADING SHALL BE ROOT PRUNED WHERE SHOWN ON THE PLAN.
- ROOT PRUNING SHALL BE CONDUCTED USING A TRENCHER OR VIBRATORY PLOW.
- THE ROOT PRUNING TRENCH SHALL BE A MAXIMUM OF 6 INCHES WIDE AND TWENTY (24) INCHES DEEP, COMPLETED THE ROOT PRUNING TRENCH SHALL BE IMMEDIATELY BACK FILLED.
- ROOT PRUNING SHALL BE CONDUCTED UNDER THE SUPERVISION OF A CERTIFIED ARBORIST.

2 / 25 ROOT PRUNING
NOT TO SCALE



- SPREAD MULCH BY HAND TO A UNIFORM THICKNESS OF 4 INCHES.
- MULCH SHALL COVER AS MUCH OF THE ENTIRE CRITICAL ROOT ZONE AS POSSIBLE UP TO 10' FROM THE LIMITS OF CLEARING AND GRADING.
- MULCH SHALL CONSIST OF A WOODY MATERIAL THAT HAS BEEN CHIPPED OR SHREDDED OR OTHER APPROVED MATERIAL.
- MULCH SHALL NOT TOUCH THE BASE OF THE TREE.

3 / 25 PROTECTIVE MULCHING
NOT TO SCALE

TREE PRESERVATION AREA
KEEP OUT
NO EQUIPMENT OR MATERIALS ARE TO BE STORED OR DISPOSED WITHIN THIS AREA, INCLUDING CONSTRUCTION EQUIPMENT AND PERSONNEL IS PROHIBITED.
CONSTRUCTION INSPECTOR NAME
NECESSARY CONTACT PERSON & TELEPHONE NUMBER
PENALTY FOR VIOLATIONS
STRICTLY ENFORCED

SPECIFICATIONS:
DIMENSIONS: WIDTH: 17 INCHES MINIMUM
HEIGHT: 11 INCHES MINIMUM
BACKGROUND COLOR: WHITE
LETTER COLOR: BLACK
LETTER SIZE:
LETTER 1: 1.5 INCH MINIMUM (LARGEST)
LETTER 2: 0.75 INCH MINIMUM
LETTER 3: 0.5 INCH MINIMUM
LETTER 4: 0.375 INCH MINIMUM (SMALLEST)
LANGUAGE: ENGLISH AND SPANISH (SEPARATE SIGNS)

NOTE: ALTERNATE SIGNAGE MAY BE SUBMITTED TO FAIRFAX COUNTY FOR APPROVAL.

4 / 25 TREE PRESERVATION SIGN
NOT TO SCALE

TREE CONSERVATION REQUIREMENTS:

IN ACCORDANCE WITH THE FAIRFAX COUNTY PUBLIC FACILITIES MANUAL (PFM) TREE CONSERVATION REQUIREMENTS (SECTION 12-0000), TREE CONSERVATION PLANS SHALL BE SUBMITTED AS PART OF FIRST SITE PLAN SUBMISSION. THE SUBMISSION WILL PROVIDE AN EXISTING VEGETATION MAP, TREE PRESERVATION TARGET CALCULATIONS AND NARRATIVE, 10-YEAR TREE CANOPY REQUIREMENTS AND CALCULATIONS, A TREE INVENTORY AND CONDITIONS ANALYSIS, LANDSCAPE PLANS AND REQUIREMENTS AND SPECIFICATIONS FOR REPLACEMENT TREES. THE TREE INVENTORY AND CONDITION ANALYSIS SHALL IDENTIFY ALL TREES 12 INCHES OR GREATER IN DIAMETER, ALL TREES IN POOR CONDITION (PFM SECTION 12-12.0507.2A(2)), ALL HAZARDOUS TREES (PFM SECTION 12-.0507.2B) AND ALL DEAD TREES WITHIN THE REQUIRED REPORTING AREA. APPROPRIATE ACTIONS AND TREATMENTS FOR THESE TREES INCLUDING REMOVAL, PRUNING, ROOT PRUNING, FERTILIZATION, ETC. WILL BE RECOMMENDED.

A MODIFICATION OF THE TREE INVENTORY AND CONDITIONS ANALYSIS SUBMISSION MAY BE REQUESTED IF THE PLANS CLEARLY MEET OR EXCEED THE MINIMUM LEVEL OF TREE PRESERVATION IDENTIFIED BY TREE PRESERVATION TARGET PROVISION OF PFM SECTION 12.503.3.

CERTIFIED ARBORIST

International Society of Arboriculture
CERTIFIED ARBORIST
Dennis Dale Dixon
Certificate No. [illegible] — Valid Through Dec 31, 2014

BC Consultants
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(703)449-8100 (703)449-8108 (Fax)
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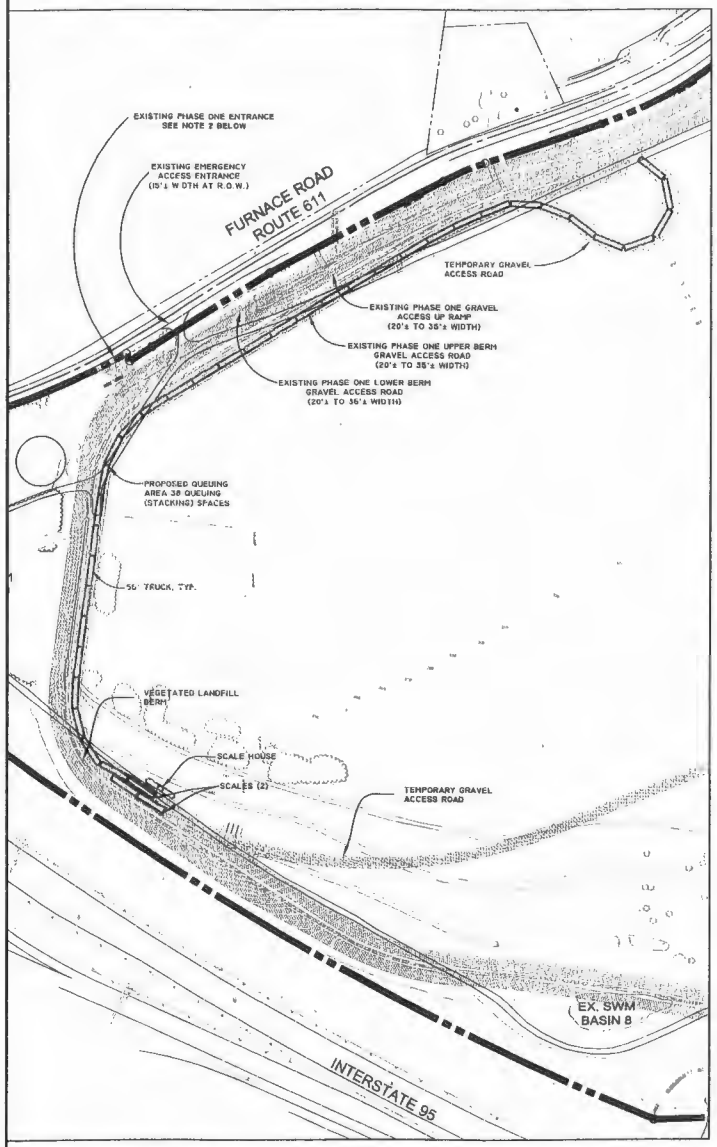
COMMONWEALTH OF VIRGINIA — DONALD L. BOOTH — Lic. No. 0402 — 1-22-2014

SPECIAL EXCEPTION AMENDMENT
TREE PRESERVATION DETAILS
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 8-14-2013
REVISED 9-11-2013
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-10-2013
REVISED 1-28-2014

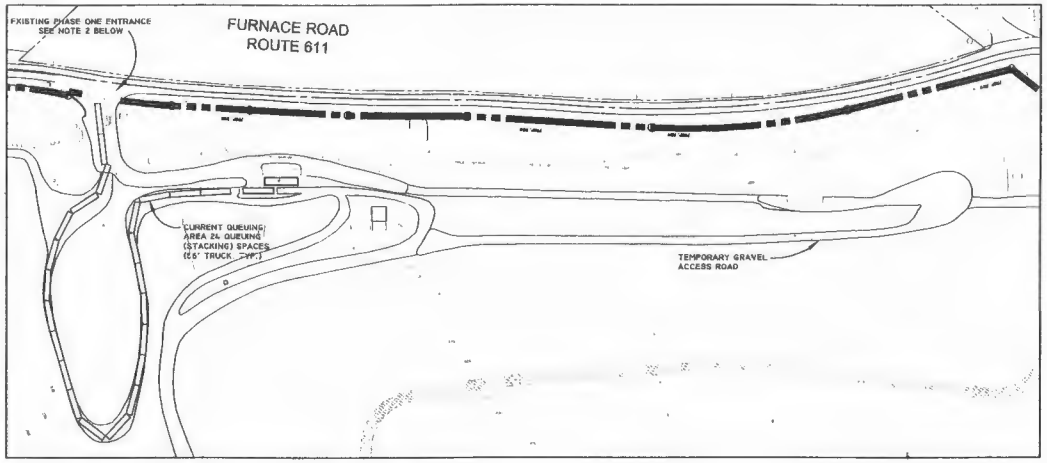
PURCELL ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. N/A
VERT. N/A
SHEET 25 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117-TPP-DET
LAYOUT: TPP-DET
FILE NO. 05117.08-00



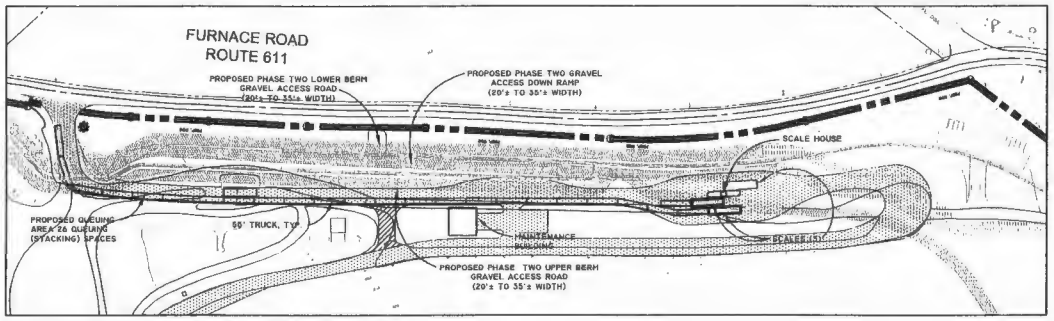
PHASE TWO THROUGH FIVE ENTRANCE QUEUING AREA

SCALE 1"=100'



BEGINNING OF PHASE ONE ENTRANCE QUEUING AREAS

SCALE 1"=100'



END OF PHASE ONE ENTRNACE AND EXIT QUEUING AREAS

SCALE 1"=100'

NOTE:

1. SEE SHEETS 39 THROUGH 43 FOR ADDITIONAL INFORMATION CONCERNING LANDFILL OPERATIONS TRAFFIC CIRCULATION.
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE TRUCKS ARE LIMITED TO LEFT TURN OUT ONLY (NO ENTRY) BY THE BEGINNING OF PHASE 2.
4. INTERNAL DETAILS SHOWN ON THIS SHEET MAY BE ADJUSTED BASED ON OPERATIONS NEEDS AS DETERMINED BY THE APPLICANT.

100' 50' 0' 100'

SCALE: 1"=100'

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(703)449-8100 (703)449-8106 (fax)

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COMMONWEALTH OF VIRGINIA
BRIAN L. NEBE
Lic. No. 0402
1-22-2014

SPECIAL EXCEPTION AMENDMENT
QUEUING AREAS

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 8-11-2013	REVISED 1-13-2014
REVISED 9-13-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

PROPERTY OWNER:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
P.O. BOX 2000
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200'
VERT.

SHEET 26 OF 45

CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117QUEUING
LAYOUT: QUEU AREAS
FILE NO. 05117.06-00

CHESAPEAKE BAY PRESERVATION ORDINANCE AND BMP NARRATIVE

CHAPTER 118-1-8 OF THE FAIRFAX COUNTY CODE DEFINES REDEVELOPMENT AS "THE SUBSTANTIAL ALTERATION, REHABILITATION, OR REBUILDING OF A PROPERTY FOR RESIDENTIAL, COMMERCIAL, INDUSTRIAL, OR OTHER PURPOSES WHERE THERE IS NO NET INCREASE IN IMPERVIOUS AREA BY THE PROPOSED REDEVELOPMENT WITHIN AN RPA AND NO MORE THAN A NET INCREASE IN IMPERVIOUS AREA WITHIN AN RMA OF 20% RELATIVE TO CONDITIONS PRIOR TO REDEVELOPMENT." THIS SITE PLAN DOES NOT PROPOSE AN INCREASE IN IMPERVIOUS AREA WITHIN THE RPA. ADDITIONALLY, THERE IS LESS THAN A 20% INCREASE IN IMPERVIOUS AREA FROM EXISTING CONDITIONS AS WELL AS THE CURRENT SEA PUBLIC PARK USE.

A TOTAL OF 37.25-ACRES OF PRIVATELY MAINTAINED OPEN SPACE HAVE BEEN PLACE WITHIN CONSERVATION EASEMENTS AND FLOODPLAIN AND STORM DRAINAGE EASEMENT ALONG THE NORTHERN AND EASTERN BOUNDARIES OF THE SITE. THIS APPLICATION PROPOSES A STORMWATER MANAGEMENT POND AND SOME RECREATIONAL AMENITIES WITHIN THE EXISTING CONSERVATION AREA. THE APPLICANT PROPOSES OFFSITE CONSERVATION EASEMENTS TO REPLACE THIS AREA IN KIND. THIS AREA WILL RECEIVE 100% PHOSPHORUS REMOVAL EFFICIENCY, THUS, GIVING A TOTAL SITE PHOSPHORUS REMOVAL EFFICIENCY OF 15.00%. SINCE THIS IS GREATER THAN THE REQUIRED 10%, BMP REQUIREMENTS ARE MET PER PFM 6-0401.2B AND COUNTY CODE CHAPTER 118-1-6.

FOR THE REDEVELOPMENT OF ANY PROPERTY NOT CURRENTLY SERVED BY ONE OR MORE BMP'S, THE REQUIRED REDUCTION IN PHOSPHORUS LOADS WILL BE COMPUTED FOR EACH SITE BASED ON THE FORMULA IDENTIFIED IN PFM 6-0401.2B. BEST MANAGEMENT PRACTICES IN THE FORM OF CONSERVATION AND FLOODPLAIN EASEMENTS HAVE BEEN PROVIDED WITH THE PREVIOUS SPECIAL EXCEPTION AND ASSOCIATED APPROVED SITE PLAN TO MEET THE REDEVELOPMENT REQUIREMENT. THIS SEA PROPOSES A CHANGE FROM A PUBLIC PARK USE TO A GREEN ENERGY PARK USE. BECAUSE THE GREEN ENERGY PARK USE DOES NOT RESULT IN ANY MORE IMPERVIOUS AREA THAN THE PUBLIC PARK USE, IT IS THE OPINION OF THE ENGINEER THAT THE BMPS PROVIDED WITH THE PREVIOUSLY APPROVED SEA STILL ADEQUATELY SERVE THE PROPERTY IN ACCORDANCE WITH CHAPTER 118 AND PFM 6-0401.2B.

PHOSPHORUS REMOVAL CALCULATIONS FOR REDEVELOPMENT SITES

Per PFM 6-0401.2B, the Redevelopment of any property not currently served by one or more BMP's, the required reduction in phosphorus loads will be computed for each site based on the formula:

[1 - 0.8(("pre"/"post")) x 100 = % P removal "I" = Impervious Area

Site Area = 249.89 Acres

			(AC.)	(%)
Pre "C" factor =	0.32	"I"pre =	9.30	3.7
Post "C" factor =	0.30	"I"post =	1.90	0.8

% P Removal = required for site [1 - 0.8 (0.087 / 0.035)] x 100 = -316.25% (Min 10%)

BMP FACILITY DESIGN CALCULATIONS

II. WATERSHED INFORMATION

PART 1. LIST ALL OF THE SUBAREAS AND "C" FACTORS USED IN THE BMP COMPUTATIONS

SUBAREA DESIGNATION & DESCRIPTION (1)		"C" (2)	AREA (AC.) (3)
CE & FP	Onsite - Treated	0.28	37.25
UT	Onsite - Untreated	0.31	212.64

PART 2. COMPUTE THE WEIGHTED AVERAGE "C" FACTOR FOR THE SITE

(A) AREA OF THE SITE (a) 249.89 ACRES

(B) SUBAREA DESIGNATION (1)		"C" (2)		AREA (AC.) (3)		PRODUCT (4)
CE & FP	Onsite - Treated	0.28	X	37.25	=	10.31
UT	Onsite - Untreated	0.31	X	212.64	=	65.92
				(b) TOTAL	=	76.23

(C) WEIGHTED AVERAGE "C" FACTOR (b) / (a) = (c) 0.30

PART 3. COMPUTE THE TOTAL PHOSPHORUS REMOVAL FOR THE SITE

SUBAREA DESIGNATION (1)	BMP TYPE (2)	REMOVAL EFF. (%) (3)		AREA RATIO (4)		"C" FACTOR RATIO (5)		PRODUCT (6)
CE & FP	Conservation Eset't	100	X	0.15	X	1.00	=	15.00
UT	None	0	X	0.85	X	1.00	=	0.00
	20% Credit for Offsite Areas.							
						(e) TOTAL	=	15.00

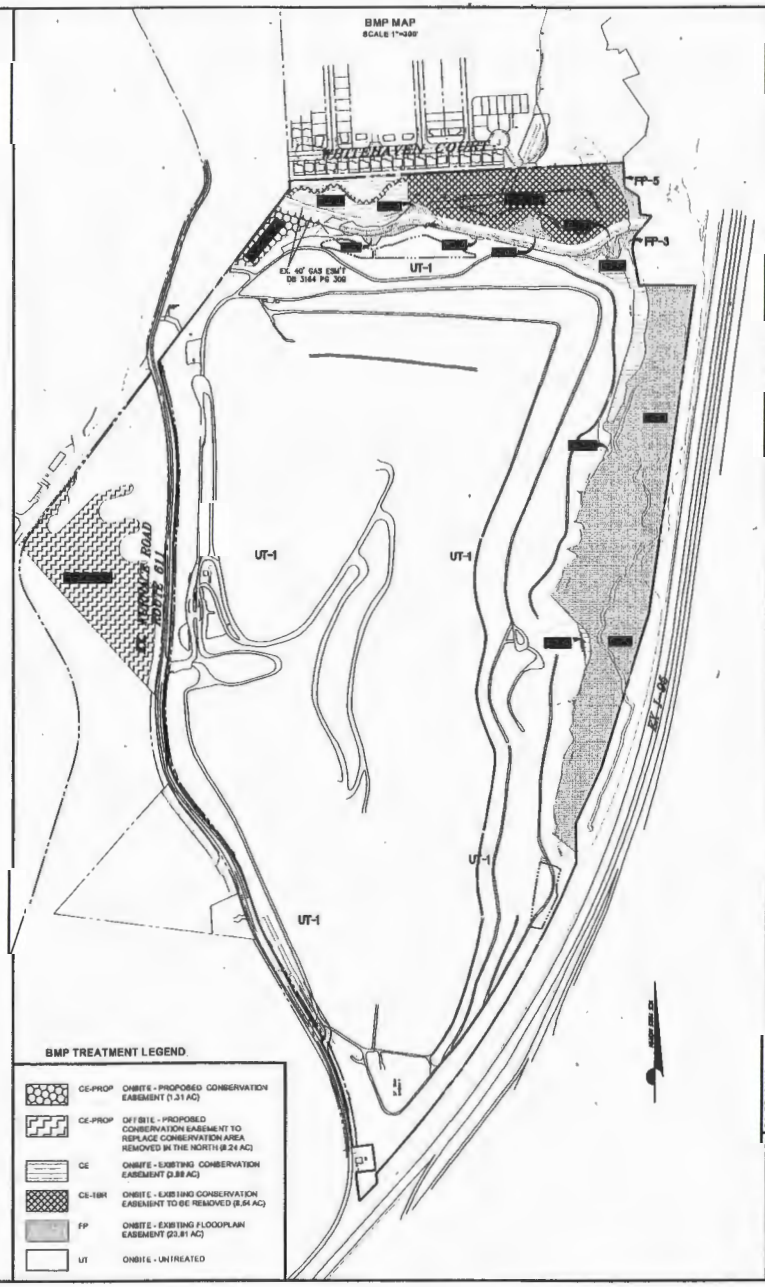
PART 4. DETERMINE COMPLIANCE WITH PHOSPHORUS REMOVAL REQUIREMENT

(A) SELECT REQUIREMENT: (a) 10.00 %
(FAIRFAX COUNTY CHESAPEAKE BAY PRESERVATION AREA - 40%)
OR (FAIRFAX COUNTY WATER SUPPLY OVERLAY DISTRICT - 50%)
OR (SITE REDEVELOPMENT - 10.00%)

(B) IF LINE 3 (e) 15.00 % > LINE 4(a) 10.00 %
THEN PHOSPHORUS REMOVAL REQUIREMENT IS SATISFIED.

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.



BMP TREATMENT LEGEND

	CE-PROP	ONSITE - PROPOSED CONSERVATION EASEMENT (1.31 AC)
	CE-PROP	OFFSITE - PROPOSED CONSERVATION EASEMENT TO REPLACE CONSERVATION AREA REMOVED IN THE NORTH (8.24 AC)
	CE	ONSITE - EXISTING CONSERVATION EASEMENT (3.88 AC)
	CE-TBR	ONSITE - EXISTING CONSERVATION EASEMENT TO BE REMOVED (8.64 AC)
	FP	ONSITE - EXISTING FLOODPLAIN EASEMENT (23.81 AC)
	UT	ONSITE - UNTREATED

BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
12600 Fair Lakes Circle, Suite 100, Fairfax, VA 22033
(703)449-8100 (703)449-8108 (Fax)
www.bcccom.com

SPECIAL EXCEPTION AMENDMENT
BMP PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS		
REVISED 3-11-2013	R	PERMIT SUBMISSION
REVISED 3-15-2013		
REVISED 3-21-2013		
REVISED 3-25-2013		
REVISED 3-26-2013		
REVISED 3-27-2013		
REVISED 3-28-2013		
REVISED 3-29-2013		
REVISED 3-30-2013		
REVISED 3-31-2013		
REVISED 4-10-2013		

APPLIED ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 27 OF 45
CO. NO. SEA 80-L/V-08-2
CAD NAME: SE51178MP
LAYOUT: BMP
FILE NO. 05117.08-00

STORMWATER MANAGEMENT NARRATIVE

GENERAL

THIS 250.13-ACRE SITE IS BORDERED BY RESIDENTIAL LOTS TO THE NORTH, I-95 TO THE EAST, AND FURNACE ROAD THE WEST. THERE ARE SEVEN EXISTING PONDS ONSITE. SIX OF THE SEVEN PONDS DRAIN TO GILES RUN BEFORE CROSSING UNDER INTERSTATE 95. THE SOUTHERNMOST POND DRAINS INTO AN UNNAMED TRIBUTARY OF BELMONT BAY. THE ENTIRE SITE RESIDES WITHIN THE MILL BRANCH WATERSHED.

THE EXISTING STORMWATER MANAGEMENT PONDS WERE DESIGNED BY BC CONSULTANTS, MAY 2, 2001, PER PFM STANDARDS. THE INTENT OF THE PONDS PROVIDE EROSION AND SEDIMENT CONTROL DURING THE ONGOING LAND DISTURBANCE ON THIS SITE ASSOCIATED WITH LANDFILL OPERATIONS.

AS PART OF THE PROPOSED EXPANSION OF THE LANDFILL, THE SEVEN EXISTING SWM PONDS WILL BE CONSOLIDATED TO FOUR SWM PONDS. EXISTING PONDS #4, #5 AND #6, WHICH ARE LOCATED TO THE EAST OF THE SITE, WILL BE REMOVED. TO COMPENSATE FOR THE LOSS OF STORAGE VOLUME EXISTING PONDS #2, #3 AND #8 WILL INCREASE IN VOLUME AND BE RELOCATED NEAR THEIR ORIGINAL FOOTPRINTS. EXISTING POND #9 WILL NOT BE DISTURBED. APPROXIMATELY 191.62-ACRES OF RUNOFF FROM THE LANDFILL WILL BE COLLECTED IN A SERIES OF BENCHES THAT WILL DIRECT THE WATER TO DOWN DRAINS. THE DOWN DRAINS WILL CONVEY THE WATER FROM THE LANDFILL SLOPES TO A COLLECTION OF FOUR PONDS. THE ORIGINAL OUTFALLS TO ALL EXISTING SEVEN SWM PONDS WILL REMAIN AND THE PRE-DEVELOPMENT CONTROLLED FLOW TO THEIR CORRESPONDING OUTFALL WILL BE MATCHED IN POST-DEVELOPMENT CONDITIONS. PROPOSED SWM POND #3 WILL PROVIDE A CONTROLLED RELEASE THAT WILL BE DIVIDED AMONGST THE ORIGINAL OUTFALLS OF THE THREE PONDS BEING REMOVED. PROPOSED STORM SEWER WILL EXTEND FROM SWM POND #3 TO EACH OF THE EXISTING OUTFALLS OF EXISTING PONDS #4, #5 AND #6. THESE FOUR PONDS HAVE BEEN DESIGNED TO COLLECT THE 2-YEAR AND 10-YEAR STORM EVENTS AND RELEASE THEM TO EACH OUTFALL AT A RATE EQUAL TO OR LESS THAN THE PREDEVELOPMENT CONDITIONS. THEY HAVE ALSO BEEN DESIGNED TO CONVEY THE 100-YEAR STORM EVENT WITH ALL PRINCIPLE SPILLWAYS CLOGGED WHILE MAINTAINING A MINIMUM FREEBOARD OF 2.0-FEET. A COMBINED SPILLWAY HAS BEEN USED IN EACH POND SINCE A SEPARATE EMERGENCY SPILLWAY WOULD NOT BE POSSIBLE WITH CURRENT GRADING CONSTRAINTS. A SUMMARY SPECIFIC TO EACH POND IS AS FOLLOWS:

PROPOSED SWM BASIN 2

THE PROPOSED STORMWATER MANAGEMENT BASIN 2 IS LOCATED TO THE NORTH OF THE SITE ON THE NORTH FACE OF THE LANDFILL. IT HAS BEEN DESIGNED TO MANAGE 34.00-ACRES OF RUNOFF FROM THE SITE. THIS POND WILL REPLACE AN EXISTING SWM POND, IDENTIFIED AS EXISTING POND #2, AND RECONSTRUCTED WITH A NEW OUTFALL STRUCTURE; HOWEVER, THE NEW OUTFALL WILL REMAIN WITHIN THE SAME EXISTING CHANNEL. IN ADDITION TO CONTROLLING THE 2- AND 10-YEAR STORMS, BASIN 2 HAS BEEN DESIGNED TO DETAIN THE 1-YEAR RUNOFF VOLUME FOR A PERIOD OF 24-HOURS. THE DRAINAGE AREA HAS A CN VALUE OF 77.

	2 YEAR	10 YEAR
EXISTING POND #2 RELEASE	0.53 CFS	8.57 CFS
PROPOSED BASIN #2 RELEASE	0.46 CFS	7.83 CFS
REDUCTION IN DISCHARGE	13.21%	8.63%

THE BASIN MEETS FREEBOARD REQUIREMENTS WITH APPROXIMATELY 2.1-FEET OF FREEBOARD DURING THE 100-YEAR STORM EVENT. THE DAM HAS A HEIGHT OF 22-FEET. THE POND WILL OUTFALL TO CROSS-SECTION A-A.

PROPOSED SWM BASIN 3

STORMWATER MANAGEMENT BASIN 3 IS LOCATED IN THE NORTHEASTERN CORNER OF THE SITE ON THE NORTH FACE OF THE LANDFILL. IT HAS BEEN DESIGNED TO MANAGE 79.50-ACRES OF RUNOFF FROM THE SITE. THIS POND WILL REPLACE FOUR EXISTING SWM PONDS, EXISTING PONDS #3, #4, #5 AND #6, IN AN EFFORT TO REDUCE LAND DISTURBING ACTIVITY AND ENVIRONMENTAL IMPACTS WITHIN THE LIMITED SPACE BETWEEN THE PROPOSED LANDFILL EXPANSION AND EXISTING FLOODPLAIN. THE RUNOFF FROM THE DRAINAGE AREA OF THESE FOUR EXISTING PONDS WILL BE DIVERTED TO PROPOSED BASIN 3 USING PROPOSED BENCHES AND PROPOSED DOWN DRAINS. THE ORIGINAL OUTFALLS TO EACH OF THE FOUR EXISTING PONDS WILL REMAIN AND BE UTILIZED. THE PROPOSED BASIN 3 WILL BE CONSTRUCTED WITH A CONTROL STRUCTURE THAT DIVIDES THE RELEASE AMONG THE FOUR EXISTING OUTFALLS. PROPOSED SWM BASIN 3 WILL ALSO PROVIDE VOLUME NECESSARY TO DETAIN THE 1-YEAR RUNOFF VOLUME FOR A PERIOD OF 24 HOURS THAT WAS NECESSARY TO MEET EXISTING POND #3 OUTFALL REQUIREMENTS. PROPOSED STORM SEWER WILL DIRECT DISCHARGE TO EACH OF THE EXISTING CHANNELS. PROPOSED BASIN 3 WILL BE DESIGNED TO MEET OR EXCEED PROPORTIONAL IMPROVEMENT DESIGN REQUIREMENTS OF THE FOUR EXISTING SWM PONDS. THE DRAINAGE AREA HAS A CN VALUE OF 77.

	2-YEAR	10 YEAR
EX POND #3 RELEASE TO OUTFALL D-D	1.30 CFS	13.44 CFS
PROP. BASIN 3 RELEASE TO OUTFALL D-D	0.00 CFS	0.00 CFS
REDUCTION IN DISCHARGE	100.00%	100.00%

	2-YEAR	10 YEAR
EX POND #4 RELEASE TO OUTFALL E-E	1.68 CFS	10.84 CFS
PROP. BASIN 3 RELEASE TO OUTFALL E-E	1.36 CFS	9.34 CFS
REDUCTION IN DISCHARGE	19.05%	13.84%

	2 YEAR	10 YEAR
EX. POND #5 RELEASE TO OUTFALL F-F	0.27 CFS	4.74 CFS
PROP. BASIN 3 RELEASE TO OUTFALL F-F	0.21 CFS	4.19 CFS
REDUCTION IN DISCHARGE	22.22%	11.60%

	2-YEAR	10-YEAR
EX POND #6 RELEASE TO OUTFALL G-G	1.77 CFS	16.17 CFS
PROP. BASIN 3 RELEASE TO OUTFALL G-G	0.81 CFS	12.91 CFS
REDUCTION IN DISCHARGE	54.24%	20.16%

THE BASIN HAS BEEN EVALUATED DURING THE 100-YEAR STORM LEAVING APPROXIMATELY 3.2-FEET OF FREEBOARD. THE DAM HAS A HEIGHT OF 14-FEET. THE POND OUTFALL TO CROSS-SECTION D-D, E-E, F-F AND G-G.

PROPOSED SWM BASIN 8

STORMWATER MANAGEMENT BASIN 8 IS LOCATED IN THE SOUTHEASTERN CORNER OF THE SITE ON THE EAST FACE OF THE LANDFILL. IT HAS BEEN DESIGNED TO MANAGE 31.33-ACRES OF RUNOFF FROM THE SITE. THIS POND WILL REPLACE AN EXISTING SWM POND, IDENTIFIED AS EXISTING POND #8, AND RECONSTRUCTED WITH A NEW OUTFALL STRUCTURE; HOWEVER, THE NEW OUTFALL WILL REMAIN WITHIN THE SAME EXISTING CHANNEL. IN ADDITION TO CONTROLLING THE 2- AND 10-YEAR STORMS, BASIN 8 HAS BEEN DESIGNED TO DETAIN THE 1-YEAR RUNOFF VOLUME FOR A PERIOD OF 24 HOURS. THE DRAINAGE AREA HAS A CN VALUE OF 77.

	2 YEAR	10-YEAR
EXISTING POND #8 RELEASE	2.12 CFS	18.52 CFS
PROPOSED BASIN #8 RELEASE	1.72 CFS	14.27 CFS
REDUCTION IN DISCHARGE	18.87%	22.95%

THE BASIN HAS BEEN EVALUATED DURING THE 100-YEAR STORM LEAVING APPROXIMATELY 3.0-FEET OF FREEBOARD. THE DAM HAS A HEIGHT OF 22-FEET. THE POND WILL OUTFALL TO CROSS-SECTION J-J.

EXISTING SWM BASIN 9

EXISTING STORMWATER MANAGEMENT POND #9 IS LOCATED IN THE SOUTHERN MOST CORNER OF THE SITE. THIS EXISTING POND WILL NOT BE DISTURBED. THE PRE-DEVELOPMENT AND POST-DEVELOPMENT DRAINAGE AREA, IMPERVIOUS AREA, RUNOFF VOLUME INFLOW AND POND RELEASE RATES REMAIN THE SAME. IT HAS BEEN DESIGNED TO MANAGE 46.79-ACRES OF RUNOFF FROM THE SITE. IN ADDITION TO CONTROLLING THE 2- AND 10-YEAR STORMS, BASIN 2 HAS BEEN DESIGNED TO DETAIN THE 1 YEAR RUNOFF VOLUME. THE DRAINAGE AREA HAS A CN VALUE OF 77.

	2-YEAR	10-YEAR
EXISTING POND #9 PRE-DEV. RELEASE	0.89 CFS	15.78 CFS
EXISTING POND #9 POST-DEV. RELEASE	0.89 CFS	15.78 CFS
REDUCTION IN DISCHARGE	0.00%	0.00%

THE BASIN MEETS FREEBOARD REQUIREMENTS WITH APPROXIMATELY 3.6-FEET OF FREEBOARD DURING THE 100-YEAR STORM EVENT. THE DAM HAS A HEIGHT OF 18.0-FEET. THE POND WILL OUTFALL TO CROSS-SECTION L-L.

CONCLUSION

EACH OF THESE FOUR PONDS HAS A RELEASE FOR THE 2- AND 10-YEAR STORM EVENT THAT IS LESS THAN THE PREDEVELOPMENT CONDITIONS. ALSO EACH POND CONTAINS AND PASSES THE 100-YEAR STORM EVENT WHILE MAINTAINING A MINIMUM 2.0 FOOT FREEBOARD. THEREFORE, IT IS THE OPINION OF THIS ENGINEER THAT THE PONDS HAVE BEEN DESIGNED ADEQUATELY AND IN CONFORMANCE WITH FAIRFAX COUNTY.

MINIMUM STORMWATER INFORMATION FOR REZONING, SPECIAL EXCEPTION, SPECIAL PERMIT AND DEVELOPMENT PLAN APPLICATIONS

The following information is required to be shown or provided in all zoning applications, or a waiver request of the submission requirement with justification shall be attached. Note: Waivers will be acted upon separately. Failure to adequately address the required submission information may result in a delay in processing this application.

This information is required under the following Zoning Ordinance paragraphs:

Special Permits (8-011 2J & 2L) — Special Exceptions (9-011 2J & 2L)
Cluster Subdivision (9-615 1G & 1N) — Commercial Revitalization Districts (9-622 2A (12)&(14))
Development Plans PRC District (16 302 2 & 4L) — PRC Plan (16-303 1E & 1O)
FDP - P Districts (except PRC) 916 502 1F & 1Q) — Amendments (18 202 10F & 10I)

1. Plat is at a minimum scale of 1"=50 (unless it is depicted on one sheet with a minimum scale of 1"=100)
2. A graphic depicting the stormwater management facility(ies) and limits of clearing and grading to accommodate the stormwater management facility(ies), storm drainage pipe systems and outlet protection, pond spillways, access roads, site outfalls, energy dissipation devices, and stream stabilization measures as shown on Sheets 26 27, 28, 29 and 30
3. Provide:

Facility Name/ Type & No.	On Site area served (acres)	Off-Site area served (acres)	Drainage area (acres)	Footprint area (sf)	Storage Volume (cf)	If pond, dam height (ft)
Dry Pond #2	34	0	34	58,217	454,089	22
(e.g., dry pond A, infil. trench, underground vault, etc.)						
Dry Pond #3	79.5	0	79.5	104,821	1,034,936	14
Dry Pond #8	31.33	0	31.33	35,780	361,773	22
Dry Pond #9	46.79	0	46.79	58,520	562,442	18
Totals	191.62	0	191.62	257,138	2,413,260	

4. Onsite drainage channels, outfalls and pipe systems are shown on Sheet 29, 30, 31, 33, 35 and 37. Pond inlet and outlet pipe systems are shown on Sheets Sheet 29, 30, 31, 33, 35 and 37.
5. Maintenance access (road) to stormwater management facility(ies) are shown on Sheets 29, 30, 31, 33, 35 and 37. Type of maintenance access road surface noted on the plat is Gravel (asphalt, geoblock, gravel, etc.)
6. Landscaping and tree preservation shown in and near the stormwater management facility is shown on Sheets 17, 18, 19, 20 and 21.
7. A "stormwater management narrative" which contains a description of how detention and best management practices requirements will be met is provided on Sheet 28.
8. A description of the existing conditions of each numbered site outfall extended downstream from the site to a point which is at least 100 times the site area or which has a drainage area of at least one square mile (640 acres) is provided on Sheet 38.
9. A description of how the outfall requirements, including known changes to contributing drainage areas (i.e. drainage diversions), of the Public Facilities Manual will be satisfied is provided on Sheet 39.
10. Existing topography with maximum contour intervals of two (2) feet and a note as to whether it is an air survey or field run is provided on Sheet 29.
11. A submission waiver is requested for: N/A
12. Stormwater management is not required because: N/A

Revised 2-21-2006

PROPOSED SEDIMENT BASIN VOLUME CALCS

Stage-Area-Storage for Pond 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.00	426	0
104.50	628	261
105.00	871	634
105.50	1,155	1,139
106.00	1,478	1,796
106.50	1,834	2,622
107.00	2,228	3,636
107.50	2,660	4,856
108.00	3,131	6,303
108.50	3,635	7,992
109.00	4,176	9,944
109.50	4,755	12,175
110.00	5,372	14,705
110.50	6,051	17,559
111.00	6,779	20,763
111.50	7,529	24,326
112.00	8,329	28,299
112.50	9,405	32,730
113.00	10,547	37,715
113.50	11,754	43,288
114.00	13,027	49,480
114.50	14,392	56,332
115.00	15,825	63,883
115.50	17,325	72,168
116.00	18,894	81,220
116.50	20,453	91,054
117.00	22,073	101,683
117.50	23,755	113,137
118.00	25,499	125,448

DA = 34.00 Acres

Wet Volume (Required) = 34acres x 67 CY/Acre (Per VESCH) = 2,278 CY = 61,506 CF

Dry Volume (Required) = 34acres x 67 CY/Acre = 2,278 CY = 61,506 CF

114.86 = 61,506 CF (Approx.) Wet Volume Storage Elev.
117.50 = 123,012 CF (Approx.) Dry Volume Storage Elev.

Stage-Area-Storage for Pond 8

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
62.00	680	0
62.50	1,030	425
63.00	1,453	1,042
63.50	1,948	1,889
64.00	2,515	3,002
64.50	3,015	4,383
65.00	3,561	6,025
65.50	4,152	7,951
66.00	4,788	10,184
66.50	5,402	12,730
67.00	6,052	15,592
67.50	6,740	18,788
68.00	7,465	22,338
68.50	8,172	26,246
69.00	8,911	30,516
69.50	9,683	35,163
70.00	10,486	40,204
70.50	11,253	45,638
71.00	12,047	51,461
71.50	12,868	57,689
72.00	13,716	64,334
72.50	14,535	71,396
73.00	15,378	78,873
73.50	16,245	86,777
74.00	17,135	95,121
74.50	18,005	103,905
75.00	18,896	113,130

DA = 31.3 Acres

Wet Volume (Required) = 31.3 Acres x 67 CY/Acre (Per VESCH) = 2,099 CY = 56,676 CF

Dry Volume (Required) = 31.3 Acres x 67 CY/Acre = 2,099 CY = 56,676 CF

71.45 = 56,676 CF (Approx.) Wet Storage Volume Elev.
75.05 = 113,352 CF (Approx.) Dry Storage Volume Elev.

Stage-Area-Storage for Pond 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
86.00	44,652	0
86.40	46,202	18,130
86.80	47,778	36,965
87.20	49,381	56,396
87.60	51,010	76,473
88.00	52,666	97,258
88.40	54,271	118,594
88.80	55,900	140,628
89.20	57,553	163,318
89.60	59,231	186,674
90.00	60,932	210,705
90.40	62,573	235,406
90.80	64,236	260,767
91.20	65,921	286,798
91.60	67,628	313,507

DA = 79.5 Acres

Wet Volume (Required) = 79.5 Acres x 67 CY/Acre (Per VESCH) = 5,327 CY = 143,816 CF

Dry Volume (Required) = 79.5 Acres x 67 CY/Acre = 5,327 CY = 143,816 CF

88.86 = 143,816 CF (Approx.) Wet Storage Volume Elev.
91.22 = 287,632 CF (Approx.) Dry Storage Volume Elev.

Stage-Area-Storage for Pond 9

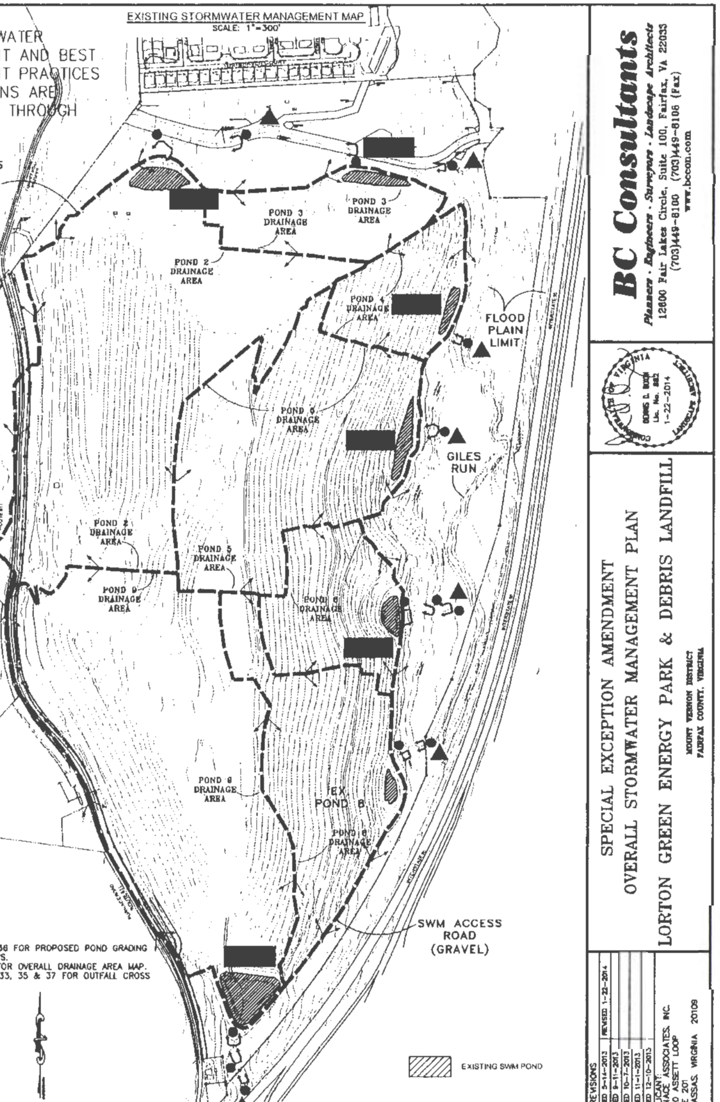
Elevation (ft)	Area (sq.ft)	A1 A2sqt(A1*A2) (sq.ft)	Volume (cu ft)	Volume Sum (cu.ft)
174.00	0	0	0	0
176.00	5830	5830	3753	3753
178.00	25870	43568	29046	32799
180.00	35570	91775	61183	93982
182.00	40210	113595	75733	169715
184.00	44550	127084	84723	254438
186.00	48560	140243	93495	347933
188.00	53540	153729	102486	450419
190.00	58520	168045	112023	562442
190.80	58520	175560	46816	609258

Wet Volume (Required) = 46.8 acres x 67 CY/Acre (Per VESCH) = 3,136 CY = 84,672 CF

Dry Volume (Required) = 46.8 acres x 67 CY/Acre = 3,136 CY = 84,672 CF

175.67 = 84,672 CF (Approx.) Wet Volume Storage Elev.
176.17 = 169,344 CF (Approx.) Dry Volume Storage Elev.

NOTE:
ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.



NOTES:

1. SEE SHEETS 30-36 FOR PROPOSED POND GRADING AND COMPUTATIONS.
2. SEE SHEETS 38 FOR OVERALL DRAINAGE AREA MAP.
3. SEE SHEETS 31, 33, 35 & 37 FOR OUTFALL CROSS SECTIONS.

CROSS-SECTION ID	POND OUTFALL	CHANNEL DESCRIPTION	MANNING'S 'N'	2-YEAR FLOW (CFS)	2-YEAR VELOCITY (FPS)	10-YEAR FLOW (CFS)	10-YEAR DEPTH (FT)
A-A	2	RIP RAP	0.078	N/A	N/A	N/A	N/A
B-B	2	WEEDY	0.045	N/A	N/A	N/A	N/A
C-C	2	WEEDY	0.045	N/A	N/A	N/A	N/A
D-D	2,3	WEEDY	0.045	1.92	2.13	25.79	0.90
E-E	4	WEEDY	0.045	1.01	1.66	9.48	0.38
F-F	5	WEEDY	0.045	1.72	2.77	15.34	0.81
G-G	6	WEEDY	0.045	1.83	2.44	15.91	0.89
H-H	6	WEEDY	0.045	1.63	2.54	15.91	0.49
I-I	6	WEEDY	0.045	1.83	2.75	15.91	0.81
J-J	8	WEEDY	0.045	1.79	2.17	17.92	0.79
K-K	8	WEEDY	0.045	1.79	2.27	17.92	0.77
L-L	9	WEEDY	0.045	N/A	N/A	N/A	N/A
M-M	9	WEEDY	0.045	N/A	N/A	N/A	N/A
N-N	9	WEEDY	0.045	N/A	N/A	N/A	N/A

BC Consultants
Planners · Engineers · Surveyors · Landscape Architects
12600 Fair Lakes Circle, Suite 100, Fairfax, VA 22033
(703)449-8100 (703)449-8106 (Fax)
www.bccon.com

DENNIS L. BOOK, Lic. No. 882, 1-22-2014, CERTIFIED LANDSCAPE ARCHITECT, COMMONWEALTH OF VIRGINIA

SPECIAL EXCEPTION AMENDMENT
OVERALL STORMWATER MANAGEMENT PLAN
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS: REVISED 5-14-2013; REVISED 9-11-2013; REVISED 10-7-2013; REVISED 11-1-2013; REVISED 12-10-2013; REVISED 1-22-2014

APPLICANT: FURNACE ASSOCIATES, INC. 11220 ASSETT LOOP, SUITE 201, MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 28 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117SWM1
LAYOUT: SWM-1
FILE NO. 05117.08-00

PHASE 6 STORMWATER MANAGEMENT MAP
SCALE: 1"=200'

SWM ACCESS ROAD (GRAVEL)

FURNACE ROAD ROUTE 611

POND 2 DRAINAGE AREA

POND 9 DRAINAGE AREA

HDPE DOWNDRAINS (TYP.)

POND 3 DRAINAGE AREA

POND 8 DRAINAGE AREA

SWM BASIN 2 (SEE DETAIL SHEET 30)

SWM BASIN 3 (SEE DETAIL SHEET 32)

SWM ACCESS ROAD (GRAVEL)

GILES RUN

FLOOD PLAIN LIMIT

POND OUTFALL PIPES

INTERSTATE 95

200' 100' 0' 200' 400'

SCALE: 1"=200'
CONTOUR INTERVAL = 10'

NOTE: SEE SHEET 38 FOR STORMWATER MANAGEMENT NARRATIVE

PHASE 6 SWM POND

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

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SPECIAL EXCEPTION AMENDMENT
OVERALL STORMWATER MANAGEMENT
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

NO.	REVISIONS	DATE
1	REVISED PER COUNTY COMMENTS	1-22-2014
2	REVISED PER COUNTY COMMENTS	8-14-2013
3	REVISED PER COUNTY COMMENTS	6-11-2013
4	REVISED PER COUNTY COMMENTS	3-11-2013
5	REVISED PER COUNTY COMMENTS	2-15-2013

FURNACE ASSOCIATES, INC.
11220 ROSETT LOOP
SUITE 200
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
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SHEET 29 OF 45
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FILE NO. 08117.08-00

v:\projects_2005\05117\Plan\Cadfiles SEA OVERLOOK BERM-SE5117swm2.dwg, Pond2, 1/21/2014 12:40:56 PM

PRE-DEVELOPED
EX. CN

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Existing Drainage Area	55	7.370			55.00
COMPOSITE AREA & WEIGHTED CN --->		7.370			55.00 (55)

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Existing Drainage Area	55	11.780			55.00
COMPOSITE AREA & WEIGHTED CN --->		11.780			55.00 (55)

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Existing Drainage Area	55	18.950			55.00
COMPOSITE AREA & WEIGHTED CN --->		18.950			55.00 (55)

PRE-DEVELOPED
EX. T.C.

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 200.00 ft
2yr, 24hr P 3.2000 in
Slope .070000 ft/ft

Avg.Velocity .15 ft/sec

Segment #1 Time: 22.65 min

Segment #2: Tc: TR-55 Shallow

Hydraulic length 950.00 ft
Slope .070000 ft/ft
Unpaved

Avg.Velocity 4.27 ft/sec

Segment #2 Time: 3.71 min

Total Tc: 26.36 min

POST-DEVELOPED
PROP. CN & T.C.

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Lorton Landfill 2.0
Type II 24-hr 2 year Rainfall=3.20"
Printed 9/20/2012
Page 6

Summary for Subcatchment 41S: Basin 2

Runoff = 42.04 cfs @ 12.16 hrs, Volume= 3.438 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
* 34.000	77	60-75% Grass cover, Fair, HSG C
34.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		Sheet Flow, Sheet Flow - 100 feet Grass: Short n= 0.150 P2= 3.20"
6.3	373	0.0200	0.99		Shallow Concentrated Flow, Shallow Flow 373 feet Short Grass Pasture Kv= 7.0 fps
0.3	308	0.0500	14.36	143.48	Channel Flow, Tack On Bench 308 feet Area= 10.0 sf Perim= 10.8' r= 0.93' n= 0.022 Earth, clean & straight
0.3	720	0.3300	44.81	140.79	Pipe Channel, 24" HDPE 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
2.9	1,124	0.0100	6.54	78.46	Channel Flow, Top of Berm Channel 1,124 feet Area= 12.0 sf Perim= 12.6' r= 0.95' n= 0.022 Earth, clean & straight
0.7	486	0.0100	11.40	142.66	Pipe Channel, RCP_Round 48" 48.0" Round w/ 1.0" inside fill Area= 12.5 sf Perim= 12.6' r= 1.00' n= 0.013
1.8	1,304	0.0100	14.98	423.61	Pipe Channel, RCP_Round 72" 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.013
21.9	4,476				Total

1 YR.
POST-DEVELOPMENT DESIGN SUMMARY

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Lorton Landfill 2.0
Type II 24-hr 1 year Rainfall=2.70"
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Page 5

Summary for Pond 42P: Basin 2

Inflow Area = 34.000 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1 year event
Inflow = 29.28 cfs @ 12.18 hrs, Volume= 2.461 af
Outflow = 0.40 cfs @ 24.28 hrs, Volume= 1.094 af, Atten= 99%, Lag= 726.9 min
Primary = 0.40 cfs @ 24.28 hrs, Volume= 1.094 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.34' @ 24.28 hrs Surf Area= 30,288 sf Storage= 90,841 cf
Flood Elev= 126.00' Surf Area= 58,217 sf Storage= 381,831 cf

Plug-Flow detention time= 1,056.7 min calculated for 1.094 af (44% of inflow)
Center-of-Mass det. time= 916.4 min (1,790.3 - 874.0)

Volume	Invert	Avail.Storage	Storage Description
#1	115.50'	507,240 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
115.50	17,326	0	0	17,326
116.00	18,894	9,062	9,062	18,917
118.00	26,499	44,228	53,290	26,628
120.00	32,755	58,103	111,393	33,011
122.00	40,713	73,324	184,707	41,116
124.00	49,277	89,854	274,561	49,845
126.00	58,217	107,370	381,931	58,975
128.00	67,200	125,310	507,240	68,178

Device	Routing	Invert	Outlet Devices
#1	Primary	109.07'	48.0" Round Culvert L= 108.0' RCP, sq cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.07' / 104.07' S= 0.0463 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	116.97'	2.8" Vert. Orifice/Grate C= 0.600
#3	Device 1	120.96'	11.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Device 1	122.33'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.40 cfs @ 24.28 hrs HW=119.34' (Free Discharge)
1=Culvert (Passes 0.40 cfs of 174.75 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.40 cfs @ 9.29 fps)
3=Orifice/Grate (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

2 YR.
POST-DEVELOPMENT DESIGN SUMMARY

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Lorton Landfill 2.0
Type II 24-hr 2 year Rainfall=3.20"
Printed 9/20/2012
Page 12

Summary for Pond 42P: Basin 2

Inflow Area = 34.000 ac, 0.00% Impervious, Inflow Depth = 1.21" for 2 year event
Inflow = 42.04 cfs @ 12.18 hrs, Volume= 3.433 af
Outflow = 0.46 cfs @ 24.30 hrs, Volume= 1.282 af, Atten= 99%, Lag= 726.5 min
Primary = 0.46 cfs @ 24.30 hrs, Volume= 1.282 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.56' @ 24.30 hrs Surf Area= 34,888 sf Storage= 130,264 cf
Flood Elev= 126.00' Surf Area= 58,217 sf Storage= 381,831 cf

Plug-Flow detention time= 1,070.1 min calculated for 1.282 af (37% of inflow)
Center-of-Mass det. time= 931.4 min (1,795.2 - 863.8)

Volume	Invert	Avail.Storage	Storage Description
#1	115.50'	507,240 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
115.50	17,326	0	0	17,326
116.00	18,894	9,062	9,062	18,917
118.00	26,499	44,228	53,290	26,628
120.00	32,755	58,103	111,393	33,011
122.00	40,713	73,324	184,707	41,116
124.00	49,277	89,854	274,561	49,845
126.00	58,217	107,370	381,931	58,975
128.00	67,200	125,310	507,240	68,178

Device	Routing	Invert	Outlet Devices
#1	Primary	109.07'	48.0" Round Culvert L= 108.0' RCP, sq cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.07' / 104.07' S= 0.0463 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	116.50'	2.8" Vert. Orifice/Grate C= 0.600
#3	Device 1	120.96'	11.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Device 1	122.33'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.46 cfs @ 24.30 hrs HW=120.56' (Free Discharge)
1=Culvert (Passes 0.46 cfs of 187.06 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.46 cfs @ 10.70 fps)
3=Orifice/Grate (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

10 YR.
POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0
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Lorton Landfill 2.0
Type II 24-hr 10 year Rainfall=5.20"
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Page 1

Summary for Pond 42P: Basin 2

Inflow Area = 34.000 ac, 0.00% Impervious, Inflow Depth = 2.79" for 10 year event
Inflow = 98.74 cfs @ 12.16 hrs, Volume= 7.906 af
Outflow = 7.83 cfs @ 13.54 hrs, Volume= 5.676 af, Atten= 92%, Lag= 83.1 min
Primary = 7.83 cfs @ 13.54 hrs, Volume= 5.676 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 122.37' @ 13.54 hrs Surf Area= 42,078 sf Storage= 198,417 cf
Flood Elev= 126.00' Surf Area= 58,217 sf Storage= 381,831 cf

Plug-Flow detention time= 158.6 min calculated for 5.673 af (72% of inflow)
Center-of-Mass det. time= 358.1 min (1,197.6 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	115.50'	507,240 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
115.50	17,326	0	0	17,326
116.00	18,894	9,062	9,062	18,917
118.00	26,499	44,228	53,290	26,628
120.00	32,755	58,103	111,393	33,011
122.00	40,713	73,324	184,707	41,116
124.00	49,277	89,854	274,561	49,845
126.00	58,217	107,370	381,931	58,975
128.00	67,200	125,310	507,240	68,178

Device	Routing	Invert	Outlet Devices
#1	Primary	109.07'	48.0" Round Culvert L= 108.0' RCP, sq cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.07' / 104.07' S= 0.0463 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	116.50'	2.8" Vert. Orifice/Grate C= 0.600
#3	Device 1	120.96'	11.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Device 1	122.33'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.82 cfs @ 13.54 hrs HW=122.37' (Free Discharge)
1=Culvert (Passes 7.82 cfs of 203.68 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.53 cfs @ 12.41 fps)
3=Orifice/Grate (Orifice Controls 7.28 cfs @ 5.52 fps)
4=Orifice/Grate (Weir Controls 0.00 cfs @ 0.11 fps)

100 YR. CLOGGED
POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0
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Lorton Landfill 2.0
Type II 24-hr 100 year Rainfall=7.30"
Printed 9/20/2012
Page 6

Summary for Pond 44P: Basin 2 100yr

Inflow Area = 34.000 ac, 0.00% Impervious, Inflow Depth = 4.64" for 100 year event
Inflow = 186.23 cfs @ 12.15 hrs, Volume= 13.138 af
Outflow = 138.48 cfs @ 12.26 hrs, Volume= 13.137 af, Atten= 16%, Lag= 6.1 min
Primary = 138.48 cfs @ 12.26 hrs, Volume= 13.137 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.06 hrs / 2
Starting Elev= 122.33' Surf Area= 42,070 sf Storage= 198,356 cf
Peak Elev= 124.04' @ 12.25 hrs Surf Area= 48,498 sf Storage= 276,768 cf (78,403 cf above start)
Flood Elev= 126.00' Surf Area= 58,217 sf Storage= 381,831 cf (183,665 cf above start)

Plug-Flow detention time= 192.5 min calculated for 8.574 af (65% of inflow)
Center-of-Mass det. time= 17.7 min (842.8 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	115.50'	507,240 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
115.50	17,326	0	0	17,326
116.00	18,894	9,062	9,062	18,917
118.00	26,499	44,228	53,290	26,628
120.00	32,755	58,103	111,393	33,011
122.00	40,713	73,324	184,707	41,116
124.00	49,277	89,854	274,561	49,845
126.00	58,217	107,370	381,931	58,975
128.00	67,200	125,310	507,240	68,178

Device	Routing	Invert	Outlet Devices
#1	Primary	109.07'	48.0" Round Culvert L= 108.0' RCP, sq cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 109.07' / 104.07' S= 0.0463 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	122.33'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

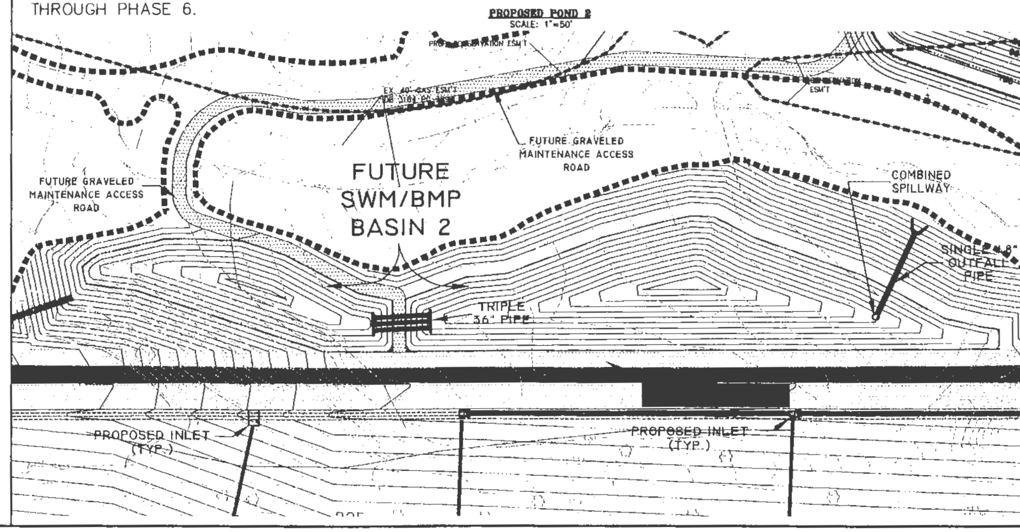
Primary OutFlow Max=138.16 cfs @ 12.26 hrs HW=124.04' (Free Discharge)
1=Culvert (Passes 138.16 cfs of 218.82 cfs potential flow)
2=Orifice/Grate (Weir Controls 138.16 cfs @ 4.28 fps)

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

THIS SHEET IS FOR STORMWATER MANAGEMENT INFORMATION ONLY

PROPOSED POND 2
SCALE: 1"=50'



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COMMONWEALTH OF VIRGINIA
DENNIS D. DIXON
Lic. No. 862
1-22-2014
LANDSCAPE ARCHITECT

SPECIAL EXCEPTION AMENDMENT
STORMWATER MANAGEMENT POND 2
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 5-14-2013 | REVISED 1-22-2014
REVISED 8-11-2013
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-10-2013

APPLICANT:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 30 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117SWM2
LAYOUT: Pond2
FILE NO. 05117.08-00

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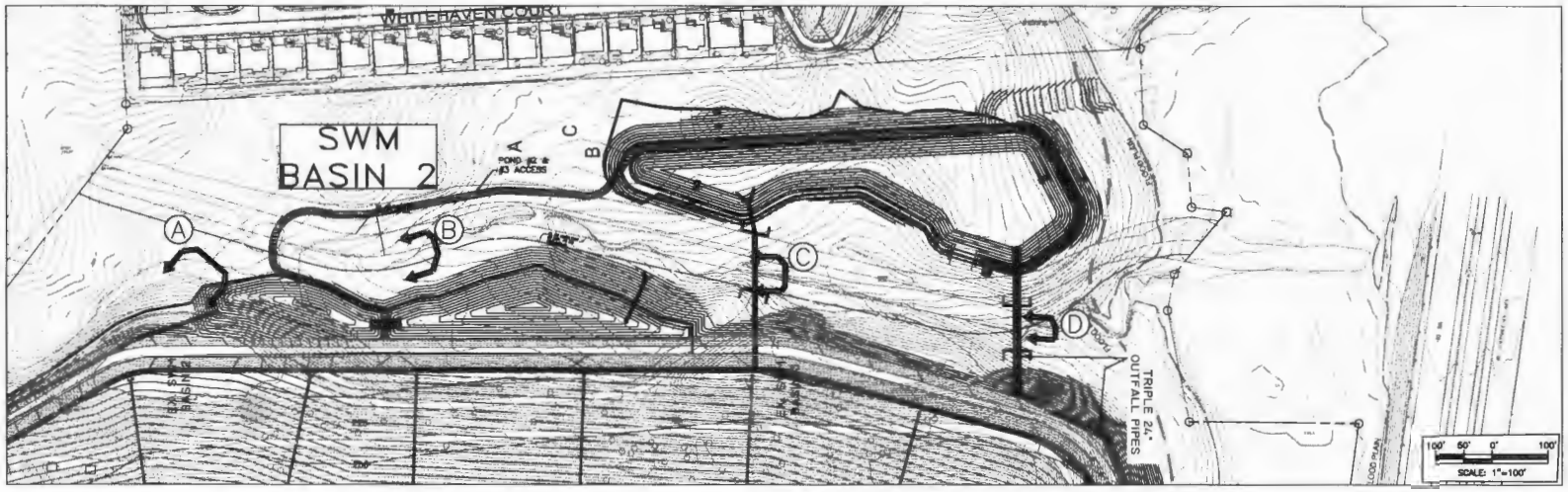
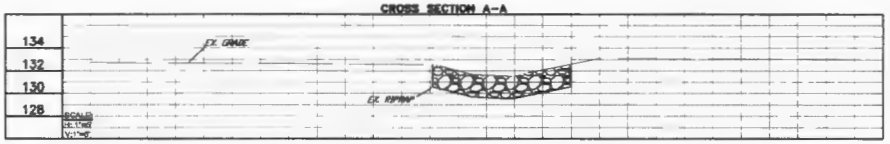
OUTFALL 2 CROSS SECTION PLAN VIEW

SCALE: 1"=100'

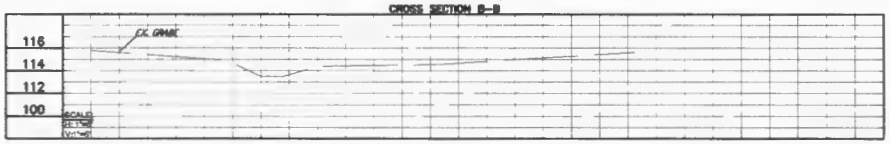


OUTFALL 2

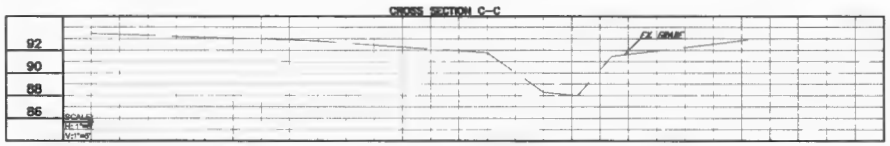
CROSS SECTION A-A



CROSS SECTION B-B

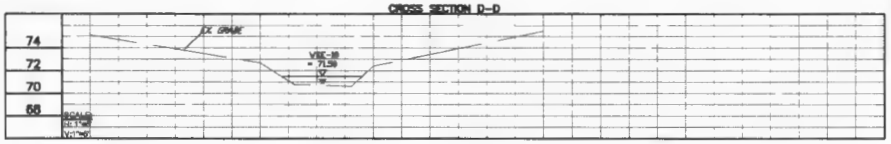


CROSS SECTION C-C



OUTFALL 3

CROSS SECTION D-D



NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

NOTES:

1. SEE SHEET 28 FOR CROSS SECTION LOCATIONS AND OUTFALL NARRATIVE.

BC Consultants

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SPECIAL EXCEPTION AMENDMENT
OUTFALL CROSS SECTIONS POND 2

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 1-22-2014	
REVISED 8-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

FAIRFAX ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 200
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.

CO. NO. SEA 80-L/V-081-2
CAD NAME: SE511759M3
LAYOUT: OUT2 3
FILE NO. 05117.08-00

V:\project_2005\05117\Plan\Cad\Sen\SEA OVERLOOK BERM\SE5117swm2.dwg, Pond3, 1/21/2014 12:32:45 PM

PRE-DEVELOPED EX. CN

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Existing Drainage Area	55	15.620			55.00
COMPOSITE AREA & WEIGHTED CN ---->		15.620			55.00 (55)

PRE-DEVELOPED EX. T.C.

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 200.00 ft
2yr, 24hr P 3.2000 in
Slope .100000 ft/ft

Avg.Velocity .17 ft/sec

Segment #1 Time: 19.64 min

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 650.00 ft
Slope .100000 ft/ft
Unpaved

Avg.Velocity 5.10 ft/sec

Segment #2 Time: 2.12 min

Total Tc: 21.76 min

POST-DEVELOPED PROP. CN & T.C.

Lorton LF 2.0 — Lorton Landfill 2.0
Type II 24-hr 2 year Rainfall=3.20"
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Summary for Subcatchment 33S: Basin 3

Runoff = 98.29 cfs @ 12.16 hrs, Volume= 8.030 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
* 79.600	77	50-75% Grass cover, Fair, HSG C
79.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		Sheet Flow, Sheet Flow - 100 feet; Grass: Short n= 0.150 P2= 3.20"
6.2	373	0.0200	0.99		Shallow Concentrated Flow, Shallow Flow 373 feet; Short Grass Pasture Kv= 7.0 fps
0.3	300	0.0500	14.35	143.48	Channel Flow, Vert Ok Bench 300 feet; Area= 10.0 sf Perim= 10.8' r= 0.93'; n= 0.022 Earth, clean & straight
0.3	729	0.3300	44.81	140.79	Pipe Channel, 24" HDPE; 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'; n= 0.012
2.9	1,124	0.0100	6.54	78.46	Channel Flow, Top of Berm Channel 1,124 feet; Area= 12.0 sf Perim= 12.6' r= 0.95'; n= 0.022 Earth, clean & straight
0.7	488	0.0100	11.43	143.64	Pipe Channel, RCP_Round 48"; 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00'; n= 0.013
1.6	1,384	0.0100	14.98	423.51	Pipe Channel, RCP_Round 72"; 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50'; n= 0.013
21.9	4,478	Total			

100 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Type II 24-hr 100 year Rainfall=7.30"
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Summary for Pond 59P: Basin 3

Inflow Area = 119.250 ac, 0.00% Impervious, Inflow Depth = 4.84" for 100 year event
Inflow = 579.51 cfs @ 12.16 hrs, Volume= 48.076 af
Outflow = 522.78 cfs @ 12.22 hrs, Volume= 48.074 af, Atten= 10%, Lag= 4.5 min
Discarded = 522.78 cfs @ 12.22 hrs, Volume= 48.074 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 95.82' Surf.Area= 88,945 sf Storage= 554,214 cf
Peak Elev= 98.98' @ 12.22 hrs Surf.Area= 95,300 sf Storage= 774,400 cf (220,886 cf above start)
Flood Elev= 100.00' Surf.Area= 104,621 sf Storage= 890,947 cf (336,633 cf above start)

Plug-Flow detention time= 160.3 min calculated for 33.314 af (72% of inflow)
Center-of-Mass det. time= 14.5 min (839.6 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	88.88'	1,109,206 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.88	58,147	0	0	58,147
90.00	60,882	68,716	68,716	61,067
92.00	68,388	130,167	198,914	69,726
94.00	77,898	147,209	344,122	78,575
96.00	86,674	164,539	508,685	87,619
98.00	95,898	182,171	690,825	96,826
100.00	104,621	200,122	890,947	108,226
102.00	113,700	218,289	1,109,206	116,681

Device	Routing	Invert	Outlet Devices
#1	Discarded	95.57'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28); Head (feet) 0.00 4.00; Width (feet) 40.00 80.00

Discarded OutFlow Max=517.21 cfs @ 12.22 hrs HW=98.94' (Free Discharge)
└1=Custom Weir/Orifice (Weir Controls 517.21 cfs @ 4.85 fps)

1 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Type II 24-hr 1 year Rainfall=2.70"
Prepared by Geosyntec Consultants, Inc. — Printed 9/20/2012
HydroCAD 10.00 s/n 07907 © 2012 HydroCAD Software Solutions LLC — Page 5

Summary for Pond 54P: Basin 3

Inflow Area = 79.500 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1 year event
Inflow = 66.46 cfs @ 12.16 hrs, Volume= 5.785 af
Outflow = 1.98 cfs @ 18.77 hrs, Volume= 4.768 af, Atten= 97%, Lag= 456.1 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 1.13 cfs @ 18.77 hrs, Volume= 2.717 af
Secondary = 0.17 cfs @ 18.77 hrs, Volume= 0.418 af
Tertiary = 0.68 cfs @ 18.77 hrs, Volume= 1.623 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 91.82' @ 18.77 hrs Surf.Area= 67,712 sf Storage= 170,844 cf
Flood Elev= 100.00' Surf.Area= 104,621 sf Storage= 890,947 cf

Plug-Flow detention time= 881.9 min calculated for 4.768 af (83% of inflow)
Center-of-Mass det. time= 813.6 min (1,687.6 - 874.0)

Volume	Invert	Avail.Storage	Storage Description
#1	88.88'	1,109,206 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.88	58,147	0	0	58,147
90.00	60,882	68,716	68,716	61,067
92.00	68,388	130,167	198,914	69,726
94.00	77,898	147,209	344,122	78,575
96.00	86,674	164,539	508,685	87,619
98.00	95,898	182,171	690,825	96,826
100.00	104,621	200,122	890,947	108,226
102.00	113,700	218,289	1,109,206	116,681

Device	Routing	Invert	Outlet Devices
#1	Primary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.88'	6.2" Vert. Orifice/Grate Pond 4 C= 0.600
#3	Device 1	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#6	Device 5	88.88'	2.0" Vert. Orifice/Grate Pond 5 C= 0.600
#7	Device 5	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#8	Device 5	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#9	Tertiary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#10	Device 9	88.88'	4.0" Vert. Orifice/Grate Pond 6 C= 0.600
#11	Device 9	92.76'	13.1" Vert. Orifice/Grate X 2.00 C= 0.600
#12	Device 9	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#13	Discarded	95.57'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28); Head (feet) 0.00 4.00; Width (feet) 40.00 80.00

2 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Type II 24-hr 2 year Rainfall=3.20"
Prepared by Geosyntec Consultants, Inc. — Printed 9/20/2012
HydroCAD 10.00 s/n 07907 © 2012 HydroCAD Software Solutions LLC — Page 12

Summary for Pond 54P: Basin 3

Inflow Area = 79.600 ac, 0.00% Impervious, Inflow Depth = 1.21" for 2 year event
Inflow = 98.29 cfs @ 12.16 hrs, Volume= 8.030 af
Outflow = 2.39 cfs @ 20.23 hrs, Volume= 6.041 af, Atten= 98%, Lag= 484.4 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 1.36 cfs @ 20.23 hrs, Volume= 3.498 af
Secondary = 0.21 cfs @ 20.23 hrs, Volume= 0.558 af
Tertiary = 0.81 cfs @ 20.23 hrs, Volume= 2.084 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 92.78' @ 20.23 hrs Surf.Area= 72,556 sf Storage= 266,812 cf
Flood Elev= 100.00' Surf.Area= 104,621 sf Storage= 890,947 cf

Plug-Flow detention time= 954.0 min calculated for 6.041 af (75% of inflow)
Center-of-Mass det. time= 855.8 min (1,719.8 - 863.8)

Volume	Invert	Avail.Storage	Storage Description
#1	88.88'	1,109,206 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.88	58,147	0	0	58,147
90.00	60,882	68,716	68,716	61,067
92.00	68,388	130,167	198,914	69,726
94.00	77,898	147,209	344,122	78,575
96.00	86,674	164,539	508,685	87,619
98.00	95,898	182,171	690,825	96,826
100.00	104,621	200,122	890,947	108,226
102.00	113,700	218,289	1,109,206	116,681

Device	Routing	Invert	Outlet Devices
#1	Primary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.88'	6.2" Vert. Orifice/Grate Pond 4 C= 0.600
#3	Device 1	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#6	Device 5	88.88'	2.0" Vert. Orifice/Grate Pond 5 C= 0.600
#7	Device 5	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#8	Device 5	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#9	Tertiary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#10	Device 9	88.88'	4.0" Vert. Orifice/Grate Pond 6 C= 0.600
#11	Device 9	92.76'	13.1" Vert. Orifice/Grate X 2.00 C= 0.600
#12	Device 9	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#13	Discarded	95.57'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28); Head (feet) 0.00 4.00; Width (feet) 40.00 80.00

10 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Type II 24-hr 10 year Rainfall=5.20"
Prepared by Geosyntec Consultants, Inc. — Printed 9/20/2012
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Summary for Pond 54P: Basin 3

Inflow Area = 79.600 ac, 0.00% Impervious, Inflow Depth = 2.79" for 10 year event
Inflow = 233.20 cfs @ 12.16 hrs, Volume= 18.488 af
Outflow = 26.48 cfs @ 13.03 hrs, Volume= 16.208 af, Atten= 89%, Lag= 52.3 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 9.36 cfs @ 13.03 hrs, Volume= 6.784 af
Secondary = 4.21 cfs @ 13.03 hrs, Volume= 2.318 af
Tertiary = 12.82 cfs @ 13.03 hrs, Volume= 7.117 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 95.04' @ 13.03 hrs Surf.Area= 82,427 sf Storage= 427,592 cf
Flood Elev= 100.00' Surf.Area= 104,621 sf Storage= 890,947 cf

Plug-Flow detention time= 489.7 min calculated for 16.200 af (88% of inflow)
Center-of-Mass det. time= 408.4 min (1,249.0 - 838.6)

Volume	Invert	Avail.Storage	Storage Description
#1	88.88'	1,109,206 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.88	58,147	0	0	58,147
90.00	60,882	68,716	68,716	61,067
92.00	68,388	130,167	198,914	69,726
94.00	77,898	147,209	344,122	78,575
96.00	86,674	164,539	508,685	87,619
98.00	95,898	182,171	690,825	96,826
100.00	104,621	200,122	890,947	108,226
102.00	113,700	218,289	1,109,206	116,681

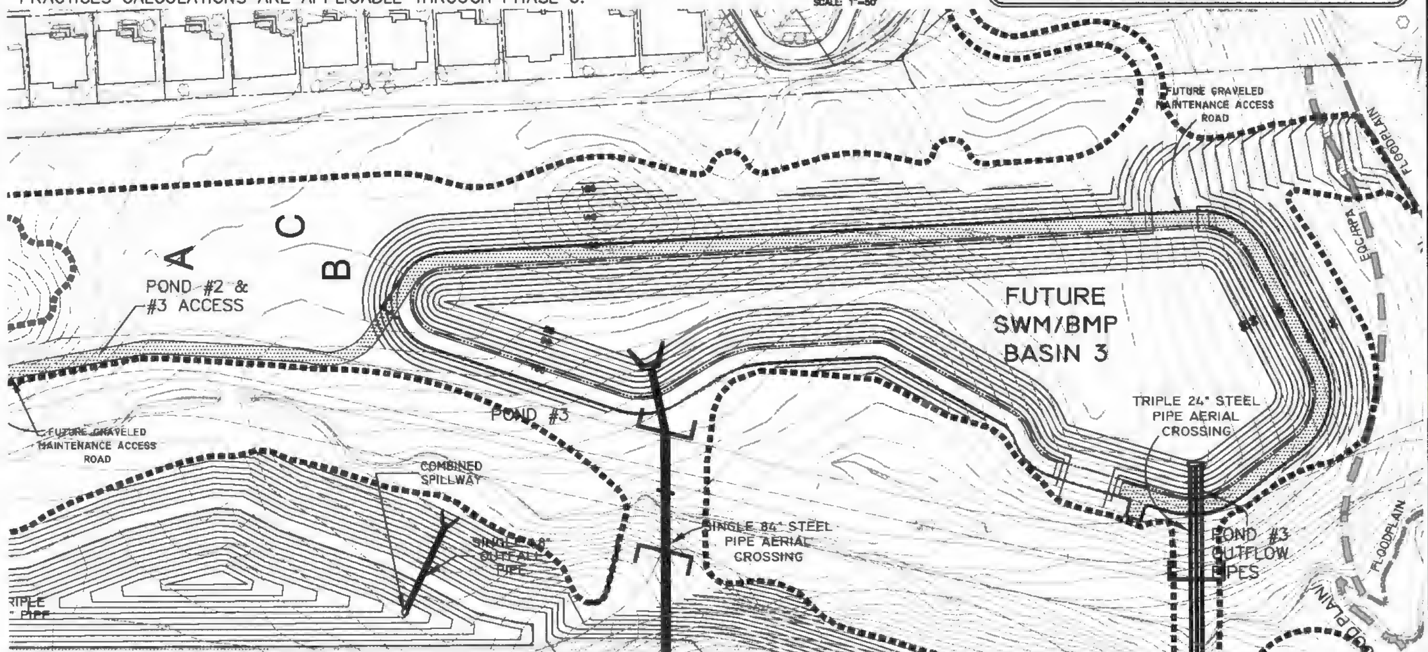
Device	Routing	Invert	Outlet Devices
#1	Primary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.88'	6.2" Vert. Orifice/Grate Pond 4 C= 0.600
#3	Device 1	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#6	Device 5	88.88'	2.0" Vert. Orifice/Grate Pond 5 C= 0.600
#7	Device 5	92.76'	16.0" Vert. Orifice/Grate C= 0.600
#8	Device 5	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#9	Tertiary	88.70'	24.0" Round Culvert L= 270.0' RCP, sq.cut end projecting, Ke= 0.500; Inlet / Outlet Invert= 88.70' / 81.80' S= 0.0256 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#10	Device 9	88.88'	4.0" Vert. Orifice/Grate Pond 6 C= 0.600
#11	Device 9	92.76'	13.1" Vert. Orifice/Grate X 2.00 C= 0.600
#12	Device 9	95.04'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#13	Discarded	95.57'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28); Head (feet) 0.00 4.00; Width (feet) 40.00 80.00

NOTE.

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

PROPOSED POND 3
SCALE: 1"=50'

THIS SHEET IS FOR STORMWATER MANAGEMENT INFORMATION ONLY



BC Consultants
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COMMONWEALTH OF VIRGINIA — Lic. No. [illegible] — 1-22-2014 — LANDSCAPE ARCHITECT

SPECIAL EXCEPTION AMENDMENT
STORMWATER MANAGEMENT POND 3
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 8-14-2013	REVISED 1-22-2014
REVISED 9-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-16-2013	

APPLICANT:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 32 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117SWM2
LAYOUT: Pond3
FILE NO. 05117.08-00

XREFS

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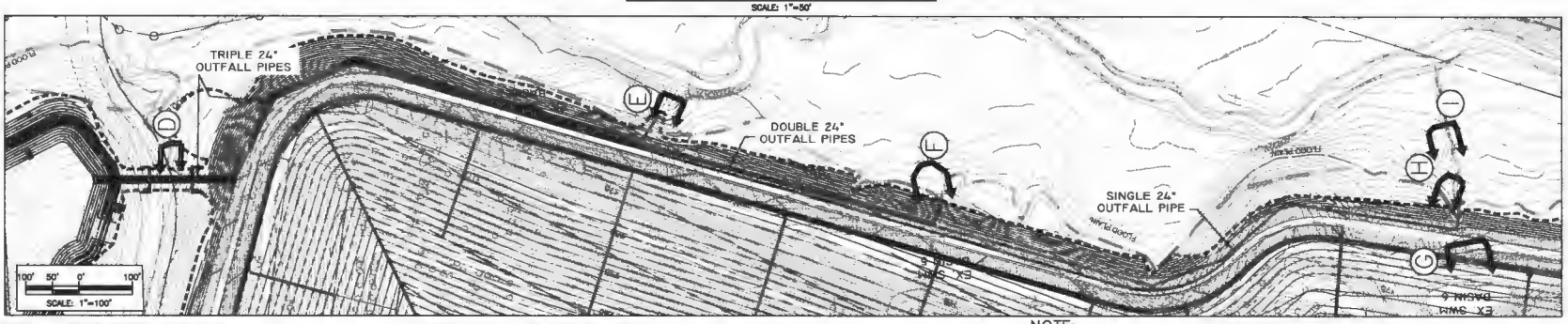
OUTFALL 4,5,&6 OVERALL CROSS SECTION PLAN VIEW

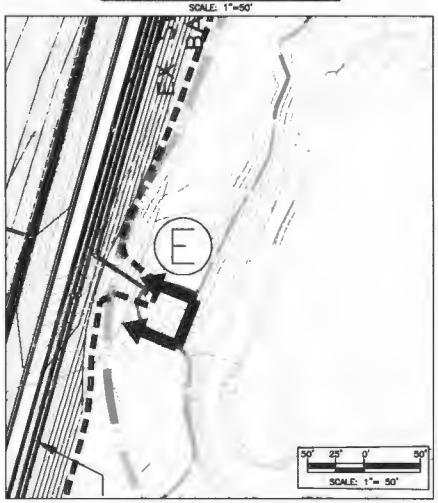
SCALE: 1"=50'



NOTE:
ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

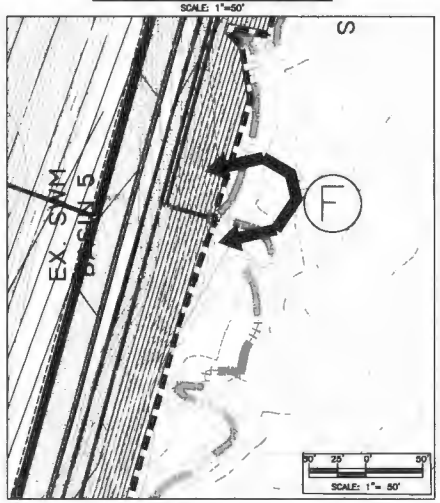
OUTFALL 4 CROSS SECTION PLAN VIEW

SCALE: 1"=50'



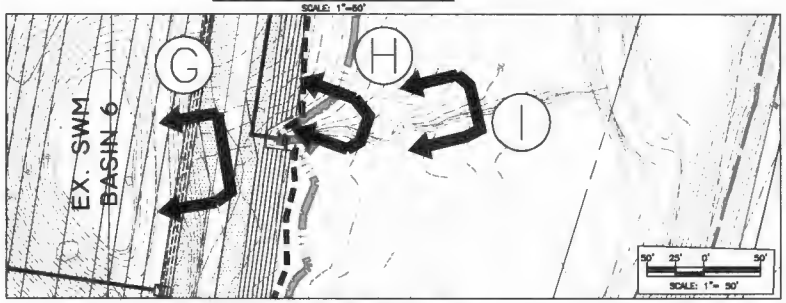
OUTFALL 5 CROSS SECTION PLAN VIEW

SCALE: 1"=50'



OUTFALL 6 CROSS-SECTION PLAN VIEW

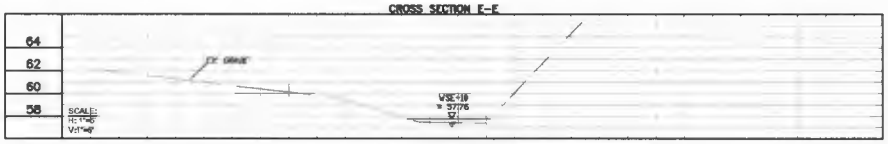
SCALE: 1"=50'



OUTFALL 6

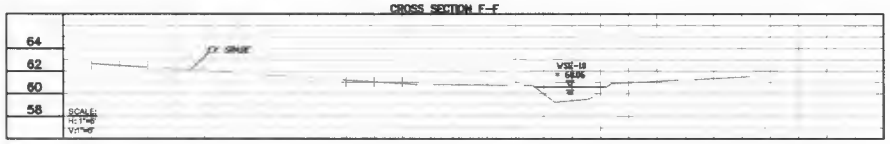
OUTFALL 4

CROSS SECTION E-E

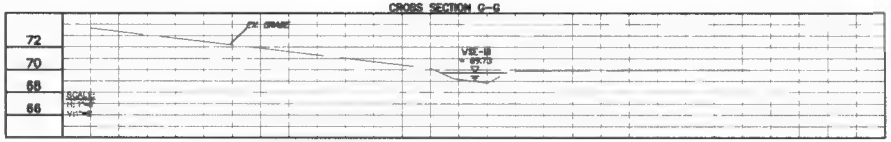


OUTFALL 5

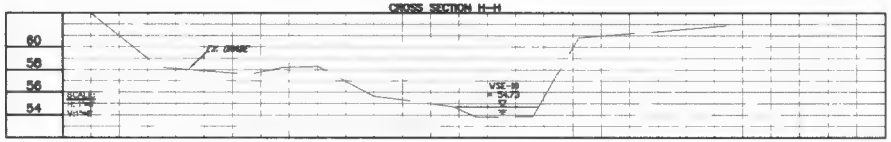
CROSS SECTION F-F



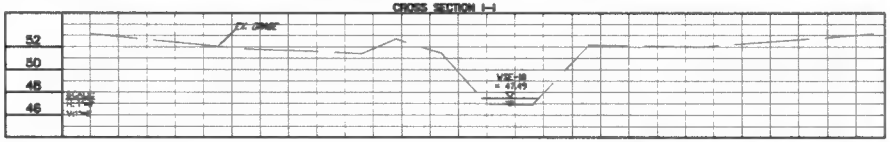
CROSS SECTION G-G



CROSS SECTION H-H



CROSS SECTION I-I



NOTES:

1. SEE SHEET 38 FOR CROSS SECTION LOCATIONS AND OUTFALL NARRATIVE.

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VIRGINIA
DENNIS L. BOOTH
Lic. No. 0402
1-22-2014

SPECIAL EXCEPTION AMENDMENT
OUTFALL CROSS SECTIONS POND 3
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 2-11-2013	REVISED 1-22-2014
REVISED 3-11-2013	
REVISED 5-7-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

PURVIS GRAY ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 200
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN
VERT.

SHEET 33 OF 46

CO. NO. SEA 60-L/V-061-2
CAD NAME: SE51173WM3
LAYOUT: OUT4 5 6
FILE NO. 05117.06-00

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PRE-DEVELOPED EX. CN

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Existing Drainage Area	55	21.290			55.00
COMPOSITE AREA & WEIGHTED CN --->		21.290			55.00 (55)

PRE-DEVELOPED EX. T.C.

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 200.00 ft
2yr, 24hr P 3.2000 in
Slope .100000 ft/ft

Avg.Velocity .17 ft/sec

Segment #1 Time: 19.64 min

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 800.00 ft
Slope .100000 ft/ft
Unpaved

Avg.Velocity 5.10 ft/sec

Segment #2 Time: 2.61 min

Total Tc: 22.25 min

POST-DEVELOPED PROP. CN & T.C.

Lorton LF 2.0 — Lorton Landfill 2.0
Prepared by Geosyntec Consultants, Inc. — Type II 24-hr 2 year Rainfall=3.20"
HydroCAD 10.00 s/n 07057 © 2012 HydroCAD Software Solutions LLC — Printed 9/20/2012 — Page 8

Summary for Subcatchment 47S: Basin 8

Runoff = 43.37 cfs @ 12.11 hrs, Volume= 3.164 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
* 31.330	77	50-75% Grass cover, Fair, HSG C
31.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0800	0.17		Sheet Flow, Sheet Flow 100 feet Grass: Short n= 0.150 P2= 3.20"
5.9	300	0.0800	0.89		Shallow Concentrated Flow, Shallow Flow Short Grass Pasture Kv= 7.0 fps
0.3	300	0.0800	14.38	143.48	Channel Flow, Tack On Bench 300 feet Area= 10.0 sf Perim= 10.8' r= 0.93' n= 0.022 Earth, clean & straight
0.3	707	0.3300	44.81	140.79	Pipe Channel, 24" HDPE 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
1.7	880	0.0100	8.54	78.46	Channel Flow, Top of Berm Channel Area= 12.0 sf Perim= 12.8' r= 0.93' n= 0.022 Earth, clean & straight
0.1	70	0.0100	11.43	143.64	Pipe Channel, RCP_Round 48" 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
18.1	2,177	Total			

2 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Prepared by Geosyntec Consultants, Inc. — Type II 24-hr 2 year Rainfall=3.20"
HydroCAD 10.00 s/n 07057 © 2012 HydroCAD Software Solutions LLC — Printed 9/20/2012 — Page 12

Summary for Pond 48P: Basin 8

Inflow Area = 31.330 ac, 0.00% Impervious, Inflow Depth = 1.21" for 2 year event
Inflow = 43.37 cfs @ 12.11 hrs, Volume= 3.164 af
Outflow = 1.72 cfs @ 15.92 hrs, Volume= 3.127 af, Atten= 96%, Lag= 228.6 min
Primary = 1.72 cfs @ 15.92 hrs, Volume= 3.127 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 76.13' @ 15.92 hrs Surf.Area= 20,987 sf Storage= 81,521 cf
Flood Elev= 84.00' Surf.Area= 35,780 sf Storage= 307,870 cf

Plug-Flow detention time= 805.2 min calculated for 3.127 af (99% of inflow)
Center-of-Mass det. time= 888.4 min (1,456.6 - 660.2)

Volume	Invert	Avail.Storage	Storage Description
#1	71.20'	383,842 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.20	12,372	0	0	12,372
72.00	13,718	10,431	10,431	13,786
74.00	17,135	30,788	41,218	17,328
76.00	20,744	37,822	79,040	21,098
78.00	24,542	45,233	124,273	25,082
80.00	28,529	53,021	177,294	29,276
82.00	33,171	61,642	238,936	34,128
84.00	35,780	68,935	307,870	37,128
86.00	40,032	75,772	383,842	41,658

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	36.0" Round RCP_Round 36" L= 130.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 70.00' / 62.00' S= 0.0615 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	71.20'	5.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	76.18'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Device 1	78.80'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.72 cfs @ 15.92 hrs HW=76.13' (Free Discharge)
1=RCP_Round 36" (Passes 1.72 cfs of 73.26 cfs potential flow)
2=Orifice/Grate (Orifice Controls 1.72 cfs @ 10.44 fps)
3=Orifice/Grate (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

10 YR. POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Prepared by Geosyntec Consultants, Inc. — Type II 24-hr 10 year Rainfall=5.20"
HydroCAD 10.00 s/n 07057 © 2012 HydroCAD Software Solutions LLC — Printed 9/20/2012 — Page 19

Summary for Pond 48P: Basin 8

Inflow Area = 31.330 ac, 0.00% Impervious, Inflow Depth = 2.79" for 10 year event
Inflow = 102.36 cfs @ 12.11 hrs, Volume= 7.287 af
Outflow = 14.28 cfs @ 12.71 hrs, Volume= 7.252 af, Atten= 86%, Lag= 36.4 min
Primary = 14.28 cfs @ 12.71 hrs, Volume= 7.252 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 79.19' @ 12.71 hrs Surf.Area= 26,887 sf Storage= 154,975 cf
Flood Elev= 84.00' Surf.Area= 35,780 sf Storage= 307,870 cf

Plug-Flow detention time= 366.1 min calculated for 7.224 af (99% of inflow)
Center-of-Mass det. time= 361.5 min (1,197.5 - 836.0)

Volume	Invert	Avail.Storage	Storage Description
#1	71.20'	383,842 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.20	12,372	0	0	12,372
72.00	13,718	10,431	10,431	13,786
74.00	17,135	30,788	41,218	17,328
76.00	20,744	37,822	79,040	21,098
78.00	24,542	45,233	124,273	25,082
80.00	28,529	53,021	177,294	29,276
82.00	33,171	61,642	238,936	34,128
84.00	35,780	68,935	307,870	37,128
86.00	40,032	75,772	383,842	41,658

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	36.0" Round RCP_Round 36" L= 130.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 70.00' / 62.00' S= 0.0615 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	71.20'	5.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	76.18'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Device 1	78.80'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=14.28 cfs @ 12.71 hrs HW=79.19' (Free Discharge)
1=RCP_Round 36" (Passes 14.28 cfs of 94.40 cfs potential flow)
2=Orifice/Grate (Orifice Controls 2.21 cfs @ 13.42 fps)
3=Orifice/Grate (Orifice Controls 12.08 cfs @ 7.69 fps)
4=Orifice/Grate (Controls 0.00 cfs)

THIS SHEET IS FOR STORMWATER MANAGEMENT INFORMATION ONLY

100 YR. CLOGGED POST-DEVELOPMENT DESIGN SUMMARY

Lorton LF 2.0 — Lorton Landfill 2.0
Prepared by Geosyntec Consultants, Inc. — Type II 24-hr 100 year Rainfall=7.30"
HydroCAD 10.00 s/n 07057 © 2012 HydroCAD Software Solutions LLC — Printed 9/20/2012 — Page 5

Summary for Pond 50P: Basin 8 100yr

Inflow Area = 31.330 ac, 0.00% Impervious, Inflow Depth = 4.64" for 100 year event
Inflow = 169.14 cfs @ 12.10 hrs, Volume= 12.105 af
Outflow = 111.08 cfs @ 12.24 hrs, Volume= 12.105 af, Atten= 34%, Lag= 8.4 min
Primary = 111.08 cfs @ 12.24 hrs, Volume= 12.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 78.80' Surf.Area= 28,117 sf Storage= 171,629 cf
Peak Elev= 82.16' @ 12.24 hrs Surf.Area= 33,387 sf Storage= 244,010 cf (72,381 cf above start)
Flood Elev= 84.00' Surf.Area= 35,780 sf Storage= 307,870 cf (136,241 cf above start)

Plug-Flow detention time= 179.9 min calculated for 8.165 af (67% of inflow)
Center-of-Mass det. time= 12.7 min (834.3 - 821.5)

Volume	Invert	Avail.Storage	Storage Description
#1	71.20'	383,842 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.20	12,372	0	0	12,372
72.00	13,718	10,431	10,431	13,786
74.00	17,135	30,788	41,218	17,328
76.00	20,744	37,822	79,040	21,098
78.00	24,542	45,233	124,273	25,082
80.00	28,529	53,021	177,294	29,276
82.00	33,171	61,642	238,936	34,128
84.00	35,780	68,935	307,870	37,128
86.00	40,032	75,772	383,842	41,658

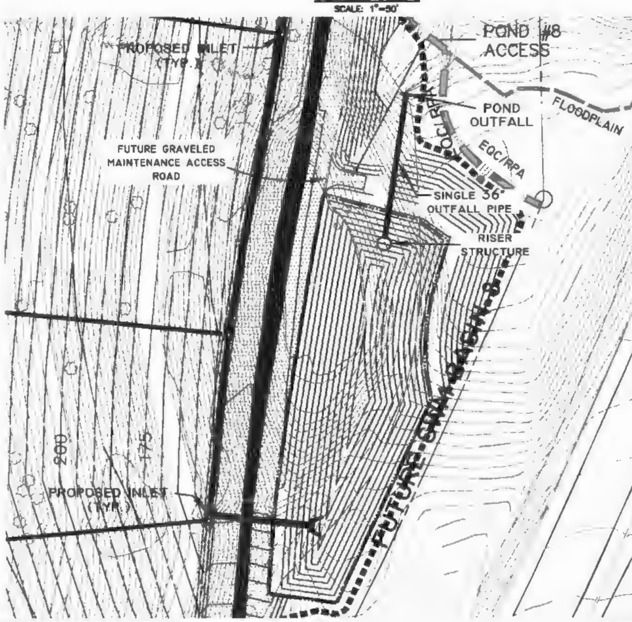
Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	36.0" Round RCP_Round 36" L= 130.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 70.00' / 56.00' S= 0.1077 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	78.80'	72.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=111.04 cfs @ 12.24 hrs HW=82.14' (Free Discharge)
1=RCP_Round 36" (Inlet Controls 111.04 cfs @ 15.71 fps)
2=Orifice/Grate (Passes 111.04 cfs of 288.44 cfs potential flow)

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

PROPOSED POND 8
SCALE: 1"=50'



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12600 Fair Lakes Circle, Suite 100, Fairfax, VA 22033
(703)449-8100 (703)449-8108 (Fax)
www.bccon.com

Seal: Commonwealth of Virginia, Lic. No. 862, 1-22-2014, Landscape Architect

SPECIAL EXCEPTION AMENDMENT
STORMWATER MANAGEMENT POND 8

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 5-14-2013
REVISED 8-11-2013
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-10-2013
REVISED 1-22-2014

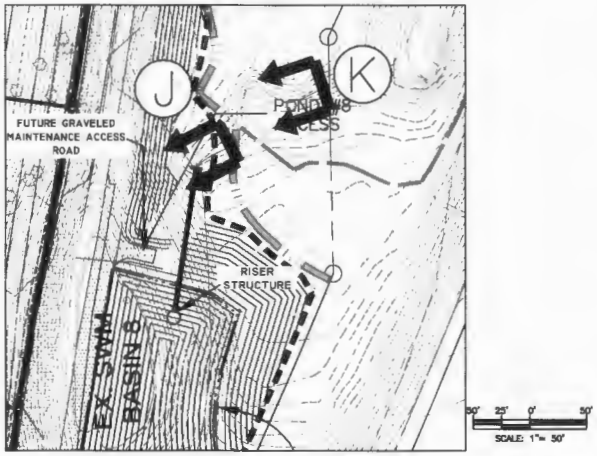
APPLICANT:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 34 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117SWM2
LAYOUT: Pond8
FILE NO. 05117.06-00

V:\projects_2005\05117\Plan\CadBase\SEA OVERLOOK BBPM\SE51172wm3.dwg, OUT8, 1/23/2014 12:12:46 PM

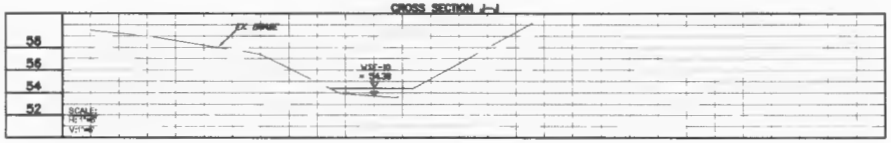
OUTFALL 8 CROSS SECTION PLAN VIEW

SCALE: 1"=50'

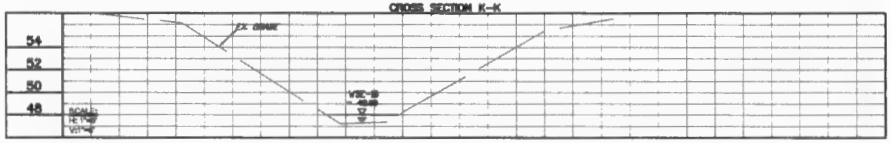


OUTFALL 8

CROSS SECTION J-J



CROSS SECTION K-K



NOTES:

1. SEE SHEET 38 FOR CROSS SECTION LOCATIONS AND OUTFALL NARRATIVE.

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SPECIAL EXCEPTION AMENDMENT
OUTFALL CROSS SECTIONS POND 8

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
REVISED 1-22-2014
REVISED 8-11-2013
REVISED 10-7-2013
REVISED 11-1-2013
REVISED 12-13-2013

PREPARED FOR:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 200
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN
VERT.

SHEET 35 OF 45

CO. NO. SEA 80-L/V-081-2
CAD NAME: SE51172WM3
LAYOUT: OUT8
FILE NO. 05117.06-00

PRE-DEVELOPED EX. CN

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%CC	Adjusted CN
Existing Drainage Area	55	50.860			55.00
COMPOSITE AREA & WEIGHTED CN --->		50.860			55.00 (55)

POST-DEVELOPED PROP. CN

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%CC	Adjusted CN
Prop Drainage Area	77	46.790			77.00
COMPOSITE AREA & WEIGHTED CN --->		46.790			77.00 (77)

PRE-DEVELOPED EX. T.C.

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: T3=55 Sheet

Mannings n .4000
Hydraulic Length 200.00 ft
2yr. 24hr P 3.2000 in
Slope .100000 ft/ft

Avg.Velocity .17 ft/sec

Segment #1 Time: 19.64 min

Segment #2: Tc: T3=55 Shallow

Hydraulic Length 600.00 ft
Slope .100000 ft/ft
Unpaved

Avg.Velocity 5.10 ft/sec

Segment #2 Time: 1.96 min

Total Tc: 21.60 min

POST-DEVELOPED PROP. TC

TIME OF CONCENTRATION CALCULATOR

Segment #1: T3=55 Sheet

Mannings n .1500
Hydraulic Length 100.00 ft
2yr. 24hr P 3.2000 in
Slope .333333 ft/ft

Avg.Velocity .52 ft/sec

Segment #1 Time: 3.18 min

Segment #2: Tc: T3=55 Shallow

Hydraulic Length 810.00 ft
Slope .010000 ft/ft
Unpaved

Avg.Velocity 1.61 ft/sec

Segment #2 Time: 8.37 min

Segment #3: Tc: T3=55 Channel

Flow Area 16.0000 sq.ft
Wetted Perimeter 34.65 ft
Hydraulic Radius 1.09 ft
Slope .333333 ft/ft
Mannings n .0690
Hydraulic Length 280.00 ft

Avg.Velocity 13.22 ft/sec

Segment #3 Time: .35 min

Segment #4: Tc: T3=55 Channel

Flow Area 26.0000 sq.ft
Wetted Perimeter 18.65 ft
Hydraulic Radius 1.29 ft
Slope .012000 ft/ft
Mannings n .0250
Hydraulic Length 1610.00 ft

Avg.Velocity 5.52 ft/sec

Segment #4 Time: 4.85 min

Total Tc: 16.76 min

POND VOLUME

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
176.00	------	0	0	0	0
176.00	------	5630	5630	3753	3753
178.00	------	25970	63560	29046	32799
180.00	------	35573	91775	61183	93982
182.00	------	49213	113599	75733	169715
184.00	------	65550	127086	84723	254438
186.00	------	88880	160243	94495	347933
188.00	------	125650	213729	102486	450419
190.00	------	159520	284921	112023	562442
190.80	------	169240	373560	46816	609258

RISER SCHEDULE

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 174.00 ft
Increment = .50 ft
Max. Elev.= 190.80 ft

OUTLET CONNECTIVITY

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	S1, ft	S2, ft
Orifice-Area	7S	--->	CV	182.000	190.800
Inlet Box	3S	--->	CV	183.900	190.800
Orifice-Circular	1F	--->	CV	174.000	190.800
Culvert-Circular	CV	--->	TW	173.750	190.800

TW SETup, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 7S
Structure Type = Orifice-Area

# of Openings = 1
Invert Elev. 182.00 ft
Area 2.2580 sq.ft
Top of Orifice = 182.50 ft
Datum Elev. 182.00 ft
Orifice Coeff. .600

Structure ID = 3S
Structure Type = Inlet Box

# of Openings 1
Invert Elev. 183.90 ft
Orifice Area = 36.0000 sq.ft
Orifice Coeff. .600
Weir Length = 24.00 ft
Weir Coeff. = 3.000
K, Reverse = 1.000
Mannings n .0000
Kev,Charged Riser = .000
Weir Submergence No

OUTLET STRUCTURE INPUT DATA

Structure ID = 1F
Structure Type = Orifice-Circular

# of Openings 1
Invert Elev. 174.00 ft
Diameter = 3.50 in
Orifice Coeff. .600

OUTLET STRUCTURE INPUT DATA

Structure ID = CV
Structure Type = Culvert-Circular

No. Barrels = 1
Barrel Diameter = 48.00 in
Upstream Invert = 173.75 ft
Dnstream Invert 172.00 ft
Horiz. Length = 115.00 ft
Barrel Length 115.01 ft
Barrel Slope .01522 ft/ft

OUTLET CONTROL DATA..
Mannings n = .0130
Ke = .5000 (forward entrance loss)
Kb = .004925 (per ft of full flow)
Kr = 1.0000 (reverse entrance loss)
HW Convergence = .001 ft

INLET CONTROL DATA...
Equation form = 1
Inlet Control K = .0098
Inlet Control M = 2.0000
Inlet Control c = .03980
Inlet Control Y = .6700
T3 ratio (HW/D) = 1.353
T2 ratio (HW/D) = 1.299
Slope Factor = -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 178.36 ft ---> Flow = 87.96 cfs
At T2 Elev = 178.95 ft ---> Flow = 100.53 cfs

OUTLET STRUCTURE INPUT DATA

Structure ID = TW
Structure Type = TW SETup, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

1 YR. - 2 YR. - 10 YR. POST-DEVELOPMENT DESIGN SUMMARY

1 YR. ROUTING SUMMARY

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 174.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 2.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow = 45.13 cfs at 724.00 min
Peak Outflow = .81 cfs at 1358.00 min

Peak Elevation = 180.50 ft
Peak Storage = 111852 cu.ft

2 YR. ROUTING SUMMARY

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 174.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 2.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow = 64.52 cfs at 724.00 min
Peak Outflow = .85 cfs at 1374.00 min

Peak Elevation = 181.90 ft
Peak Storage = 165849 cu.ft

10 YR. ROUTING SUMMARY

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 174.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 2.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow = 151.50 cfs at 724.00 min
Peak Outflow = 15.78 cfs at 770.00 min

Peak Elevation = 183.88 ft
Peak Storage = 249323 cu.ft

100 YR. CLOGGED POST-DEVELOPMENT DESIGN SUMMARY

CLOGGED 100 YR. ROUTING SUMMARY

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 183.90 ft
Starting Volume = 249994 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 2.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow = 268.45 cfs at 724.00 min
Peak Outflow = 198.96 cfs at 736.00 min

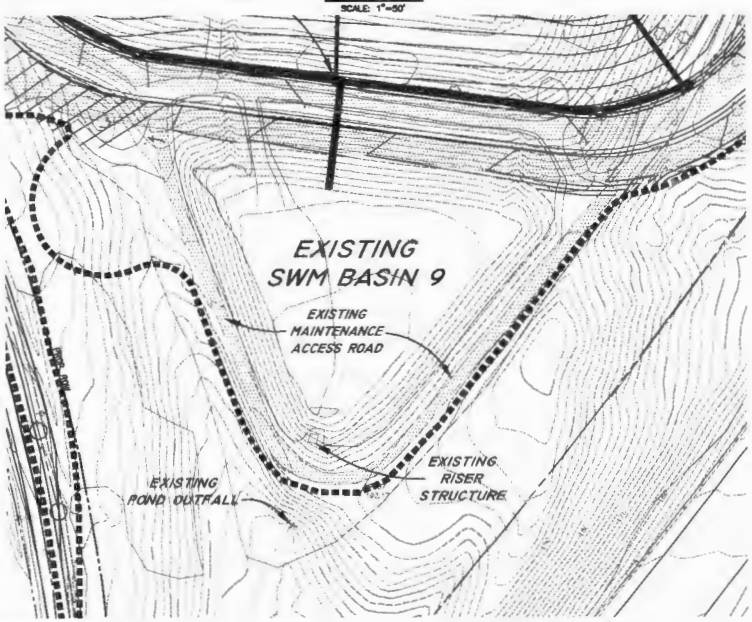
Peak Elevation = 186.38 ft
Peak Storage = 366590 cu.ft

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

THIS SHEET IS FOR STORMWATER MANAGEMENT INFORMATION ONLY

EXISTING POND 9
SCALE: 1"=50'



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COMMONWEALTH OF VIRGINIA
Lic. No. 0402
1-29-2014

SPECIAL EXCEPTION AMENDMENT
STORMWATER MANAGEMENT POND 9
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

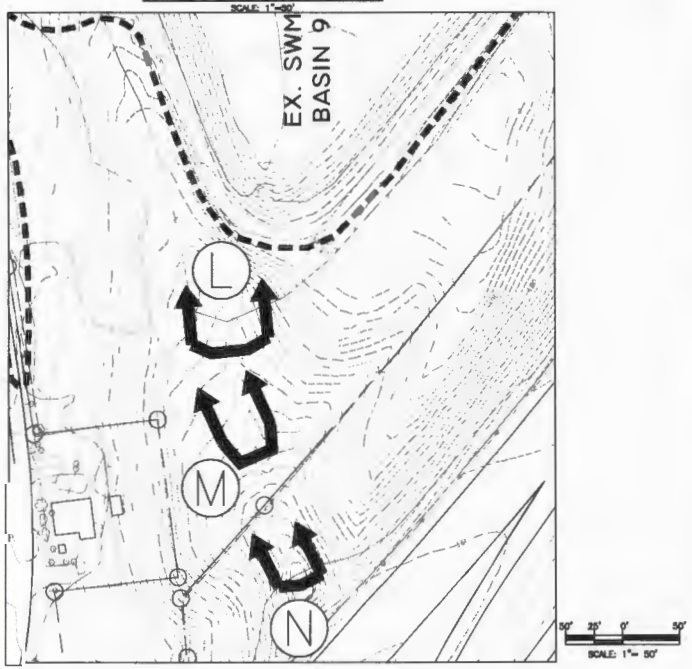
DC REVISIONS	REVISED 1-28-2014
REVISED 8-15-2013	
REVISED 8-11-2013	
REVISED 8-5-2013	
REVISED 7-29-2013	
REVISED 12-10-2013	
REVISED 12-16-2013	

BC CONSULTANTS ASSOCIATES, INC.
11220 ASHETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 36 OF 46
CO. NO. SEA 80-L/V-091-2
CAD NAME: SE011759M2
LAYOUT: Pond9
FILE NO. 05117.08-00

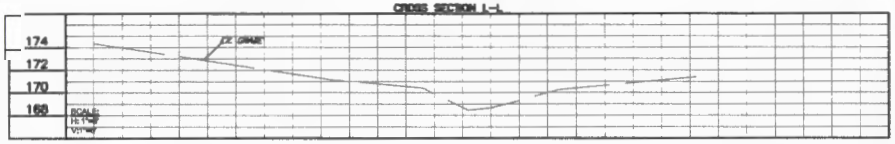
OUTFALL 9 CROSS SECTION PLAN VIEW

SCALE: 1"=50'

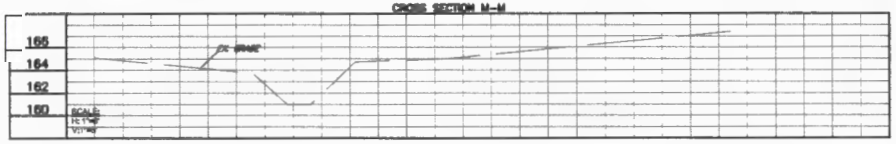


OUTFALL 9

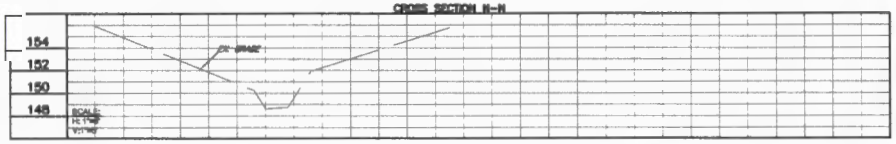
CROSS SECTION L-L



CROSS SECTION M-M



CROSS SECTION N-N



NOTES:

1. SEE SHEET 36 FOR CROSS SECTION LOCATIONS AND OUTFALL NARRATIVE.

NOTE:

ALL STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICES CALCULATIONS ARE APPLICABLE THROUGH PHASE 6.

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SPECIAL EXCEPTION AMENDMENT
OUTFALL CROSS SECTIONS POND 9

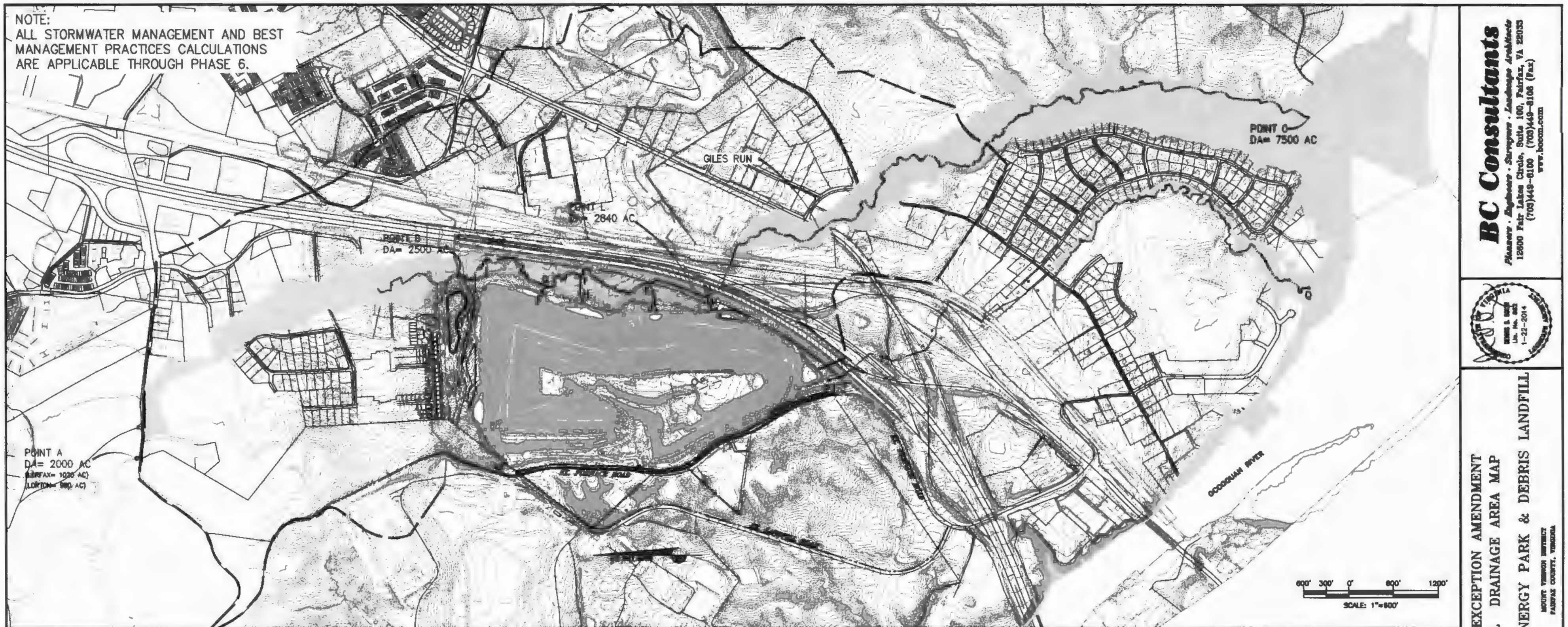
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
REVISED 8-14-2013	REVISED 1-28-2014
REVISED 8-17-2013	
REVISED 9-5-2013	
REVISED 11-1-2013	
REVISED 12-12-2013	

PARKER RUST ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. AS SHOWN VERT.
SHEET 37 OF 45
CO. NO. SEA 80-L/V-081-2
CAD NAME: SE511759M3
LAYOUT: OUT 9
FILE NO. 05117.08-00



OUTFALL AND EXTENT OF REVIEW NARRATIVE

GENERAL

THIS 250.15-ACRE SITE IS IN THE MILL BRANCH WATERSHED. NORTHERNMOST PORTIONS AND APPROXIMATELY HALF OF THE WESTERN PORTION OF THE SITE DRAIN TO AN UNNAMED TRIBUTARY OF GILES RUN. THE EASTERN PORTION OF THE SITE DRAINS DIRECTLY INTO A BOARD-ADOPTED FLOODPLAIN SURROUNDING GILES RUN. ONCE THE RUNOFF ENTERS GILES RUN, IT PASSES UNDER I-95 NEAR EXISTING SWM BASIN 8 AND IS CARRIED INTO MASSEY CREEK AND THE OCCOQUAN RIVER. THE SOUTHERN AND REMAINING WESTERN PORTIONS OF THE SITE DRAIN INTO AN UNNAMED TRIBUTARY OF THE OCCOQUAN RIVER AT POINT P. EXISTING SWM BASIN 9 IS THE ONLY POINT OF CONCENTRATED DISCHARGE THAT DRAINS INTO THIS TRIBUTARY FROM THE SITE.

PRESENTLY, THERE ARE SEVEN EXISTING STORMWATER MANAGEMENT DRY PONDS ONSITE, WITH PRE-DEVELOPMENT CONDITIONS APPROXIMATELY 190 ACRES OF RUNOFF IS COLLECTED FROM THE SITE AND IS CONVEYED TO THE SEVEN PONDS IN A SERIES OF DOWN DRAINS AND RIP-RAP CHANNELS. EXISTING PONDS 4, 6, AND 8 HAVE BEEN PREVIOUSLY DESIGNED TO HAVE PROPORTIONAL IMPROVEMENTS FOR THE 2- AND 10-YEAR STORMS. EXISTING PONDS 2, 3, 5, AND 9 HAVE BEEN PREVIOUSLY DESIGNED TO DETAIN THE 1-YEAR STORM AND HAVE PROPORTIONAL IMPROVEMENTS FOR THE 2- AND 10-YEAR STORMS.

THE PROPOSED LANDFILL EXPANSION WILL CONSOLIDATE THE SEVEN EXISTING PONDS TO FOUR BASINS. PROPOSED BASIN 2 WILL REPLACE EXISTING POND #2, PROPOSED BASIN 3 WILL REPLACE EXISTING POND #3 AND PROPOSED BASIN 8 WILL REPLACE EXISTING POND #8. EXISTING POND #9 WILL NOT BE DISTURBED AND WILL FUNCTION AS ORIGINALLY DESIGNED. SOME INTERNAL DRAINAGE DIVIDES HAVE BEEN ALTERED FROM THE EXISTING CONDITIONS SO THAT RUNOFF IS DIVERTED INTO LARGER PONDS TO MINIMIZE THE RECONSTRUCTION OF SMALLER PONDS SHOULD NATURAL DIVIDES BE MAINTAINED. ENVIRONMENTAL IMPACTS ARE MINIMIZED WITH THIS DIVERSION. PROPOSED BASIN 2 WILL COLLECT RUNOFF FROM MOST OF THE DRAINAGE AREA SERVING EXISTING POND #2. PROPOSED BASIN 3 WILL COLLECT THE REMAINING RUNOFF FROM THE DRAINAGE AREA SERVING EXISTING POND #2, THE RUNOFF FROM DRAINAGE AREA SERVING EXISTING POND #3 AND ALSO RUNOFF FROM THE DRAINAGE AREAS COLLECTED BY THE THREE EXISTING PONDS TO BE REMOVED ON THE WESTERN PORTION OF THE SITE (EXISTING PONDS #4, #5 AND #6). THE DRAINAGE AREA SERVING EXISTING POND #9 WILL NOT CHANGE. THE OVERALL DRAINAGE DIVIDE FOR THE SITE HAS BEEN MAINTAINED FROM EXISTING CONDITIONS, THUS MEETING REQUIREMENTS OUTLINED IN PFM SECTION 6-0202.2A.

AT POINT A, THE DRAINAGE AREA OF GILES RUN IS APPROXIMATELY 2000 ACRES AS REPORTED IN *THE OCCOQUAN WATERSHEDS, PG II-82*. THIS AREA IS COMPOSED OF 1020 ACRES IN THE LORFAX SEGMENT OF THE MILL BRANCH WATERSHED AND 980 ACRES IN THE LORTON SEGMENT. THE DRAINAGE AREA OF GILES RUN PRIOR TO ENTERING THE SITE (POINT B) IS APPROXIMATELY 2500 ACRES.

GENERAL (CONTINUED)

WE REVIEWED THE APPROVED OVERLOOK RIDGE SITE PLAN (COUNTY NUMBER 1883-SP-002-3) FOR THE DESIGN OF EACH OF THE SEVEN EXISTING PONDS AND ANALYSIS FOR EACH RESPECTIVE OUTFALL. THE EXISTING OUTFALLS TO EACH OF THE EXISTING SEVEN PONDS WILL REMAIN IN POST-DEVELOPMENT CONDITIONS AND ARE DESCRIBED IN THE FOLLOWING PARAGRAPHS.

OUTFALL C (BASIN 2)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT C OF 38.10 ACRES. THE GOOD FORESTED CONDITION 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 3.63 CFS AND 31.58 CFS, RESPECTIVELY. EXISTING POND 2 WAS PREVIOUSLY DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS, AS SHOWN ON THE APPROVED SITE PLAN NOTED. EXISTING POND 2 WAS DESIGNED TO DETAIN 52.80 ACRES AND RELEASE 2- AND 10-YEAR FLOWS AT 0.53 CFS AND 8.57 CFS, RESPECTIVELY.

PROPOSED BASIN 2 IS DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS THAT MEET OR EXCEED PROPORTIONAL IMPROVEMENTS FROM THE PREVIOUSLY DESIGNED EXISTING POND 2. THE PROPOSED DRAINAGE AREA FOR BASIN 2 IS 34.00 ACRES. THIS BASIN WILL OUTFALL AT POINT C AND EXTENT OF REVIEW WILL BEGIN HERE. THE DISCHARGE FROM THE POND ENTERS AN EXISTING CHANNEL WHICH CONVEYS THE WATER TO GILES RUN. THE CROSS-SECTIONS ILLUSTRATED ON SHEET 31 SHOW THIS EXISTING CHANNEL. THE DRAINAGE AREA AT POINT B IS APPROXIMATELY 2500 ACRES. SINCE THIS DRAINAGE AREA IS GREATER THAN 360 ACRES, EXTENT OF REVIEW CAN END 150' DOWNSTREAM OF THE CHANNEL'S INTERSECTION WITH GILES RUN (PFM SECTION 6-0203.2C). THE 1-YEAR STORM IS DETAINED AND PROPORTIONAL IMPROVEMENTS ON THE 2- AND 10-YEAR STORMS ARE PROVIDED. ADDITIONALLY, AN INCISED CHANNEL EXISTS FROM THE POINT OF OUTFALL TO THE END OF THE EXTENT OF REVIEW. THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION 6-0203.4C. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT B, PER Z.O. 9-011.2J(2)(C)

OUTFALL D (BASIN 3)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT D OF 15.62 ACRES. THE GOOD FORESTED CONDITION 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 1.58 CFS AND 14.30 CFS, RESPECTIVELY.

OUTFALL D (BASIN 3) - CONTINUED

EXISTING POND 3 WAS PREVIOUSLY DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS, AS SHOWN ON THE APPROVED SITE PLAN NOTED. EXISTING POND 3 WAS DESIGNED TO DETAIN 10.53 ACRES AND RELEASE 2- AND 10-YEAR FLOWS AT 0.53 CFS AND 8.57 CFS, RESPECTIVELY.

PROPOSED BASIN 3 IS DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS THAT MEET OR EXCEED PROPORTIONAL IMPROVEMENTS FROM THE PREVIOUSLY DESIGNED EXISTING POND 3. THE PROPOSED DRAINAGE AREA FOR BASIN 3 IS 79.50 ACRES. AT POINT D THE PROPOSED POND OUTFALLS INTO AN EXISTING UNNAMED TRIBUTARY TO GILES RUN AND EXTENT OF REVIEW WILL BEGIN. THE DISCHARGE FROM THE POND ENTERS AN EXISTING CHANNEL WHICH CONVEYS THE WATER TO GILES RUN. THE CROSS-SECTIONS ILLUSTRATED ON SHEET 31 SHOW THIS EXISTING CHANNEL. THE DRAINAGE AREA AT POINT B IS APPROXIMATELY 2500 ACRES. SINCE THIS DRAINAGE AREA IS GREATER THAN 360 ACRES, EXTENT OF REVIEW CAN END 150' DOWNSTREAM OF THE CHANNEL'S INTERSECTION WITH GILES RUN (PFM SECTION 6-0203.2C). THE 1-YEAR STORM IS DETAINED AND PROPORTIONAL IMPROVEMENTS ON THE 2- AND 10-YEAR STORMS ARE PROVIDED. ADDITIONALLY, AN INCISED CHANNEL EXISTS FROM THE POINT OF OUTFALL TO THE END OF THE EXTENT OF REVIEW. THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION 6-0203.4C. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT B, PER Z.O. 9-011.2J(2)(C)

OUTFALL F (BASIN 3)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT F OF 18.78 ACRES. THE PRE-DEVELOPMENT 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 1.71 CFS AND 15.32 CFS RESPECTIVELY. EXISTING POND 4 WAS PREVIOUSLY DESIGNED TO DETAIN 9.25 ACRES AND RELEASE 2- AND 10-YEAR FLOWS AT 1.64 CFS AND 11.17 CFS, RESPECTIVELY.

EXISTING POND 4 WILL BE REMOVED. INTERNAL DRAINAGE DIVIDES HAVE BEEN ALTERED FROM THE EXISTING CONDITIONS SO THAT RUNOFF FROM THIS CATCHMENT IS DIVERTED INTO PROPOSED BASIN 3 TO MINIMIZE THE RECONSTRUCTION OF SMALLER PONDS SHOULD NATURAL DIVIDES BE MAINTAINED. ENVIRONMENTAL IMPACTS ARE MINIMIZED WITH THIS DIVERSION. PROPOSED BASIN 3 WILL COLLECT RUNOFF FROM MOST OF THE DRAINAGE AREA SERVING EXISTING POND 4. THE PROPOSED DRAINAGE AREA FOR BASIN 3 IS 79.50 ACRES. THE PROPOSED BASIN WILL PROVIDE AN OUTFALL AT POINT F AND EXTENT OF REVIEW WILL BEGIN.

OUTFALL F (BASIN 3) - CONTINUED

FROM THIS POINT THE RUNOFF DRAINS TO AN UNNAMED TRIBUTARY OF GILES RUN, WHICH ENTERS GILES RUN AT POINT G. THE CROSS-SECTIONS ILLUSTRATED ON SHEET 31 SHOW THIS EXISTING UNNAMED TRIBUTARY TO GILES RUN. AT POINT G, THE TOTAL DRAINAGE AREA IS OVER 2500 ACRES WHICH IS LARGER THAN 100 TIMES THE SITE AREA DRAINING TO THIS POINT. THUS, EXTENT OF REVIEW CAN END AT THIS LOCATION PER PFM SECTION 6-0203.2B. BY DEFINITION, AN OUTFALL IS ADEQUATE IF THE CONTRIBUTING DRAINAGE AREA FROM THE SITE IS 1% OF THE OVERALL DRAINAGE AREA. THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION PER PFM SECTION 6-0203.3A. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT G, PER Z.O. 9-011.2J(2)(C)

OUTFALL H (BASIN 3)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT H OF 22.11 ACRES. THE GOOD FORESTED CONDITION 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 2.03 CFS AND 18.13 CFS, RESPECTIVELY. EXISTING POND 6 WAS PREVIOUSLY DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS, AS SHOWN ON THE APPROVED SITE PLAN NOTED. EXISTING POND 5 WAS DESIGNED TO DETAIN 32.22 ACRES.

EXISTING POND 5 WILL BE REMOVED. INTERNAL DRAINAGE DIVIDES HAVE BEEN ALTERED FROM THE EXISTING CONDITIONS SO THAT RUNOFF FROM THIS CATCHMENT IS DIVERTED INTO PROPOSED BASIN 3 TO MINIMIZE THE RECONSTRUCTION OF SMALLER PONDS SHOULD NATURAL DIVIDES BE MAINTAINED. ENVIRONMENTAL IMPACTS ARE MINIMIZED WITH THIS DIVERSION. PROPOSED BASIN 3 WILL COLLECT RUNOFF FROM MOST OF THE DRAINAGE AREA SERVING EXISTING POND 5. THE PROPOSED DRAINAGE AREA FOR BASIN 3 IS 79.50 ACRES. THIS POND WILL PROVIDE AN OUTFALL AT POINT H AND EXTENT OF REVIEW WILL BEGIN HERE. THE FLOW THEN ENTERS A CHANNEL AND IS CONVEYED TO POINT L. CROSS-SECTIONS SHOWN ON SHEET 31 SHOW THIS CHANNEL. THE DRAINAGE AREA AT POINT I IS GREATER THAN 360 ACRES. THUS, PER PFM SECTION 6-0203.2C EXTENT OF REVIEW CAN END 150' DOWNSTREAM OF POINT L. SINCE THE 1-YEAR STORM IS DETAINED AND PROPORTIONAL IMPROVEMENTS ON THE 2- AND 10-YEAR STORMS ARE PROVIDED, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION 6-0203.4C. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT B, PER Z.O. 9-011.2J(2)(C)

OUTFALL J (BASIN 3)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT J OF 18.58 ACRES. THE PRE-DEVELOPMENT 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 1.85 CFS AND 16.57 CFS RESPECTIVELY. EXISTING POND 6 WAS PREVIOUSLY DESIGNED TO DETAIN 11.86 ACRES AND RELEASE 2- AND 10-YEAR FLOWS AT 1.06 CFS AND 14.86 CFS, RESPECTIVELY.

EXISTING POND 6 WILL BE REMOVED. INTERNAL DRAINAGE DIVIDES HAVE BEEN ALTERED FROM THE EXISTING CONDITIONS SO THAT RUNOFF FROM THIS CATCHMENT IS DIVERTED INTO PROPOSED BASIN 3 TO MINIMIZE THE RECONSTRUCTION OF SMALLER PONDS SHOULD NATURAL DIVIDES BE MAINTAINED. ENVIRONMENTAL IMPACTS ARE MINIMIZED WITH THIS DIVERSION. PROPOSED BASIN 3 WILL COLLECT RUNOFF FROM MOST OF THE DRAINAGE AREA SERVING EXISTING POND 6. THE PROPOSED DRAINAGE AREA FOR BASIN 3 IS 79.50 ACRES. THE PROPOSED BASIN WILL PROVIDE AN OUTFALL AT POINT J AND EXTENT OF REVIEW WILL BEGIN. FROM THIS POINT THE RUNOFF DRAINS TO AN UNNAMED TRIBUTARY OF GILES RUN, WHICH ENTERS GILES RUN AT POINT G. THE CROSS-SECTIONS ILLUSTRATED ON SHEET 33 SHOW THIS EXISTING UNNAMED TRIBUTARY TO GILES RUN. AT POINT K, THE TOTAL DRAINAGE AREA IS OVER 2500 ACRES WHICH IS LARGER THAN 100 TIMES THE SITE AREA DRAINING TO THIS POINT. THUS, EXTENT OF REVIEW CAN END AT THIS LOCATION PER PFM SECTION 6-0203.2B. BY DEFINITION, AN OUTFALL IS ADEQUATE IF THE CONTRIBUTING DRAINAGE AREA FROM THE SITE IS 1% OF THE OVERALL DRAINAGE AREA. THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION PER PFM SECTION 6-0203.3A. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT K, PER Z.O. 9-011.2J(2)(C)

OUTFALL M (BASIN 8)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT M OF 21.29 ACRES. THE GOOD FORESTED CONDITION 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 2.13 CFS AND 19.10 CFS, RESPECTIVELY. EXISTING POND 8 WAS PREVIOUSLY DESIGNED TO PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS, AS SHOWN ON THE APPROVED SITE PLAN NOTED. EXISTING POND 8 WAS DESIGNED TO DETAIN 20.83 ACRES AND RELEASE 2- AND 10-YEAR FLOWS AT 1.96 CFS AND 17.29 CFS, RESPECTIVELY.

PROPOSED BASIN 8 IS DESIGNED TO PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS THAT MEET OR EXCEED PROPORTIONAL IMPROVEMENTS FROM THE PREVIOUSLY DESIGNED EXISTING POND 8. THE PROPOSED DRAINAGE AREA FOR BASIN 2 INCREASED TO 31.33 ACRES. THE PROPOSED BASIN WILL RELEASE 2- AND 10-YEAR FLOWS AT 1.72 CFS AND 14.27 CFS,

OUTFALL M (BASIN 8) - CONTINUED

RESPECTIVELY. THIS BASIN WILL OUTFALL AT POINT M AND EXTENT OF REVIEW WILL BEGIN HERE. THE DISCHARGE FROM THE POND ENTERS AN EXISTING CHANNEL WHICH CONVEYS THE WATER TO GILES RUN. THE CROSS-SECTIONS ILLUSTRATED ON SHEET 33 SHOW THIS EXISTING CHANNEL. THE DRAINAGE AREA AT POINT N IS APPROXIMATELY 2500 ACRES. SINCE THIS DRAINAGE AREA IS GREATER THAN 360 ACRES, EXTENT OF REVIEW CAN END 150' DOWNSTREAM OF THE CHANNEL'S INTERSECTION WITH GILES RUN (PFM SECTION 6-0203.2C). THE PROPORTIONAL IMPROVEMENTS ON THE 2- AND 10-YEAR STORMS ARE PROVIDED. ADDITIONALLY, AN INCISED CHANNEL EXISTS FROM THE POINT OF OUTFALL TO THE END OF THE EXTENT OF REVIEW. THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION 6-0203.4C. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT N, PER Z.O. 9-011.2J(2)(C)

OUTFALL P (POND 9)

AN ANALYSIS OF THE EXISTING DRAINAGE CONDITIONS AT THE BEGINNING OF THE LANDFILL OPERATIONS REPORTS A DRAINAGE AREA TO POINT P IS 50.86 ACRES. THE GOOD FORESTED CONDITION 2- AND 10-YEAR FLOWS FROM THE SITE TO THIS CATCHMENT ARE 5.15 CFS AND 46.79 CFS RESPECTIVELY. EXISTING POND 9 WAS DESIGNED TO DETAIN THE 1-YEAR STORM AND PROVIDE PROPORTIONAL IMPROVEMENTS TO THE 2- AND 10-YEAR STORMS. THE DRAINAGE AREA FOR EXISTING POND 9 IS 51.97 ACRES. EXISTING POND 9 WILL NOT BE DISTURBED AND WILL OPERATE AS ORIGINALLY DESIGNED. EXISTING POND 9 OUTFALLS AT POINT P AND EXTENT OF REVIEW WILL BEGIN HERE. THE FLOW THEN ENTERS A CHANNEL AND IS CONVEYED TO POINT Q THROUGH AN UNNAMED TRIBUTARY OF THE OCCOQUAN RIVER. CROSS-SECTIONS SHOWN ON SHEET 33 SHOW THIS CHANNEL. THE DRAINAGE AREA AT POINT Q IS GREATER THAN 360 ACRES. THUS, PER PFM SECTION 6-0203.2C EXTENT OF REVIEW CAN END 150' DOWNSTREAM OF POINT Q. SINCE THE 1-YEAR STORM IS DETAINED AND PROPORTIONAL IMPROVEMENTS ON THE 2- AND 10-YEAR STORMS ARE PROVIDED, THUS, IT IS THE OPINION OF THE ENGINEER THAT THE OUTFALL IS ADEQUATE PER PFM SECTION 6-0203.4C. FURTHERMORE, THE OUTFALL EXTENDED DOWNSTREAM OF THE SITE REACHES A POINT WHICH THE DRAINAGE AREA IS GREATER THAN ONE SQUARE MILE, THEREFORE A DESCRIPTION OF THE EXISTING CONDITIONS ENDS AT POINT Q, PER Z.O. 9-011.2J(2)(C)

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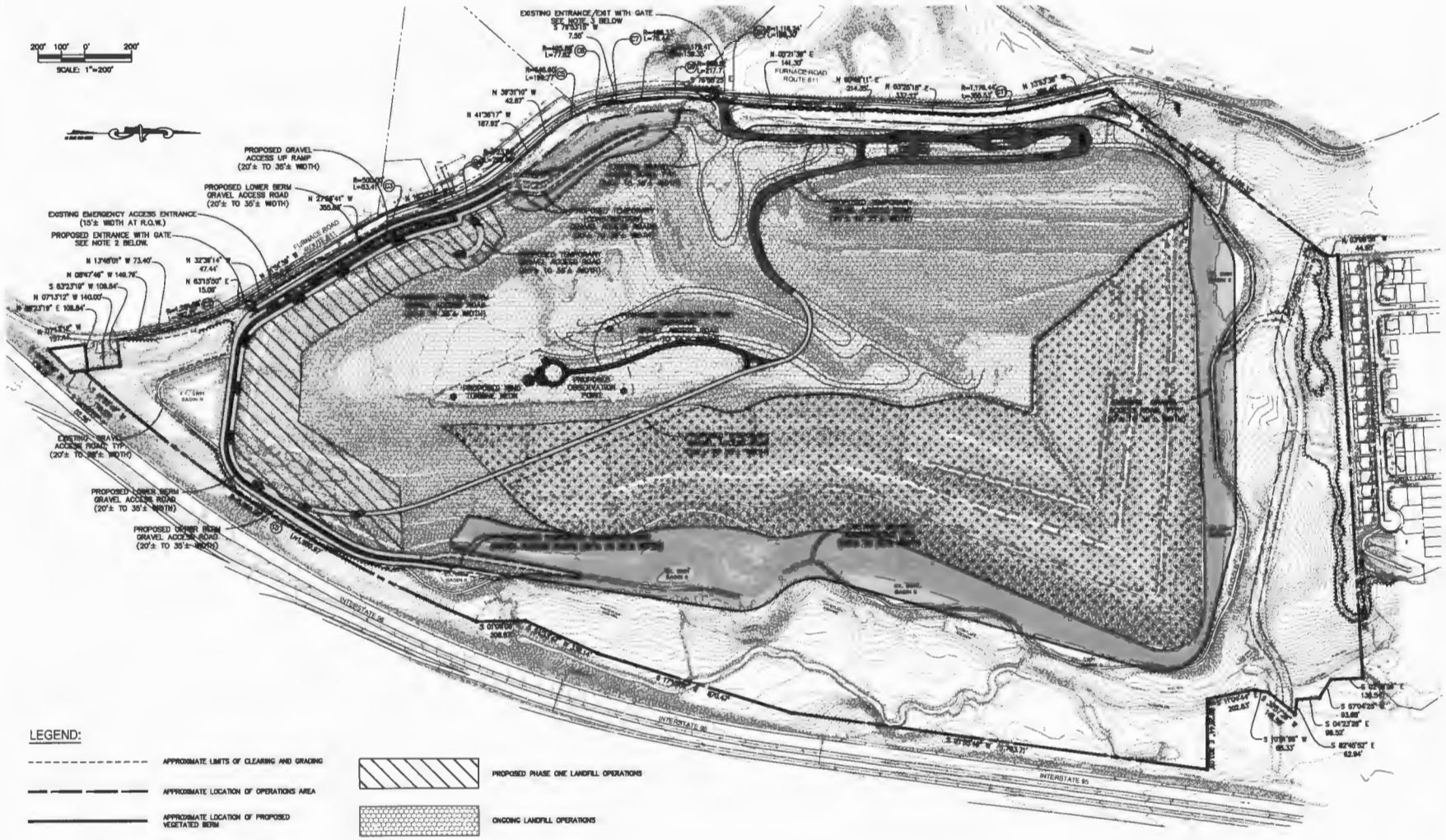
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

SPECIAL EXCEPTION AMENDMENT
OVERALL DRAINAGE AREA MAP

BC REVISIONS	
REVISED 5-14-2013	REVISED 1-22-2014
REVISED 9-11-2013	
REVISED 10-7-2013	
REVISED 11-1-2013	
REVISED 12-10-2013	

APPLICANT:
FURNACE ASSOCIATES, INC.
11220 ASSETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY:	PLR
DRAFTED BY:	CAD
CHECKED BY:	NB
DATE:	MARCH 22, 2013
SCALE:	HOR. 1"=600' VERT.
SHEET	38 OF 45
CO. NO.	SEA 80-L/V-061-2
CAD NAME:	SE5117OUT
LAYOUT:	OUT&EXT
FILE NO.	05117.06-00



LEGEND:

- APPROXIMATE LIMITS OF CLEARING AND GRADING
- APPROXIMATE LOCATION OF OPERATIONS AREA
- APPROXIMATE LOCATION OF PROPOSED VEGETATED BERM
- LANDFILL OPERATIONS TRAFFIC CIRCULATION (ONE WAY)
- GRAVEL ACCESS RAMP (ONE WAY – 10% MAXIMUM SLOPE)
- PROPOSED PHASE ONE LANDFILL OPERATIONS
- ONGOING LANDFILL OPERATIONS
- EXISTING VEGETATION/UNDISTURBED VEGETATION

NOTE:

1. THE APPROXIMATE LOCATIONS OF INTERNAL LANDFILL OPERATIONS ROADS AND LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE ROADS, LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. WITHIN THE LIMITS OF THE VEGETATED BERM/OPERATIONS AREA AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE OPERATIONS AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTE 16 ON SHEET 3).
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE LANDFILL OPERATIONS TRUCKS ARE LIMITED TO RIGHT TURN IN ONLY AND LEFT TURN OUT ONLY.

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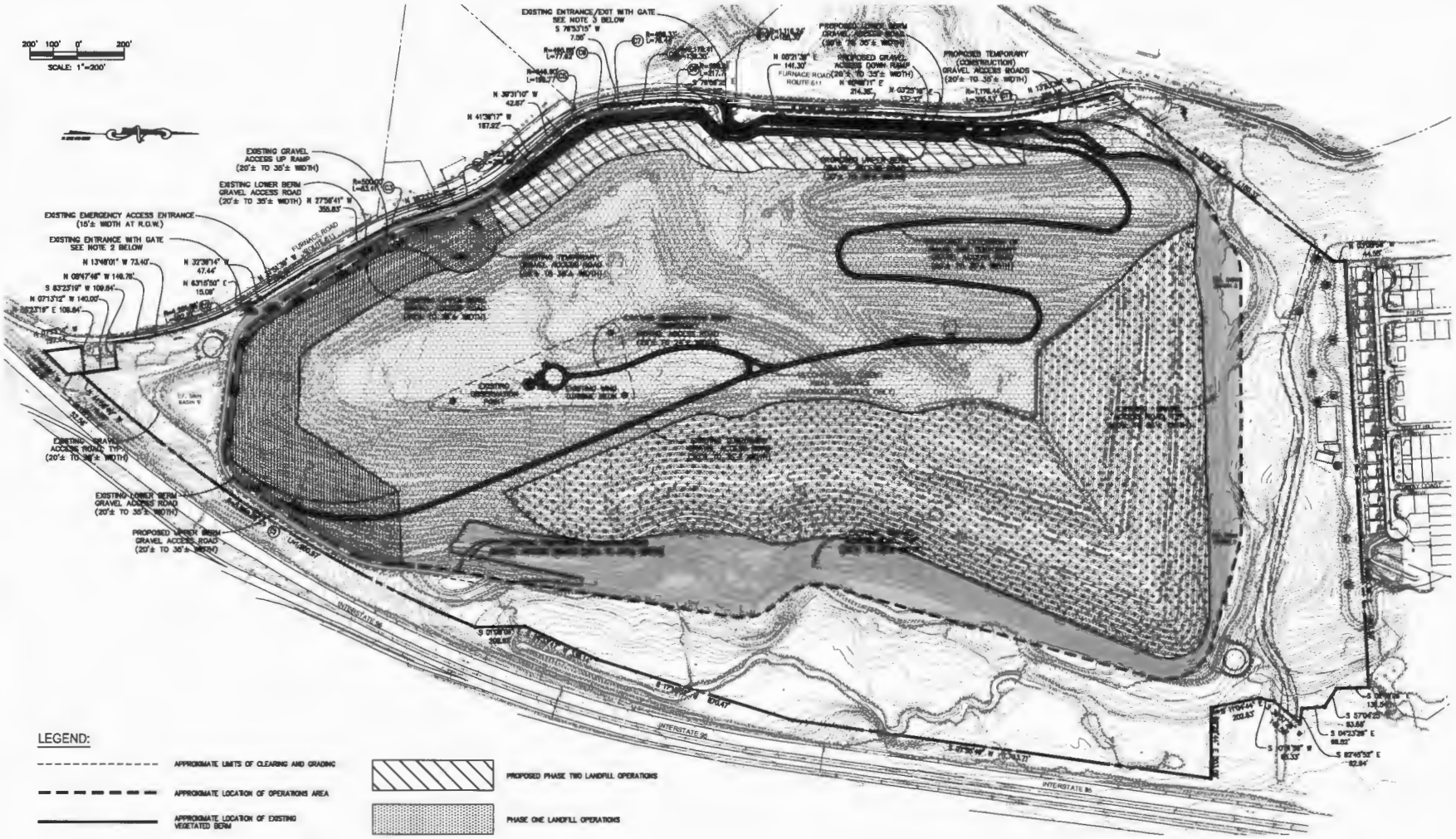
SPECIAL EXCEPTION AMENDMENT
PHASE ONE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED	5-17-2013
REVISED	5-7-2013
REVISED	5-17-2013
REVISED	1-22-2014
REVISED	1-22-2014

PROFESSIONAL ASSOCIATES, INC.
11220 ASHETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.
SHEET 39 OF 45
CO. NO. SEA 80-L/V-061-2
CAD NAME: SE5117CIR-PH1
LAYOUT: PH1
FILE NO. 05117.08-00



NOTE:

1. THE APPROXIMATE LOCATIONS OF INTERNAL LANDFILL OPERATIONS ROADS AND LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE ROADS, LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. WITHIN THE LIMITS OF THE VEGETATED BERM/OPERATIONS AREA AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE OPERATIONS AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTE 16 ON SHEET 3).
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE LANDFILL OPERATIONS TRUCKS ARE LIMITED TO LEFT TURN OUT ONLY (NO ENTRY).

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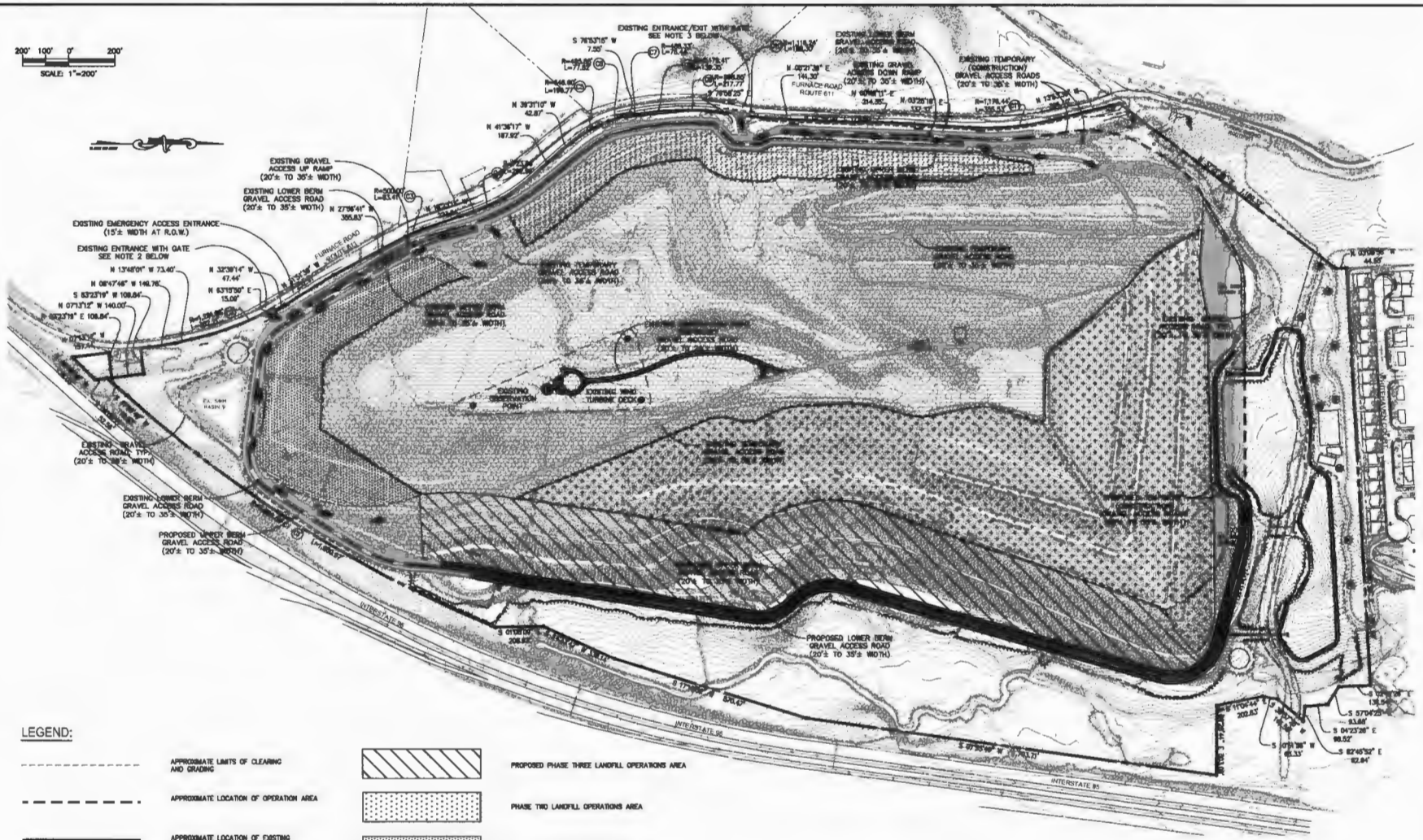
COMMONWEALTH OF VIRGINIA
BRIAN D. BOOZE
Lic. No. 0402
1-22-2014

SPECIAL EXCEPTION AMENDMENT
PHASE TWO LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED	8-11-2013
REVISED	11-1-2013
REVISED	11-8-2013
REVISED	12-10-2013
REVISED	1-22-2014
FURNACE ASSOCIATES, INC. 11220 ASSETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: HB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 40 OF 45	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117CIR-PH2	
LAYOUT: PH2	
FILE NO. 05117.06-00	



NOTE:

1. THE APPROXIMATE LOCATIONS OF INTERNAL LANDFILL OPERATIONS ROADS AND LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE ROADS, LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. WITHIN THE LIMITS OF THE VEGETATED BERM/OPERATIONS AREA AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE OPERATIONS AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTE 10 ON SHEET 3).
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE LANDFILL OPERATIONS TRUCKS ARE LIMITED TO LEFT TURN OUT ONLY (NO ENTRY).

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SPECIAL EXCEPTION AMENDMENT
PHASE THREE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED 9-11-2013	
REVISED 11-1-2013	
REVISED 11-8-2013	
REVISED 11-10-2013	
REVISED 1-22-2014	
PREPARED BY: FURMAN ASSOCIATES, INC. 11220 ASSETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 41 OF 46	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117CR-PH3	
LAYOUT: PH3	
FILE NO. 05117.06-00	

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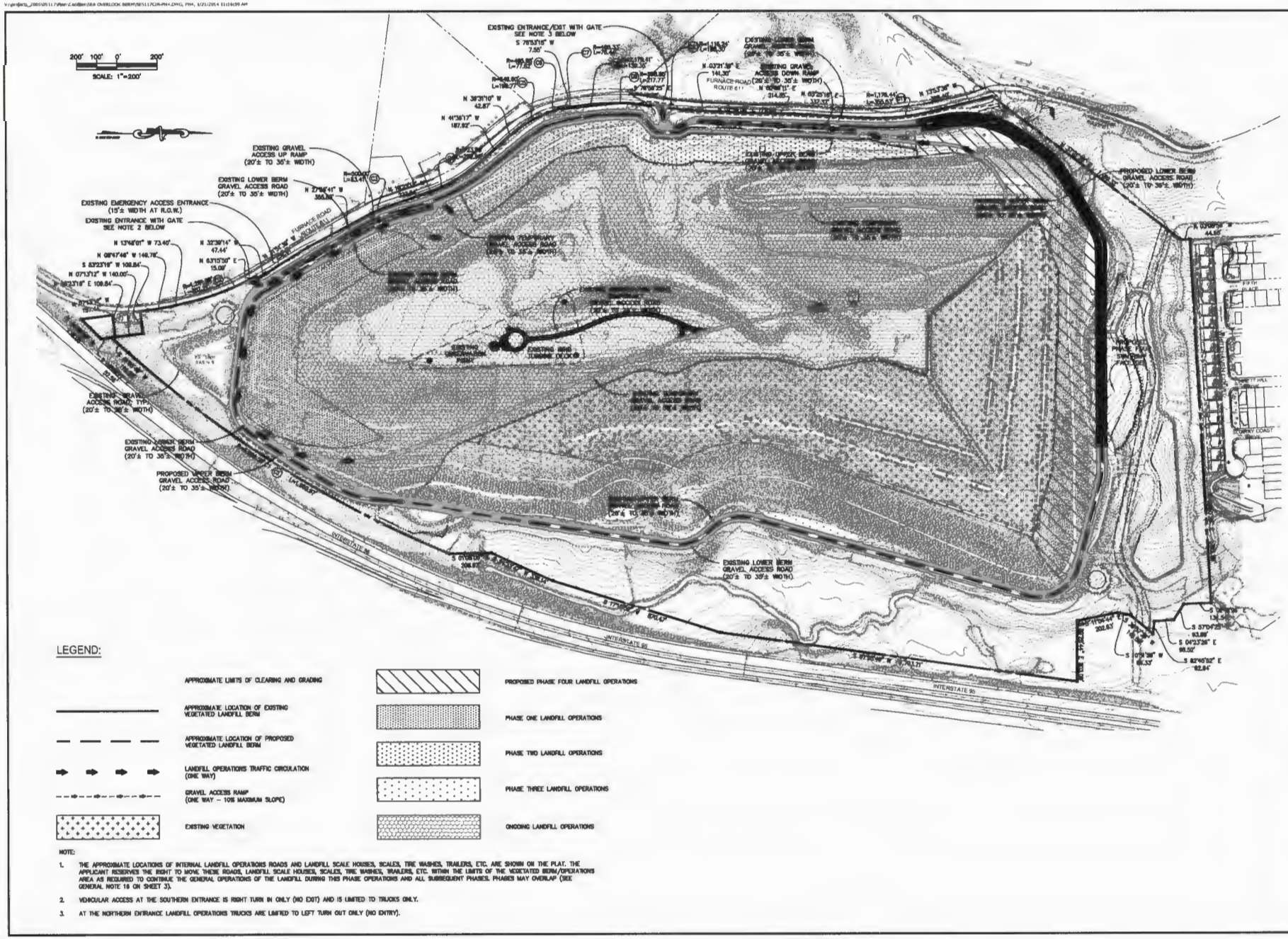

NOTE:

1. THE APPROXIMATE LOCATIONS OF INTERNAL LANDFILL OPERATIONS ROADS AND LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE ROADS, LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. WITHIN THE LIMITS OF THE VEGETATED BERM/OPERATIONS AREA AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE OPERATIONS AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTE 16 ON SHEET 3).
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE LANDFILL OPERATIONS TRUCKS ARE LIMITED TO LEFT TURN OUT ONLY (NO ENTRY).

BC Consultants
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VIRGINIA
LICENSED PROFESSIONAL ENGINEER
NO. 046 NB
1-22-2014

SPECIAL EXCEPTION AMENDMENT
PHASE FOUR LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS
SHEET ADDED 8-11-2013
REVISED 10-7-2013
REVISED 11-15-2013
REVISED 12-19-2013
REVISED 1-22-2014

FAIRFAX ENGINEERING ASSOCIATES, INC.
11220 ASHETT LOOP
SUITE 201
MANASSAS, VIRGINIA 20109

DESIGNED BY: PLR
DRAFTED BY: CAD
CHECKED BY: NB
DATE: MARCH 22, 2013
SCALE: HOR. 1"=200' VERT.

SHEET 42 OF 45

CO. NO. SEA 80-L/V-081-2
CAD NAME: SE5117CIR-PH4
LAYOUT: PH4
FILE NO. 05117.08-00

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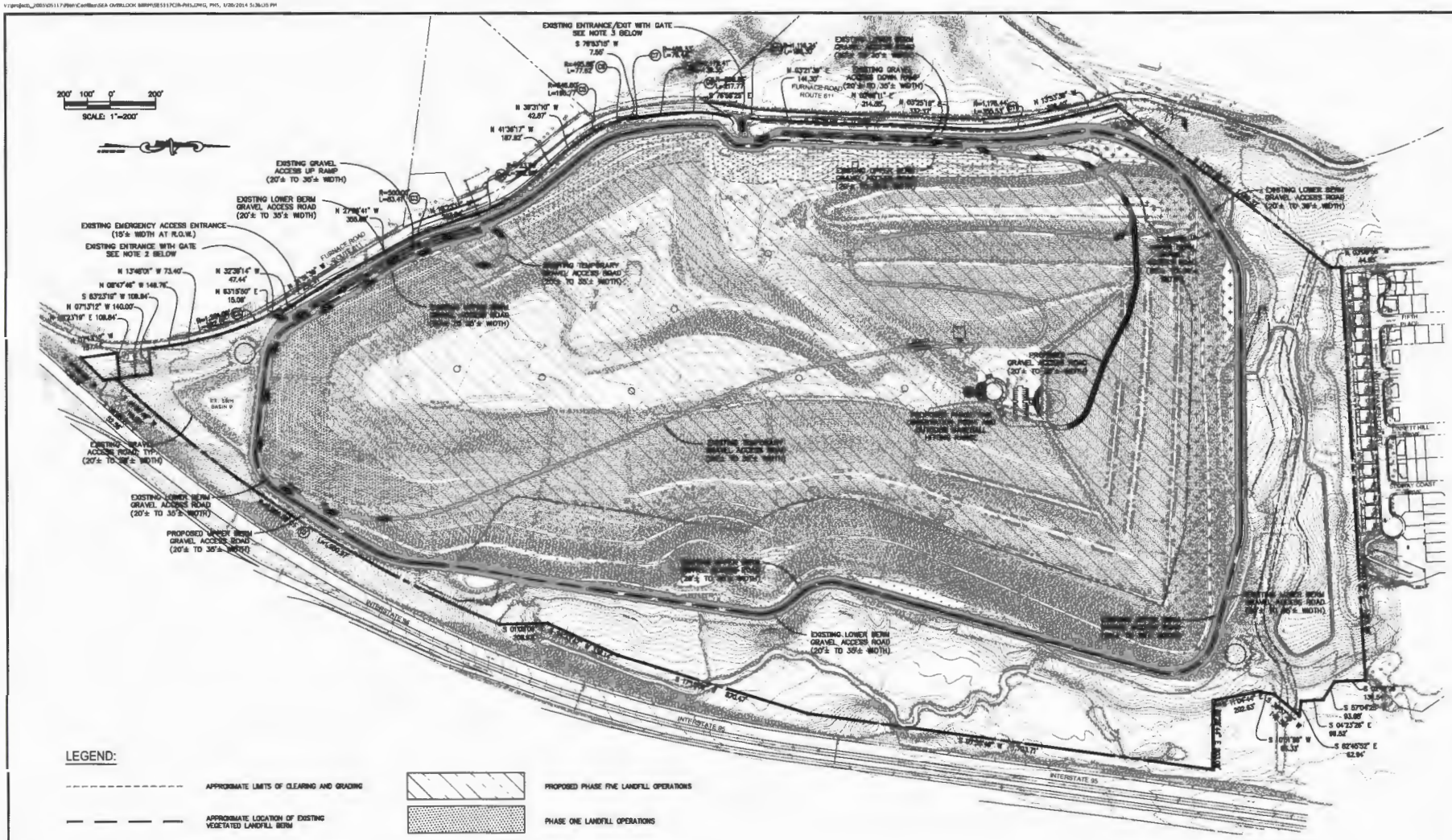

LEGEND:

- APPROXIMATE LIMITS OF CLEARING AND GRADING
- APPROXIMATE LOCATION OF EXISTING VEGETATED LANDFILL BERM
- LANDFILL OPERATIONS TRAFFIC CIRCULATION (ONE WAY)
- GRAVEL ACCESS RAMP (ONE WAY – 10% MAXIMUM SLOPE)
- PROPOSED PHASE FIVE LANDFILL OPERATIONS
- PHASE ONE LANDFILL OPERATIONS
- PHASE TWO LANDFILL OPERATIONS
- PHASE THREE LANDFILL OPERATIONS
- PHASE FOUR LANDFILL OPERATIONS

NOTE:

1. THE APPROXIMATE LOCATIONS OF INTERNAL LANDFILL OPERATIONS ROADS AND LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. ARE SHOWN ON THE PLAT. THE APPLICANT RESERVES THE RIGHT TO MOVE THESE ROADS, LANDFILL SCALE HOUSES, SCALES, TIRE WASHES, TRAILERS, ETC. WITHIN THE LIMITS OF THE VEGETATED BERM/OPERATIONS AREA AS REQUIRED TO CONTINUE THE GENERAL OPERATIONS OF THE LANDFILL DURING THIS PHASE OPERATIONS AND ALL SUBSEQUENT PHASES. PHASES MAY OVERLAP (SEE GENERAL NOTE 16 ON SHEET 3).
2. VEHICULAR ACCESS AT THE SOUTHERN ENTRANCE IS RIGHT TURN IN ONLY (NO EXIT) AND IS LIMITED TO TRUCKS ONLY.
3. AT THE NORTHERN ENTRANCE LANDFILL OPERATIONS TRUCKS ARE LIMITED TO LEFT TURN OUT ONLY.
4. AT NORTHERN ENTRANCE VEHICLES MAY ENTER AND EXIT.

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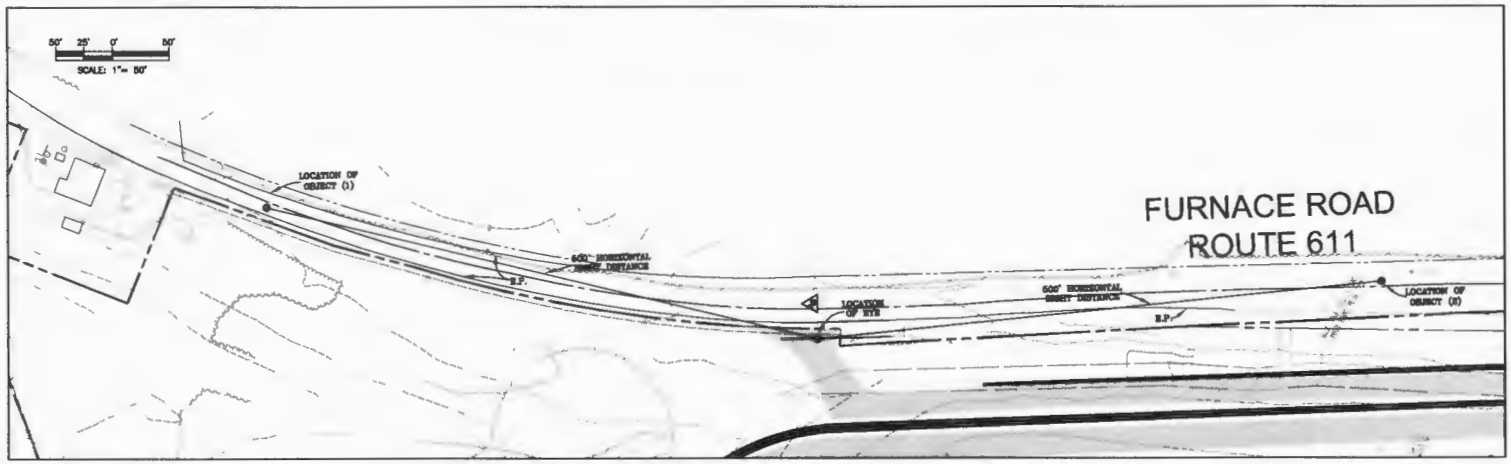
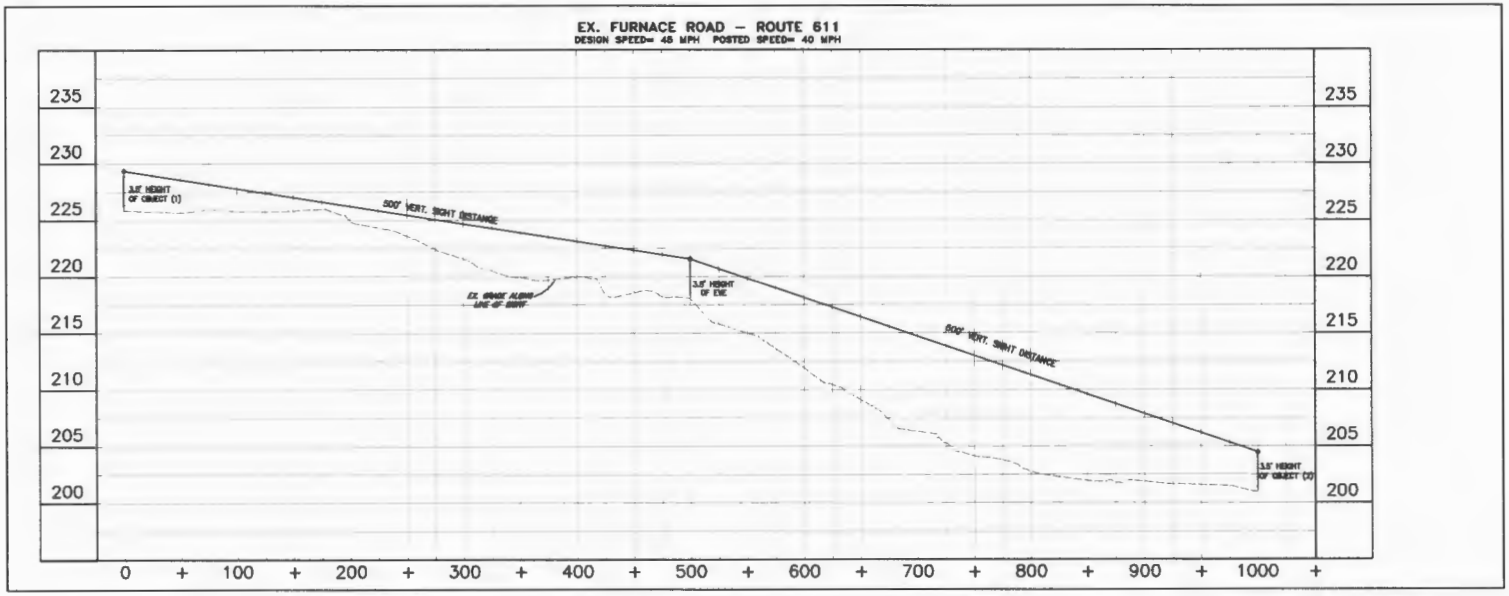
COMMONWEALTH OF VIRGINIA
DONNA L. BOYCE
Lic. No. 022
1-22-2014
PROFESSIONAL ENGINEER

SPECIAL EXCEPTION AMENDMENT
PHASE FIVE LANDFILL OPERATIONS TRUCK TRAFFIC CIRCULATION
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED	8-11-2013
REVISED	10-7-2013
REVISED	11-1-2013
REVISED	12-10-2013
REVISED	1-22-2014
FAIRFAX COUNTY ASSOCIATES, INC. 11220 ASHETT LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 43 OF 45	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117CIR-PH5	
LAYOUT: PH5	
FILE NO. 05117.06-00	





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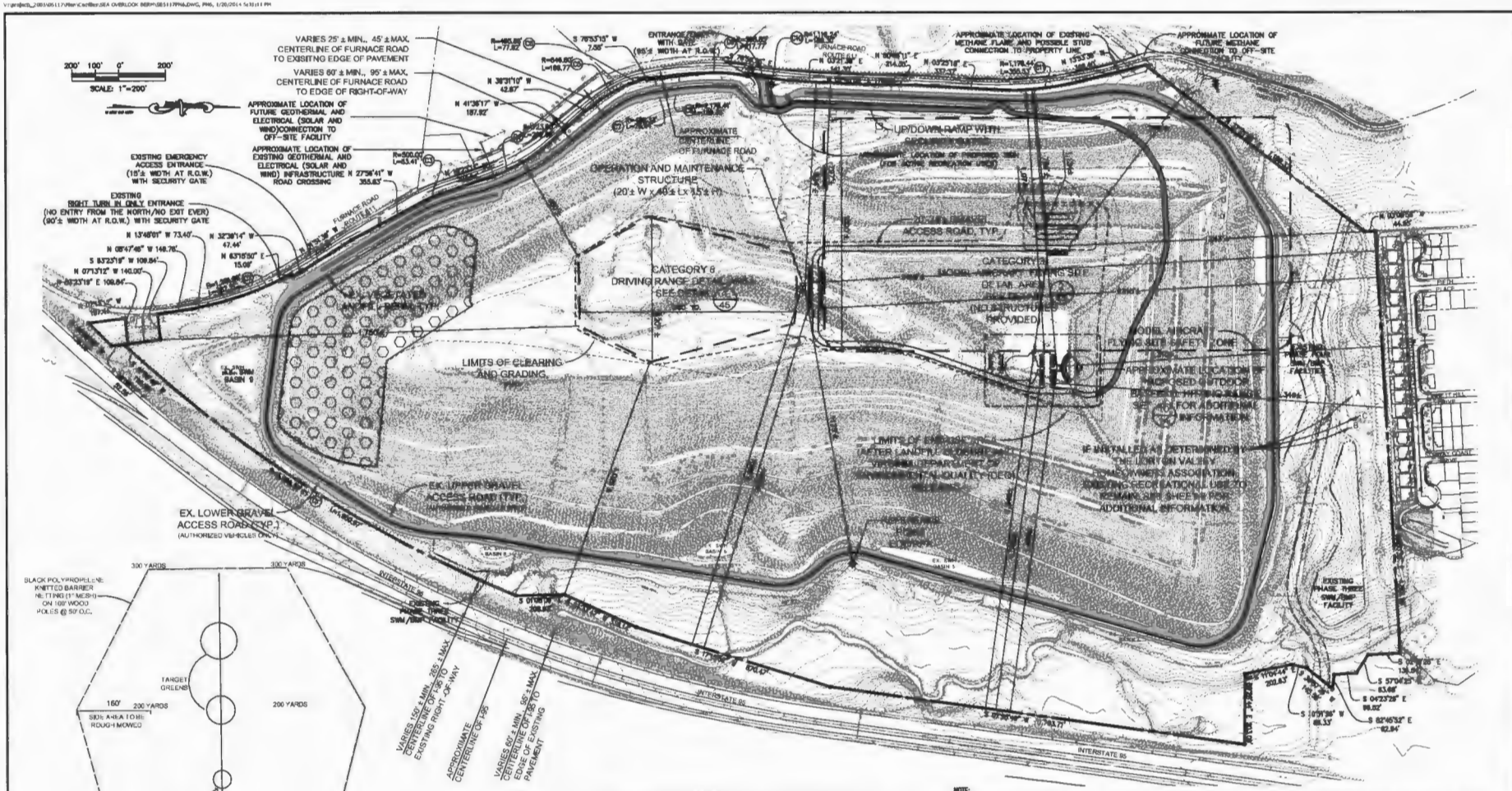
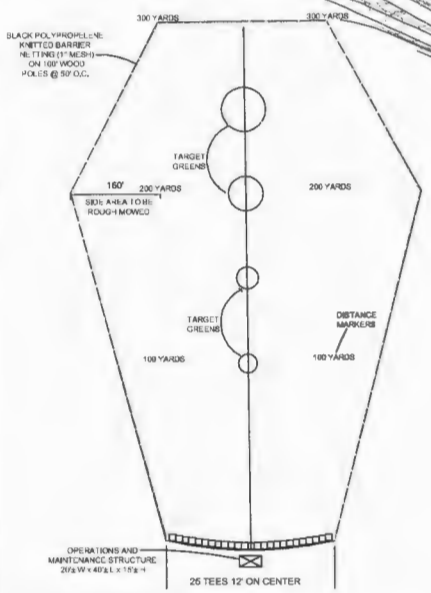
SPECIAL EXCEPTION AMENDMENT
SIGHT DISTANCE
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL
MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED 8-11-13	
REVISED 10-7-13	
REVISED 11-1-13	
REVISED 12-10-13	
REVISED 1-22-2014	
PREPARED BY: FAIRFAX ASSOCIATES, INC. 11220 ASSET LOOP SUITE 201 MANASSAS, VIRGINIA 20109	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: NB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 44 OF 46	
CO. NO. SEA 80-L/V-061-2	
CAD NAME: 05117-AUTOTURN	
LAYOUT: SIGHT	
FILE NO. 05117.08-00	





DRIVING RANGE DETAIL

NOT TO SCALE

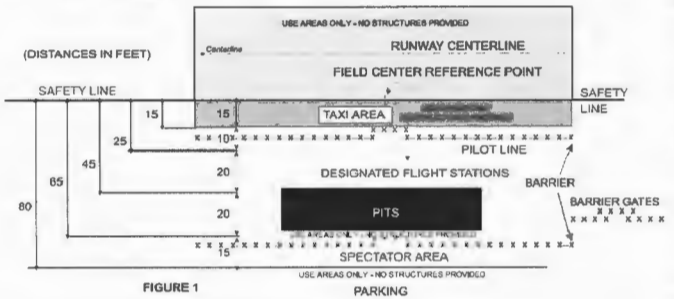


FIGURE 1

MODEL AIRCRAFT FLYING SITE DETAIL

NO STRUCTURES PROVIDED

NOT TO SCALE

NOTE:

1. PHASE 6 PRIVATE, CONTROLLED ACCESS USES TO BE CONSTRUCTED AND OPERATED BY LESSEES EITHER CONCURRENT WITH, OR SUBSEQUENT TO CESSATION OF, THE "INTERIM" GREEN ENERGY PROGRAM WHICH MAY BE ESTABLISHED BY THE END OF PHASE 5. PHASE 6 MAY NOT BE ESTABLISHED UNTIL AFTER RELEASE OF LANDFILL BY DEQ. GREEN ENERGY USES PREVIOUSLY INSTALLED MAY CONTINUE INTO PHASE 6.
2. ALL ACCESS ROADS AND PARKING AREAS ARE GRAVEL. THE GRAVEL ACCESS ROAD SHALL BE APPROXIMATELY 20' TO 24' FEET IN WIDTH. A WAIVER OF THE DUSTLESS SURFACE REQUIREMENT SHALL BE REQUESTED TO THE DIRECTOR, DPWES, SIMILAR TO THAT SHOWN FOR PHASE 5.
3. THERE IS NO OBSERVATION POINT IN PHASE 6.
4. ONE, TWO AND/OR THREE OF THE ACTIVE RECREATIONAL USES SHOWN MAY BE PROVIDED, AS DETERMINED BY THE LANDOWNER, OR MAY BE ADJUSTED FROM THAT SHOWN.
5. THE NUMBER OF PARKING SPACES SHOWN IS AN ESTIMATE AND SHALL BE PROVIDED AS DETERMINED BY THE DIRECTOR, DPWES, CONSISTENT WITH THE ZONING ORDINANCE REQUIREMENTS.
6. GIVEN THAT THE THREE ALTERNATIVE RECREATION USES SHOWN IN PHASE 6 ARE PROPOSED TO BE LOCATED ABOVE 412 FEET OF ELEVATION IN THE CENTER OF A FORTY ACRE PLATFORM ON TOP OF A CLOSED FILLED LANDFILL WITHIN A 250 ACRE PARCEL WHICH HAS AN EXTENSIVE VEGETATED PERIPHERAL BUFFER AND EXTENSIVE VEGETATED SLOPES ON ALL RESIDENTIAL USE SIDES, A MODIFICATION OF THE 25-FOOT TRANSITIONAL SCREENING FOR THE PROPERTY TO THAT SHOWN ON THE PLAT AND A WAIVER OF THE BARRIER REQUIREMENT FOR RECREATIONAL USES SHOWN IN PHASE 6 IS REQUESTED ON ALL SIDES ABUTTING RESIDENTIAL USES, PURSUANT TO PARAGRAPH 3, 11 AND 12 OF SECTION 13-305 OF THE ZONING ORDINANCE.
7. THESE USES SHALL COMPLY WITH THE LOT SIZE AND BULK REGULATIONS OF THE R-1 ZONING DISTRICT AND ALL REQUIRED PERFORMANCE STANDARDS. PRIOR TO SUCH TIME THAT NIGHT-TIME ILLUMINATION MAY BE PROVIDED FOR THE GOLF DRIVING RANGE AND/OR OUTDOOR BASEBALL HITTING RANGE(S), A SPORTS ILLUMINATION PLAN SHALL BE APPROVED PURSUANT TO PART 9 OF ARTICLE 14. THE OUTDOOR BASEBALL HITTING RANGE(S) AND GOLF DRIVING RANGE SHALL COMPLY WITH THE "ADDITIONAL STANDARDS" SET FORTH IN SECTION 9-527 AND 9-528, RESPECTIVELY, OF THE ZONING ORDINANCE.
8. SIGNAGE SHALL COMPLY WITH ZONING ORDINANCE ARTICLE 12 REQUIREMENTS.
9. EXISTING VEGETATION LOCATED BELOW THE LIMITS OF END RECREATIONAL USE AREA TO REMAIN UNDISTURBED.
10. REFER TO SHEETS 27 THROUGH 38 FOR PHASE 5 SWM/BMP INFORMATION.
11. SEE SHEET 2 FOR PHASE 6 SITE TABULATIONS.
12. SEE DETAIL 10 ON SHEET 14 SHOWING LAYOUT OF OUTDOOR BASEBALL HITTING RANGE.
13. ALL WRAPPING IN PHASE 6 SHALL BE ALLOWED TO MAKE LEFT TURNS IN AND RIGHT TURNS OUT AT MAIN ENTRANCE.

LEGEND:

EXISTING TREELINE

LIMITS OF CLEARING AND GRADING

SEE SHEET 2 FOR PHASE 6 SITE TABULATION

POTENTIAL AREAS FOR DEVELOPMENT OF A SOLAR PANEL FARM (BY APPLICANT/OWNER AND/OR BY OTHERS)

BC Consultants
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COMM. No. 2005
1-23-2014

SPECIAL EXCEPTION AMENDMENT
PHASE SIX - CATEGORY 3 AND/OR 5 END USES
LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

MOUNT VERNON DISTRICT
FAIRFAX COUNTY, VIRGINIA

BC REVISIONS	
SHEET ADDED 5-11-2013	
REVISED 10-2-2013	
REVISED 11-1-2013	
REVISED 11-15-2013	
REVISED 1-22-2014	
FAIRFAX COUNTY ASSOCIATES INC. 11220 ASSETT LOOP SUITE 201 RESTON, VIRGINIA 20190	
DESIGNED BY: PLR	
DRAFTED BY: CAD	
CHECKED BY: MB	
DATE: MARCH 22, 2013	
SCALE: HOR. 1"=200' VERT.	
SHEET 45 OF 45	
CO. NO. SEA 80-L/V-081-2	
CAD NAME: SE5117PH6	
LAYOUT: PH6	
FILE NO. 05117.08-0	

DESCRIPTION OF THE APPLICATION

The applicant, Furnace Associates, Inc., requests approval of a special exception amendment (SEA) for the Lorton Landfill, an existing construction, demolition, and debris (CDD) landfill located on approximately 250 acres in Lorton. Concurrent with this SEA application is 2232-V13-18 in which the applicant proposes solar and wind electrical generating facilities on the subject property and seeks the Planning Commission's determination that the proposed electrical generating facilities satisfies the criteria of location, character, and extent pursuant to Section 15.2-2232 of the Code of Virginia.

The County Attorney determined that a Section 15.2-2232 review is required because the proposed wind and solar electrical generating facilities are not a feature shown on the Fairfax County Comprehensive Plan and energy produced by wind and solar electrical generating facilities sold to the electrical grid (as proposed) are deemed to be a public utility. Therefore, the Planning Commission must make a determination on whether the proposed wind and solar electrical generating facilities are in substantial conformance with the Comprehensive Plan. The County Attorney further determined that the proposed methane gas and geothermal energies are not deemed to be public utilities because they are excluded from the definition of public utility in accordance with Section 15.2-2232.

By way of background on landfills, the Virginia Solid Waste Management Regulations (VSWMR) defines CDD landfills as a land burial facility engineered, constructed and operated to contain and isolate construction waste, demolition waste, debris waste, split tires, and white goods or combinations of the above as solid waste. CDD landfills accept the following solid waste:

- Construction waste: Solid waste that is produced or generated during construction, remodeling, or repair of pavements, houses, commercial buildings, and other structures. Construction wastes include, but are not limited to lumber, wire, sheetrock, broken brick, shingles, glass, pipes, concrete, paving materials, and metal and plastics if the metal or plastics are a part of the materials of construction or empty containers for such materials. Paints, coatings, solvents, asbestos, any liquid, compressed gases or semi-liquids and garbage are not construction wastes.

- Demolition waste: Solid waste produced by the destruction of structures and their foundations and includes the same materials as construction wastes.

- Debris waste: Wastes resulting from land clearing operations, including stumps, wood, brush, soil, and road spoils.

The subject CDD landfill also accepts select volumes of dredged soils from lakes, ponds, and stormwater management facilities in the County, as permitted by the Virginia Department of Environmental Quality (DEQ).

Unlike CDD landfills, sanitary and municipal solid waste landfills accept solid waste generated by residential, commercial, industrial, and institutional establishments. This includes rubbish, trash, and garbage produced by households, apartment buildings, hotels and motels, and businesses. Because of the presence of organic materials in sanitary and municipal solid wastes, a high level of decomposition takes place, which can lead to issues of odor, settlement, and groundwater and air pollution. Since CDD landfills accept mostly inert, inorganic materials, odor and settlement issues are not as problematic; however, there is some methane gas produced from the waste. Sanitary landfills are subject to the Environmental Protection Agency (EPA) landfill criteria; whereas, CDD landfills are regulated by state and local governments (EPA regulations ban hazardous waste from being dumped in CDD landfill unless a landfill meets certain standards).

With the requested special exception amendment, the applicant proposes to:

- Extend the useful life of the landfill to continue landfill activities until December 31, 2040, or until the final debris elevation of 412 feet above sea level is reached, whichever occurs first. The current SEA permits landfill disposal activities until January 1, 2019, or when the final debris elevation of 412 feet above sea level is reached, whichever occurs first.
- Establish a Green Energy Park consisting of electrical generating facilities to include wind, solar, geothermal, and methane gas.
- Remove the previously approved public park uses and dedication requirement of the entire site to the Fairfax County Park Authority.
- Permit three limited access active recreational end uses consisting of: a radio controlled aircraft field (private club, Category 3 special exception use) and an outdoor baseball hitting range and/or golf driving range (Category 5 special exception uses).
- Create and operate an “Observation Point” on the landfill as a private, controlled access accessory use that provides an elevated view of the surrounding area and of the three wind turbines proposed in Phase 1 of the landfill development.

The applicant also proposes to:

- Construct and convey an approximately 5.2 acre private recreational area located along the site’s northern property line and provide recreational amenities within the private recreational area for the sole use by the Lorton Valley Homeowners Association residents.

- Contribute to the County 50% of any revenue in excess of 2.5 cents per kilowatt hour that the applicant receives from the sale of the electricity produced by the three wind turbines proposed in Phase 1.
- Contribute to the County 50% of the net profit from any renewable energy sales related to the wind and/or solar infrastructure proposed in Phases 4 and 5 as the Green Energy Park.
- Deliver to the edge of the property and ultimately to the Landfill Energy Systems facility (formerly known as the Michigan Cogeneration facility) methane gas sufficient to generate the equivalent of an average of two million kilowatt hours annually of electricity.
- Contribute $15 million to the Board of Supervisors in installments of $750,000 per year beginning no later than January 31, 2019, and ending no later than January 31, 2038, for local community needs in the Lorton/South County area as determined by the Board of Supervisors.
- Contribute $3.2 million to the Park Authority by January 31, 2019, for recreational facilities in the Lorton/South County area.
- Contribute $200,000 to the Board of Supervisors toward an educational feature that describes and provides information on renewable energy activities occurring on the applicant's properties and on County land.

The applicant requests the following waivers and modifications:

- Modification of Par. 9 of Sect. 9-205 of the Zoning Ordinance to permit improvements less than 20 years after the termination of landfill operations;
- Waiver of Par. 11 of Sect. 11-102 of the Zoning Ordinance for a dustless surface;
- Waiver of the peripheral and interior parking lot landscaping requirement pursuant to Par. 6 of Sect. 13-202 and Par. 3 of Sect. 13-203 of the Zoning Ordinance;
- Modification of the transitional screening and waiver of the barrier requirements pursuant Sect. 13-305 of the Zoning Ordinance to permit the landscaping as shown on the SEA Plat;
- Waiver of Par. 2 of Sect. 17-201 of the Zoning Ordinance for an 8-foot wide major paved trail along the east side of Furnace Road, as shown on the Countywide Trails Plan;
- Modification of the invasive species management plan requirement pursuant to Section 12-0404.2C of the Public Facilities Manual;
- Modification of the submission requirements for a tree inventory and condition analysis pursuant to Section 12-12-0503.3 of the Public Facilities Manual; and
- Board of Supervisors' approval to permit off-site vehicular parking on Tax Map Parcels 113-1 ((1)) 12 and 13 for the Observation Point, pursuant to Sect. 11-102 of the Zoning Ordinance.

The proposed development conditions, the statement of justification, and the applicant's affidavit are provided as Appendices 1-3, respectively.

LOCATION AND CHARACTER

The subject property consists of six parcels (collectively referred to as the subject property) containing a total of approximately 249.82 acres and is developed with an existing construction, demolition, and debris (CDD) landfill. A scale house and scales, maintenance building, gravel parking lot, operations trailer, and tire wash facility are located on-site. The site is bound by the Lorton Valley subdivision to the north; to the east, Interstate I-95 and Giles Run; to the south, an existing single family dwelling at Tax Map Parcel 113-3 ((1)) 3; and to the west, Furnace Road. The surrounding uses are shown in Figure 1.

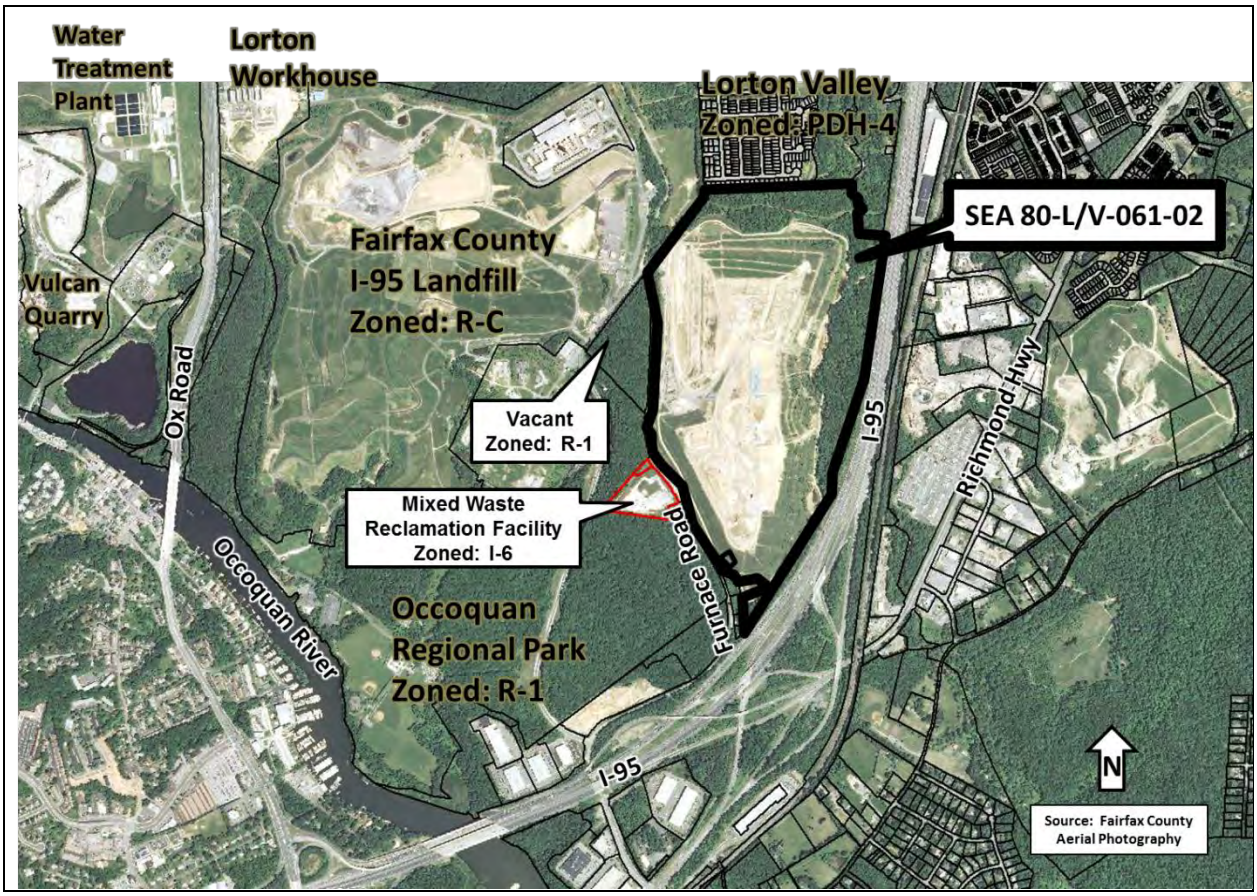

Figure 1: Surrounding uses

BACKGROUND

In the early 1960s, a portion of the subject property was used as a mining operation for gravel extraction. The exact year is unknown since special exception approval was not required at that time for such a use.

On May 14, 1976, a debris landfill was established on a portion of the subject property pursuant to the approval of a grading permit, which was renewable on a yearly basis. (Prior to the adoption of the current Zoning Ordinance, a debris landfill was permitted with the approval of a grading permit.) At that time, the debris landfill was limited to a 30-acre area in the southwestern portion of the subject property. Special Exception SE 101-L/V-78 was submitted to operate a sanitary landfill on the application property but was later withdrawn on June 11, 1979.

On October 21, 1981, the Board of Supervisors approved Special Exception SE 80-L/V-061 to permit a debris landfill on the subject site.

On September 19, 2002, the applicant submitted an application to amend its solid waste permit (Permit #331) with the Virginia Department of Environmental Quality (DEQ), which regulates landfills in Virginia. This amendment reflected the changes proposed under SEA 80-L/V-061, which included an increase to the height of the landfill and the proposed closure and post-closure activities on the landfill.

On January 8, 2007, the Board of Supervisors approved Special Exception Amendment SEA 80-L/V-061 to permit an increase in the maximum height of the landfill from 290 feet above sea level to 412 feet above sea level, to permit a public park on the closed portions of the landfill; and other site modifications. Additional information on this application that includes the staff report and approved development conditions is located at: http://ldsnet.fairfaxcounty.gov/ldsnet/ZAPSMain.aspx?cde=SEA&seq=4088181.

SPECIAL EXCEPTION AMENDMENT PLAT (A copy is located at the front of the staff report.)

The Special Exception Amendment Plat entitled, “Lorton Green Energy Park and Debris Landfill,” was prepared by BC Consultants on March 22, 2013 and revised through January 22, 2014, consists of 45 sheets, and is reviewed below along with staff analysis.

ANALYSIS

Vegetated Landfill Berm (Appendices 2C and 2E)

The applicant proposes to expand the 4-acre platform of the final elevation of the landfill to an approximately 40-acre platform for the potential installation of up to 12 wind turbines and/or solar panels by the applicant/owner and/or by others. The final debris elevation is not proposed to change and will remain at 412 feet above sea level.

To achieve the proposed 40-acre platform, a vegetated berm up to 70 feet in height is proposed around the entire perimeter of the landfill, and construction of the berm would occur during each of the five phases of landfill development, as described in more detail in the Phases of Development section of this staff report. A lower berm access road is proposed at base of the berm and an upper berm access road with a guardrail is proposed at the top of the berm. The berm access roads are for access and maintenance of the berm. The berm access roads are proposed at a minimum of 20 feet in width. Figure 2 illustrates the berm access roads, as shown on Sheet 15 of the GDP.

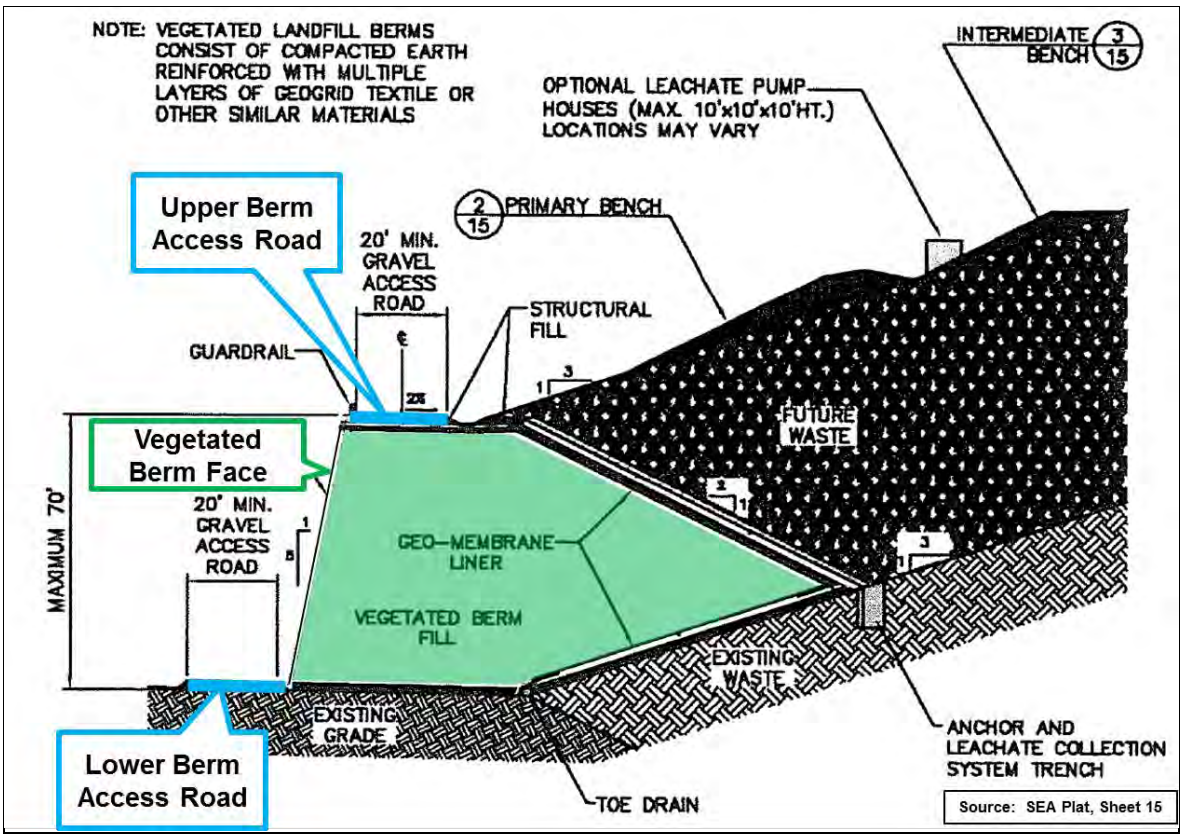

Figure 2: Berm access road

The area between the berm and the side slope of the landfill will provide the additional fill capacity needed to achieve the 40-acre platform at the top of the landfill, as depicted in Figure 2A. Staff has asked the applicant to provide the increase in fill capacity that would result from the construction of the proposed berm. The applicant has declined and stated that the fill capacity of a landfill is proprietary information within the solid waste industry.

The fill capacity between the berm and the side slope of the landfill is considered by DEQ as a landfill "piggyback," which the applicant's renewable energy consultant, Geosyntec Consultants (Geosyntec) states is common in Virginia and has been used at the County's I-95 Landfill. The piggyback provides a two-layer liner system for the landfill. Piggybacks are required by DEQ to have a base liner system and a geomembrane overlain by an 18-inch thick drainage layer that is installed over the side slope of the landfill in lieu of a clay liner in areas where the piggyback is proposed. The geomembrane and drainage layer would function as the base liner on top of the side slope, which provides an impermeable barrier that better prevents liquid from entering and exiting the debris.[1] The piggyback requires a more stringent capping system than the current landfill cap (clay liner) design. As a result, the two-layer liner system (cap and piggyback liner) provides an increased benefit by minimizing the potential for leachate (a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials from such waste, as defined in the Virginia Solid Waste Management Regulations) and risk of groundwater impact.[2]

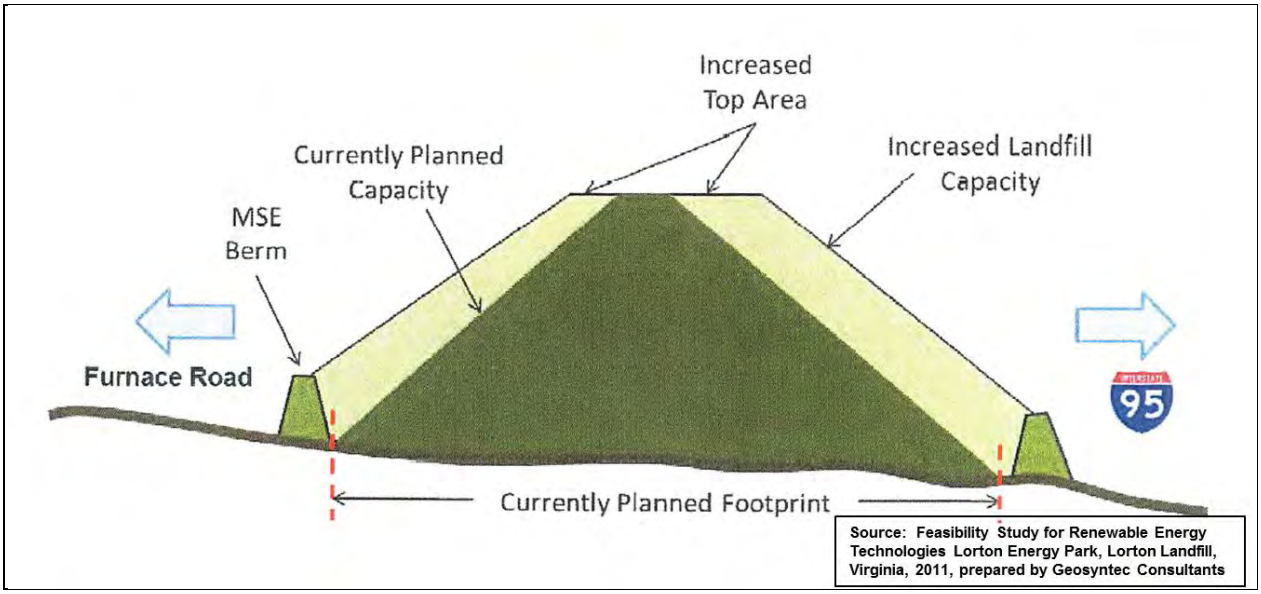

Figure 2A: Illustration of proposed vegetated landfill berm and increase in landfill capacity.

1 Geosyntec Consultants' Memorandum dated January 30, 2014, provided as Appendix 2E.
2 Geosyntec Consultants' Memorandum dated January 30, 2014, provided as Appendix 2E.

According to Geosyntec, "the design of the berm face includes a configuration of welded wire baskets, struts, facing geogrid (a polysynthetic material similar to that used for landfill liners), erosion control mat, select fill, and topsoil that are designed to facilitate installation and provide a suitable zone of establishment of a sustainable vegetative cover over the exterior slope.[3]" It is staff's understanding that the geogrid would be laid horizontally to add strength and stability to the berm. The facing geogrid in conjunction with the berm geogrid provides stability in the vegetated berm face and the facing materials are designed to promote vegetative growth. The vegetated berm facing consists of seed mix/plantings, which is intended to soften the appearance of the berm and to provide a more natural appearance, as shown in Figure 2B.

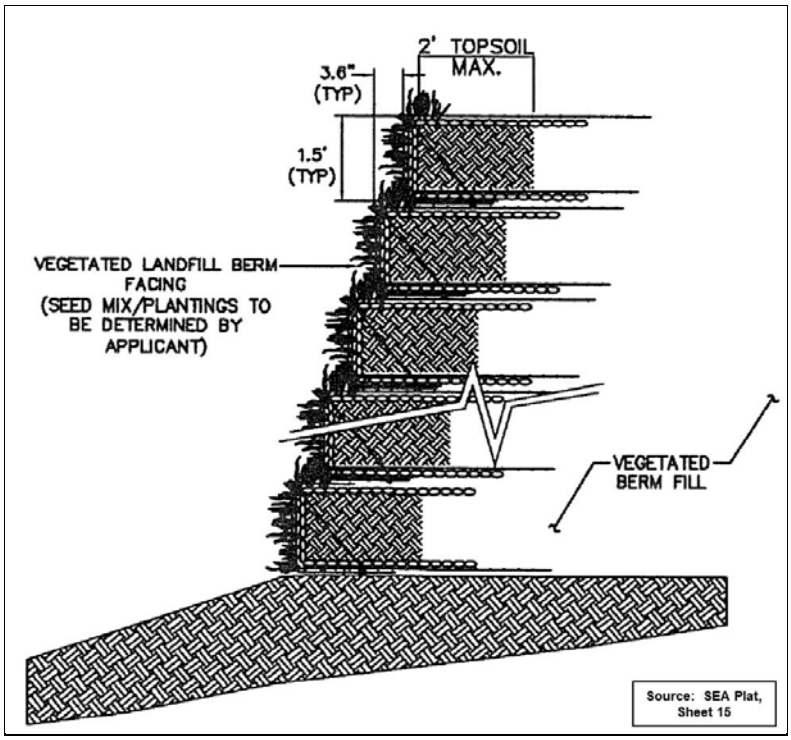

Figure 2B: Vegetated Berm Facing Plantings

The berm is a benefit because it strengthens the materials underneath of it by exerting a downward force on the materials by compressing the underlying materials and squeezing water out to allow the material to compress and strengthen. Additionally, Geosyntec states that a benefit of the berm is that it is designed to act as a buttress. When debris is placed on the side slopes of the landfill it exerts an outward force (a force away from the landfill) and if not properly resisted the side slope of the landfill can become unstable and fail. The berm provides a resisting force (typically designed to be at least twice the magnitude of the outward force) sufficient to resist the outward force of the debris on the landfill side slope. As previously discussed, the two-layer liner system

3 Geosyntec Consultants' Memorandum dated January 30, 2014, provided as Appendix 2E.

(cap and piggyback liner) also provides an increased benefit by minimizing the potential for leachate and risk of groundwater impact.

According to Geosyntec, the landfill berms are designed and constructed based on standards set forth by the Federal Highway Administration (for the parameter values for the geogrid and berm fill) and the Virginia Solid Waste Management Regulations. The berm also will be subject to a geotechnical design analysis review by the County's Geotechnical Review Board (GRB). The GRB consists of six members recommended by the County Executive who are either professional engineers specializing in soil and foundation engineering or professional engineering geologists. The Director of the Office of Site Development Services of the Department of Public Works and Environmental Services (DPWES), serves as secretary to the GRB, and is a non-voting member. The applicant would be required to submit structural design calculations and global stability analysis to demonstrate the berm's structural and geotechnical stabilities. In accordance with the development conditions, any and all recommendations within the purview of the GRB shall be implemented by the applicant. In addition, the applicant is subject to a technical review by DEQ that would include a structural evaluation of the berm as part of the DEQ permitting process. The technical reviews are intended to ensure the structural soundness of the berm.

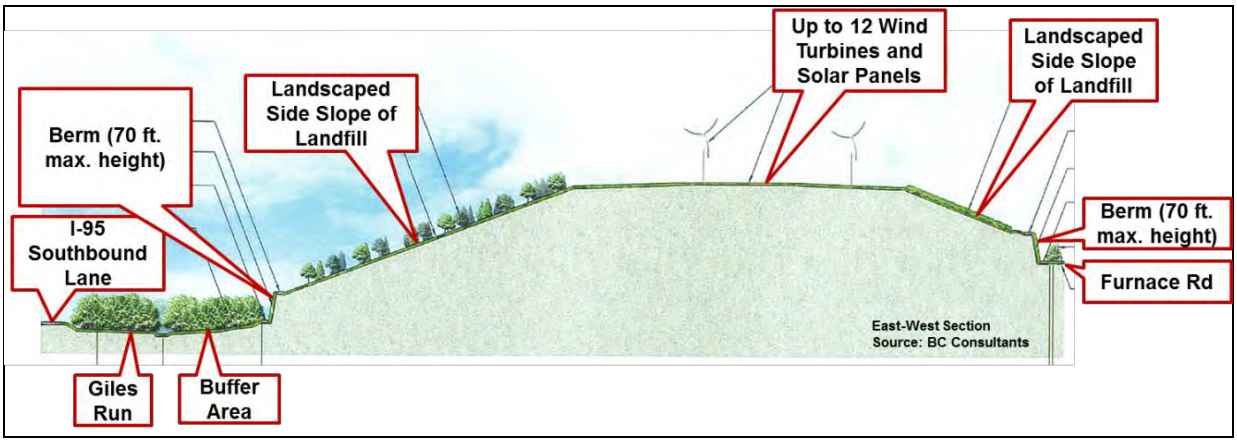

Figure 3: East-west cross section of proposed berm

In general, the distance between the berm and the site's property lines varies because along each side of the landfill there are areas that are wider or narrower in distance. In general, there are approximately 429 to 489 feet between the berm and the northern property line, as shown on Sheet 11 of the SEA Plat; approximately 479 feet between the berm and the southern property line, as shown on Sheet 13; and approximately 39 to 50 feet between the berm and the western property line, as shown on Sheets 11 and 12. Along the eastern property line, there is a significant variance from approximately 44 to 369 feet between the berm and the eastern property line because the Giles Run resource protection area (RPA), environmental quality corridor (EQC), and

floodplain are located on the eastern portion of the site and regulations prohibit landfilling activities in those areas, as shown on Sheets 12 and 13. An east-west cross section of the proposed berm is provided in Figure 3 and additional cross sections are provided in Appendix 2C.

Current Virginia and County regulations and industry standards do not require a buffer between the limits of debris and the 100-year floodplain. Section 9VAC20-81-120 of the Virginia Administrative Code, Section 5-0102.2 of the Fairfax County Public Facilities Manual (PFM), and Chapter 118 of the Fairfax County Code require only that the landfill not encroach closer to Giles River than the greater of the RPA or the 100-year floodplain. Section 9VAC20-81-120 of the Virginia Administrative Code states "[n]o new landfill shall be sited in a 100-year floodplain" and does not provide a restriction in terms of distances to be measured from a floodplain. Section 5-0102.2 of the PFM states "[t]he fill or excavation area shall be shown and shall not encroach on the RPA, existing 100-year drainageway or floodplain nor be within 50 feet of any perennial watercourse." Chapter 118 of the County Code addresses the Chesapeake Bay Preservation Ordinance. Therefore, the applicant states that the proposed 75-foot buffer exceeds all current, scientifically determined standards. Staff has proposed a development condition that no new waste (debris) placement activity shall take place within 75 feet of the greater of the RPA or the 100-year floodplain of Giles Run. There shall be no disturbance within the RPA except in those limited areas depicted on the SEA Plat and/or as permitted under the Chesapeake Bay Preservation Ordinance.

Seven retaining walls up to 22 feet in height are proposed on the east side of the berm. According to Geosyntec, "[t]he purpose of the retaining walls is to prevent the earthen embankment from the lower perimeter utility road (lower berm access road) from impacting the RPA.[4]" This provides an additional buffer to Giles Run. The retaining walls would be subject to review by the GRB, DPWES, and DEQ.

Phases of Development (Appendix 4)

As depicted on the SEA Plat, the applicant proposes to phase the landfill operations, construction of the berm, closure of the landfill, and end use over six phases. The applicant provided that the length of each phase varies depending on the volume of in-bound tons of waste. Based on expected volumes, the applicant estimates the length of each phase could last between approximately 4 to 6 years, depending on the amount of volume received. During each phase, the applicant indicates that the subsequent phase may begin for uninterrupted landfill operations. The proposed phasing activities are described below.

4 Geosyntec Consultants' Memorandum dated January 30, 2014, provided as Appendix 2E.

Phase 1

The applicant proposes to provide an approximately 5.2 acre private recreation area along the site's northern property line, adjacent to the Lorton Valley subdivision. This recreation area is proposed for the sole use by the residents of Lorton Valley subject to the Lorton Valley Homeowners Association (HOA) approval of the recreation area. The applicant proposes to convey the private recreation area and amenities to the HOA and to create a conservation easement for the recreation area prior to conveyance. The following amenities within the recreation area are proposed: an approximately 12,750 square foot multi-purpose open space area, an approximately 2,625 square foot dog park, a picnic area with picnic tables, and exercise stations.

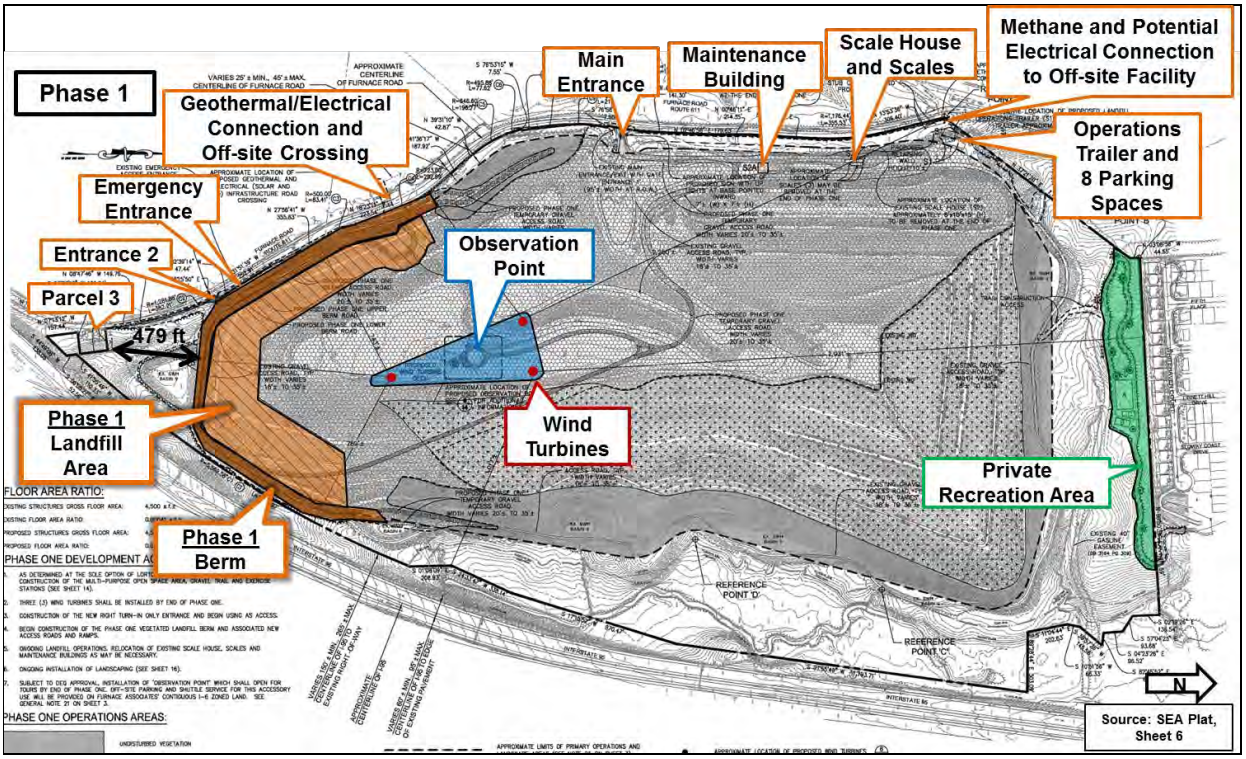

Figure 4: Phase 1 development

Phase 1 landfill activities are proposed in the southern portion of the landfill and consists of the following: construction of temporary on-site gravel roads for access to the active landfill area; landfilling; ongoing installation of landscape; and construction of a vegetated berm in the southern portion of the site, along with associated upper and lower berm roads used for access and maintenance of the berm. An interim vegetated cover will be provided in disturbed areas where landfill operations are complete and where an interim landfill cap has been installed. It is noted that there is a single family dwelling on Parcel 3 and the subject property abuts it on three sides. The distance from

the berm to Parcel 3 is approximately 479 feet. Figure 4 depicts the proposed Phase 1 development.

The existing 2,500 square foot maintenance building (15 feet in height), located near the site's main entrance along Furnace Road, is proposed to be removed at the end of Phase 1 and relocated towards the center of the landfill in Phase 2. The existing scale house and scales near the site's main entrance shift further north along Furnace Road in Phase 1. The scales are used to weigh trucks and their debris as they enter and exit the site. The scale house is approximately 80 square feet and 15 feet in height. An operations trailer is proposed at the northwest corner of the site and is approximately 1,800 square feet and 15 feet in height with eight parking spaces. The trailer and parking area are proposed to remain at that location through Phase 5. A 10-foot tall retaining wall is proposed adjacent to the operations trailer to provide an additional buffer to Furnace Road. It is noted that these landfill operational facilities and roads may shift from their general location as depicted on the SEA Plat in order to continue the general operation of the landfill during Phase 1 and in subsequent phases.

Also in Phase 1, the applicant proposes to construct a new right-in only entrance (south of the site's main entrance) for truck traffic travelling north on Furnace Road. No left turns into or exits from the landfill would be permitted at this location. The existing southbound left turn restriction on Furnace Road is proposed to continue until landfill operations cease at the end of Phase 5.

By the end of Phase 1, the applicant proposes to install three wind turbines in the southern portion of the landfill. The wind turbines are proposed to be a maximum of 180 feet in height. A limited access Observation Point is proposed at the southern end of the landfill and in the general vicinity of the wind turbines. Public tours are proposed for the Observation Point, which provides an elevated view of the surrounding area and of the wind turbines. Outdoor-style wooden bench seating is proposed to provide for up to 20 visitors with a lectern at the head of the benches for speakers. Tourist-style telescopes on posts and informational signage are proposed to describe the "Green Energy Triangle," history of the area, and local attractions. Visitor parking for the Observation Point is proposed not at the landfill but at the applicant's adjacent parcel located at Tax Map 113-1 ((1)) 12 and 13, which is on the opposite side of Furnace Road from the landfill. The applicant is requesting the Board of Supervisors' approval to permit off-site parking for the Observation Point at this location and this is discussed in more detail in the Waivers and Modifications section of this report.

<u>Phase 2</u>

The Phase 2 landfill operations include landfilling, construction of the Phase 2 vegetated berm/access roads, and landscaping along the western portion of the site, and the Observation Point tours would continue. An interim vegetated cover will be provided in

disturbed areas where landfill operations are complete and where an interim landfill cap has been installed.

The applicant proposes to construct a second scale house and scales in the southeast area of the site since the new southern entrance will be completed. The proposed scale house is approximately 80 square feet and 15 feet in height. Four parking spaces are proposed with the scale house. The existing scale house and scales from Phase 1 are proposed to relocate to the center of the site to correspond with ongoing landfill operations. A leachate tank is proposed at the southwest and northwest areas of the landfill. Leachate is liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials from such waste. Each leachate tank is proposed to be a maximum of 20 feet above grade and a maximum of 90 feet in diameter. According to the applicant, the leachate tanks provide storage to manage leachate flow and discharge to the public sewer connection in accordance with the landfill discharge permit. Leachate storage allows for consistent pre-treatment required by the public sewer discharge permit. Figure 5 depicts the proposed Phase 2 development.

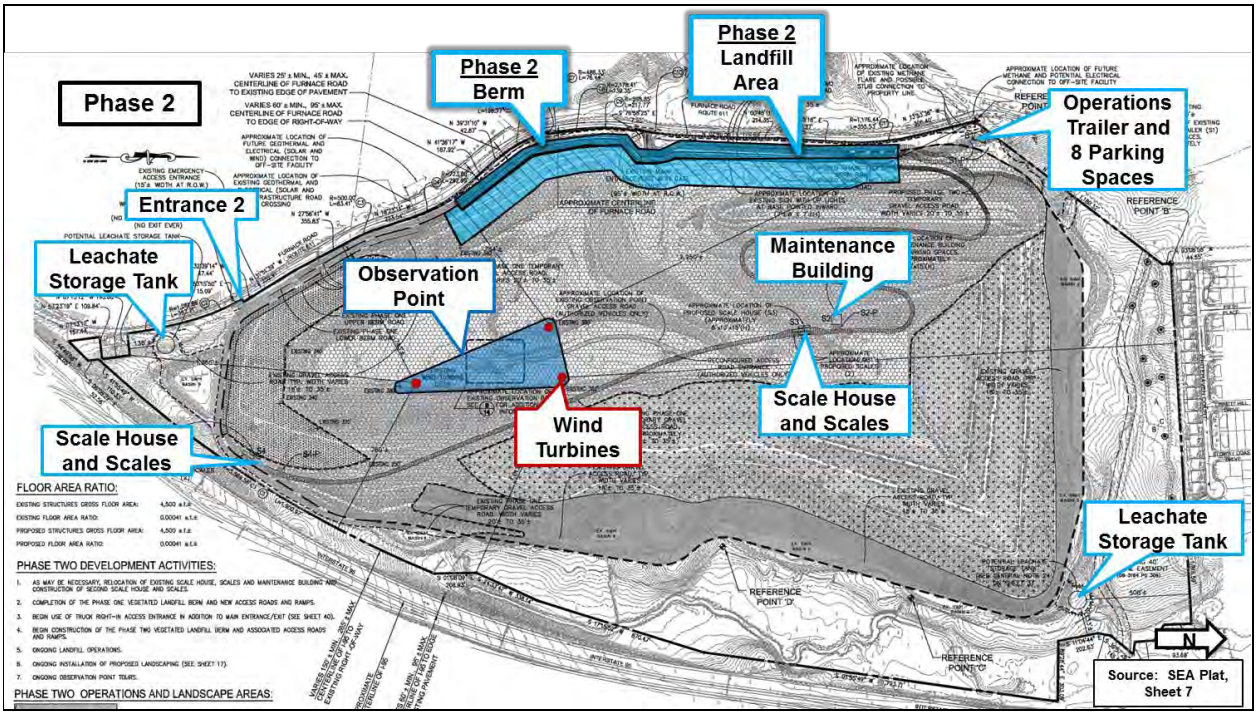

Figure 5: Phase 2 development

Phase 3

The Phase 3 landfill operations include landfilling, construction of the vegetated berm/access roads, and landscaping along the eastern portion of the site, and

Observation Point tours are proposed to continue. An interim vegetated cover will be provided in disturbed areas where landfill operations are complete and where an interim landfill cap has been installed.

In addition, the applicant proposes to construct a stormwater basin (identified as stormwater basin 3) along the northern portion of the site; install above grade steel stormwater aerial crossings to carry stormwater outfall to the basin; and to install a split rail fence at a minimum height of 36 feet with wire mesh or other type of safety screening to surround the basin. In addition, a stormwater basin is proposed in the southeastern corner of the site (stormwater basin 8) to replace existing stormwater management pond #8. Additional details on the proposed stormwater management basins are provided later in the Stormwater section of this report.

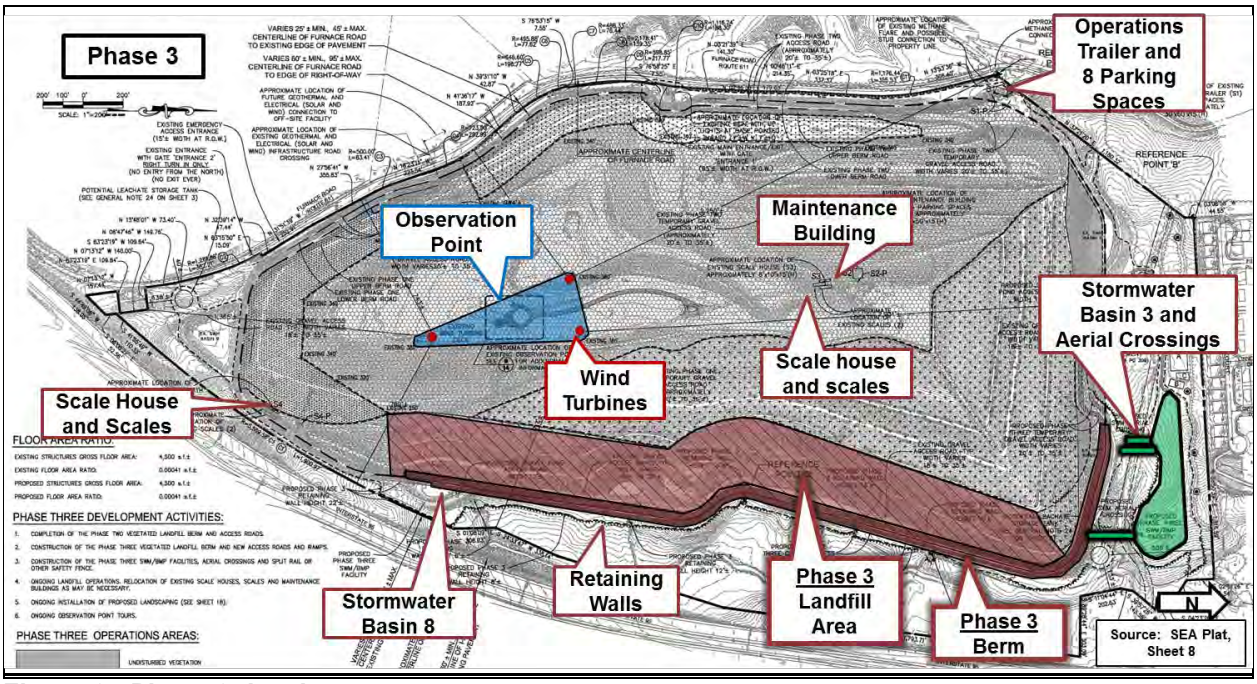

Figure 6: Phase 3 development

Up to seven retaining walls are proposed along the eastern portion of the site, adjacent to the Giles Run EQC, RPA, and floodplain areas. The retaining walls are not located on the vegetated berm but on the eastern side of the lower berm access road and are intended to provide an additional buffer to the EQC, RPA, and floodplain areas. The retaining walls prevent the embankment of the berm access road from impacting the RPA. The applicant provides further explanation of the retaining walls in Appendix 2E. The retaining walls are proposed to be approximately 6 to 22 feet in height. Figure 6 depicts the Phase 3 development.

Phase 4

Phase 4 landfill operations include landfilling, construction of the vegetated berm/access roads, and landscaping in the northern portion of the landfill, and the Observation Point tours are proposed to continue. An interim vegetated cover will be provided in disturbed areas where landfill operations are complete and where an interim landfill cap has been installed.

Construction of stormwater basin 2 in the northern portion of the site is proposed to begin. An approximately 10-acre area in the southern portion of the landfill will be available for a potential solar panel farm by the applicant/owner and/or by others. Figure 7 depicts the Phase 4 development.

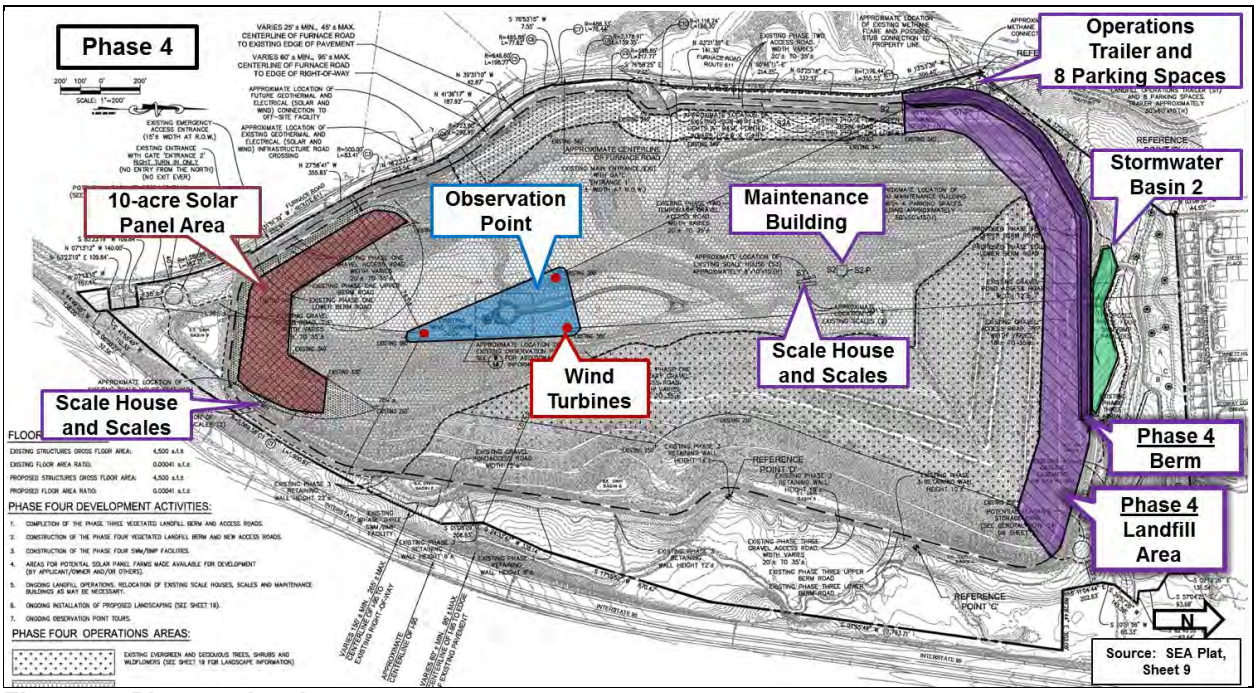

Figure 7: Phase 4 development

It is noted that the site's northern property line abuts the Lorton Valley subdivision. The vegetated berm would be buffered from the Lorton Valley subdivision to the north by a distance of 429 to 489 feet between the berm and the site's northern property line. As shown in Figure 7A, within this area is the 5.2 acre private recreational area proposed for the Lorton Valley Homeowners Association; a required 50-foot transitional screening area; a 23,979 square foot reforestation area; a stormwater management pond and associated access road; and existing and supplemental vegetation.

Washington Gas and Light Company and Columbia Liquified Natural Gas have an existing 40-foot wide gas transmission line easement that runs in an east to west

direction parallel to the northern property line. Because the gas line easement meanders along the northern property line, the closest point from the easement to the northern property line is approximately 110 feet at the northwest corner of the site and at the farthest point is approximately 210 feet near the northeast corner of the site.

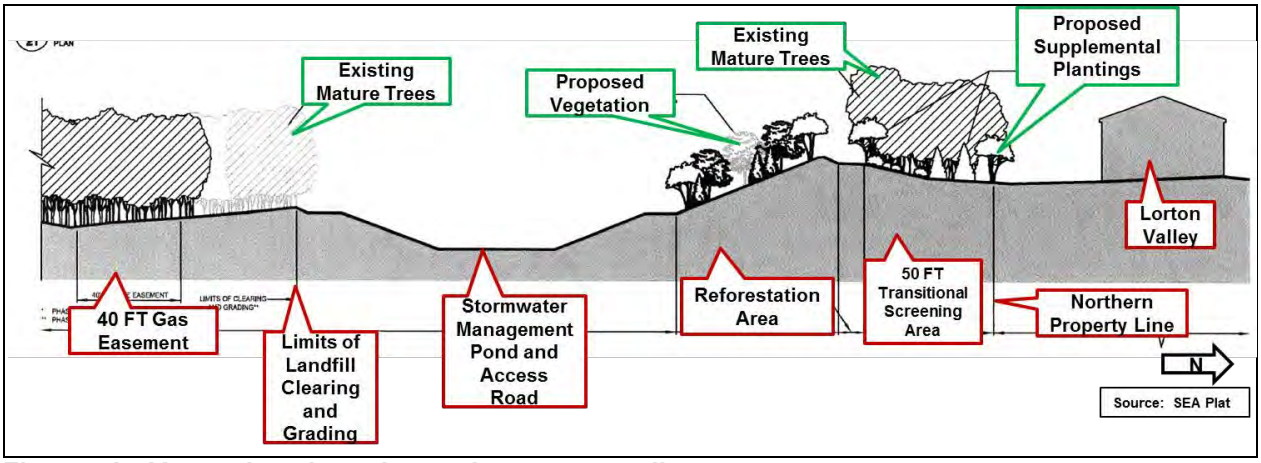

Figure 7A: Vegetation along the northern property line

Phase 5

The three wind turbines installed in Phase 1 are proposed to be removed in Phase 5 in order to complete the landfill operations in that area. In addition, the Observation Point is proposed to relocate further north to allow for completion of landfill operations in that area. During the relocation of the Observation Point, the tours would cease until the Observation Point has been relocated. Once the tours resume, they are proposed to continue through the landfill post-closure period.

Phase 5 landfill operations include the construction of the vegetated berm and associated access roads and landscaping at the top of the landfill. Completion of the stormwater management basins would continue until the landfill operations are complete. Once the landfill operations are complete, the maintenance building, scale houses and scales, and operations trailer would be removed and the final landfill cap and landscaping will be installed.

Phase 5 also includes the landfill's post-closure period. After a landfill closes, post-closure period activities and monitoring are required by DEQ to ensure environmental and public health safety. For a CDD landfill, post-closure activities are approximately 10-years. According to DEQ, post-closure period activities include "maintaining the integrity and effectiveness of the final cover, maintaining and operating the leachate collection system, monitoring the groundwater and maintaining and operating a gas monitoring system." Figure 8 depicts the Phase 5 development.

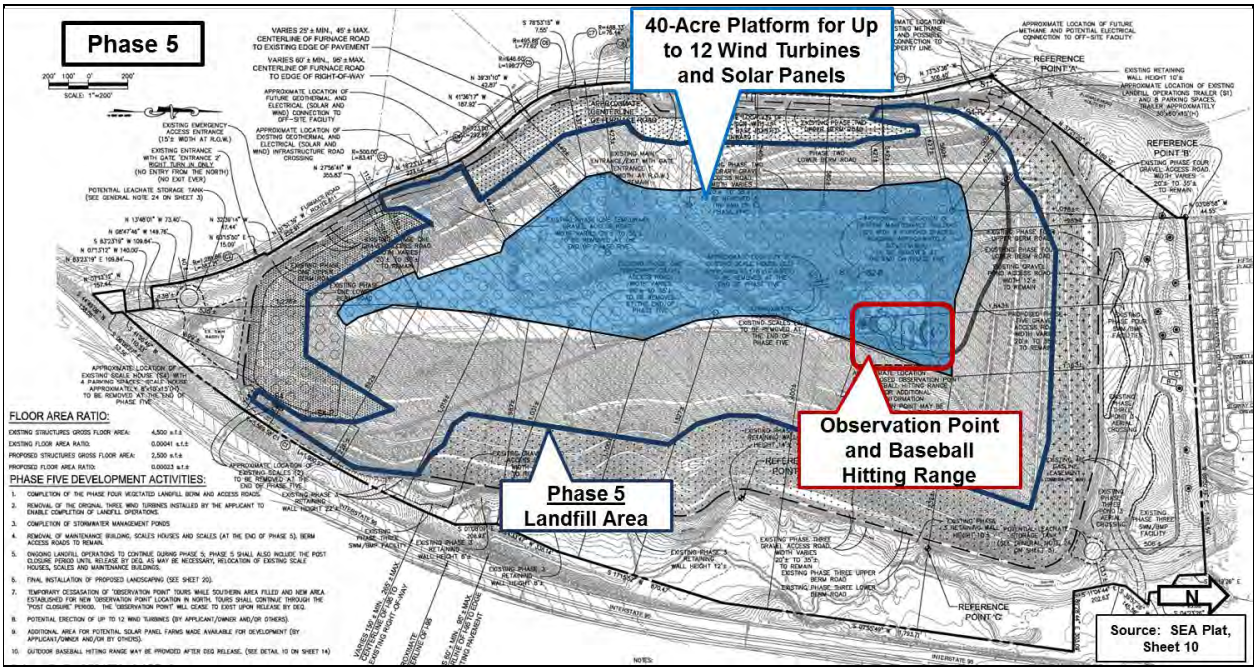

Figure 8: Phase 5 development

Prior to the end of Phase 5, up to 12 wind turbines may be erected subsequent to the cessation of landfill operations and an additional area for solar panels would be available for development by the applicant/owner and/or by others. The wind turbines and solar panels installed in Phase 5 may continue into Phase 6. Staff recommended that in order to be in harmony with the Comprehensive Plan land use recommendation, the proposed active recreational uses should be provided during the post-closure monitoring period and not tied to the cessation of the potential establishment of up to 12 wind turbines and/or solar panels on the 40-acre platform. As such, the applicant proposes that an outdoor baseball hitting range may be provided at the end of Phase 5 as shown on Sheet 14 of the SEA Plat.

Phase 6

Active recreational uses constructed and operated by lessees are proposed in Phase 6 after the DEQ post-closure period ends. Such active recreational uses include a baseball hitting range with the potential for a second nine-station batting range, and a golf driving range and/or radio controlled aircraft field.

The baseball hitting range consists of nine individual batting cage stations with an automated fee collection box and a centrally located pitching machine. The golf driving range consists of 25 tees with a target green up to 300 yards in length with distance markers at 100, 200, and 300 yards. An operations and maintenance structure containing 800 square feet (15 feet in height) is proposed with the golf driving range.

The radio controlled aircraft field consists of a field area, taxi area, flight stations, pits, and spectator area. No structures are proposed. Parking areas are provided for the active recreational uses and all traffic in Phase 6 are proposed to be able to make left turns in and right turns out at the site's main entrance. Figure 9 depicts the Phase 6 development.

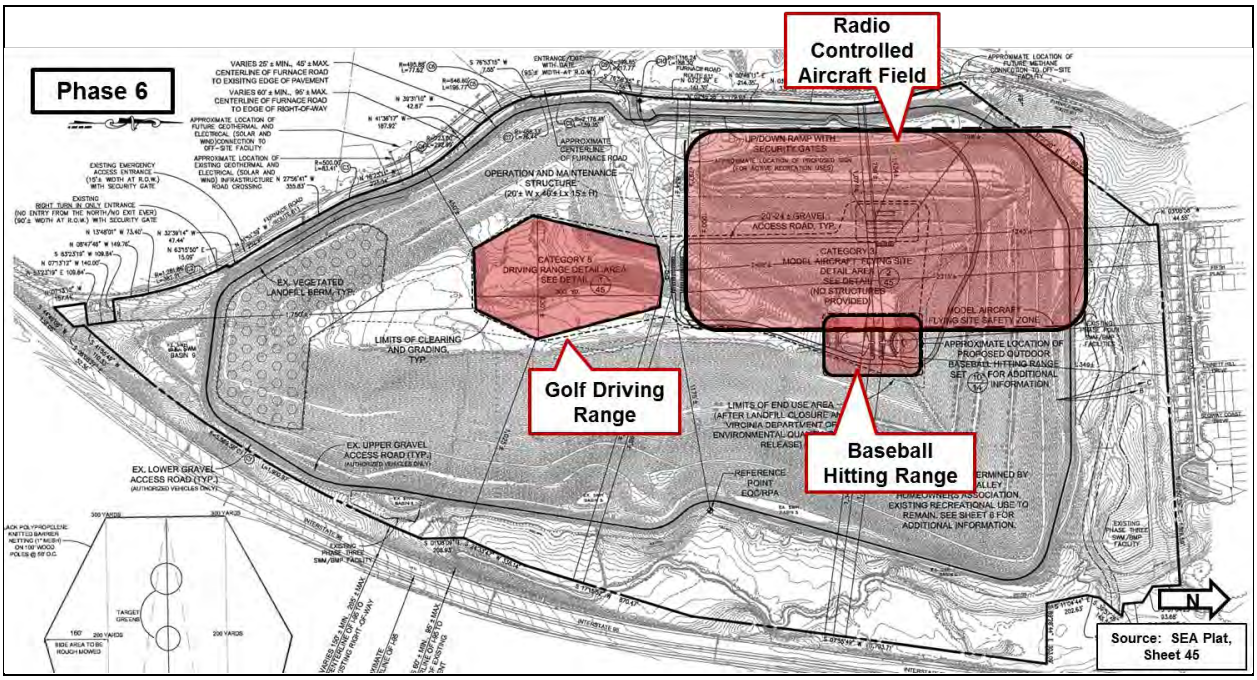

Figure 9: Phase 6 development

Electrical Generating Facilities (Appendix 2B)

The applicant's Green Energy Park (GEP) is a proposed on a portion of the landfill and consists of four renewable electrical generating facilities: wind, methane gas, geothermal infrastructure collection systems, and potentially solar panels, as interim uses during both the landfill operations and landfill post-closure period.

Geosyntec stated in its report entitled "Feasibility Study for Renewable Energy Technologies Lorton Energy Park, Lorton Landfill, Virginia," (subsequently referred to as the Feasibility Study) dated August 17, 2011, and provided as Appendix 2B, that the applicant's proposed GEP would represent a number of significant firsts:

1. If operational at an output level above 1-megawatt (actual), the GEP would be the largest 100% renewable energy park in Virginia[5];

5. Page 44 of the Feasibility Study, provided as Appendix 2B.

2. The GEP would be the first landfill in Virginia where a mix of two or more renewable energy technologies are developed[6];
3. The GEP would be the first landfill in the nation where more than three renewable energy technologies are developed[7];
4. The landfill would be the first in the nation to utilize the heat capacity of waste for geothermal energy supply to offsite end users[8]; and
5. The GEP would be the first landfill of its scale to utilize four renewable energy technologies[9].

Figure 10 depicts the applicant's proposed Green Energy Park.

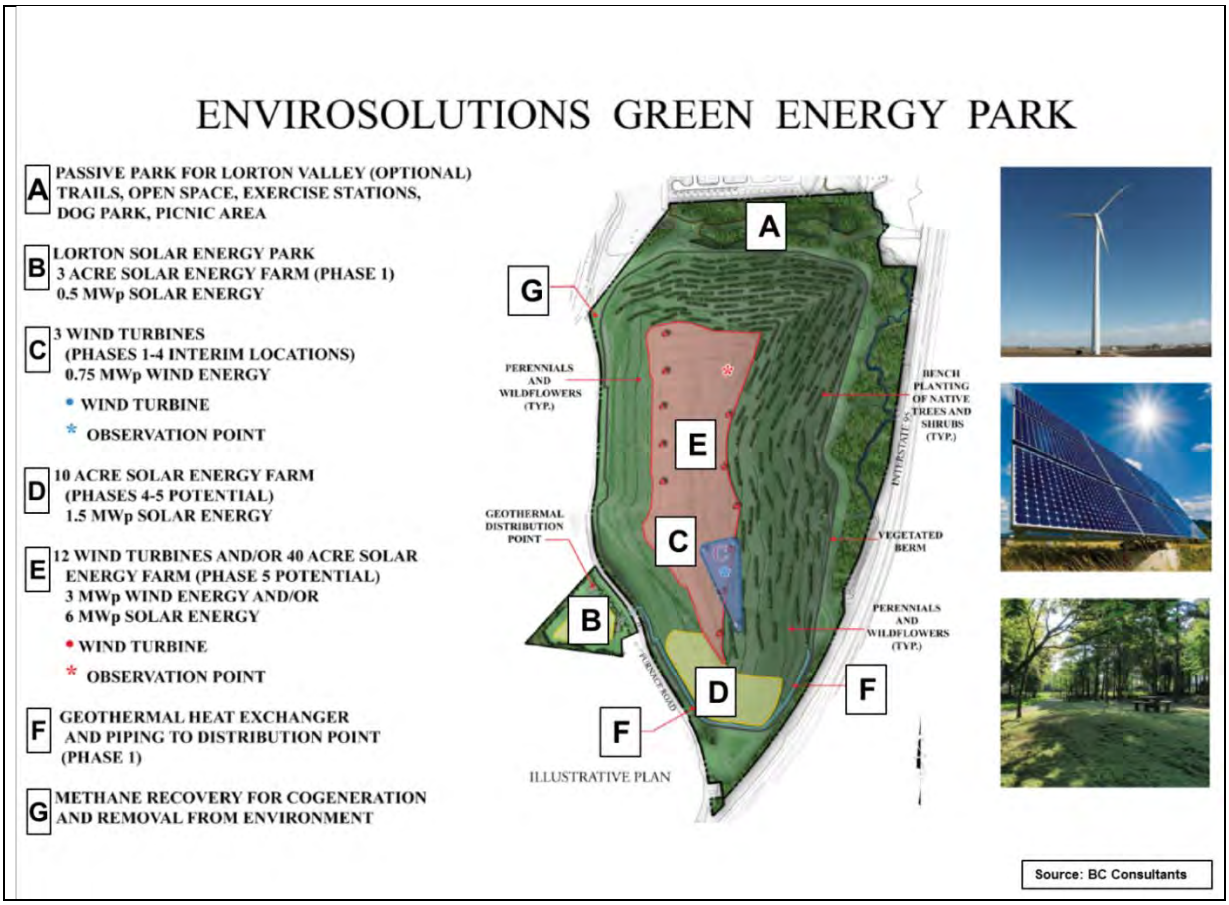

Figure 10: Applicant's Proposed Green Energy Park

It is noted that the applicant only has committed to providing the methane gas and geothermal infrastructures; as well as, the installation of three wind turbines in Phase 1.

6. Page 44 of the Feasibility Study, provided as Appendix 2B.
7. Page 44 of the Feasibility Study, provided as Appendix 2B.
8. Page 44 of the Feasibility Study, provided as Appendix 2B.
9. Page 39 of the Feasibility Study, provided as Appendix 2B.

The applicant has indicated that the 12 wind turbines and/or solar panels proposed in Phases 4 and 5 could be provided by the applicant/owner and/or by others. The applicant's proposed electrical generating facilities consist of the following:

Wind Turbines

As previously discussed, the applicant proposes to install three wind turbines in the southern portion of the landfill by the end of Phase 1 and are anticipated to become fully operational by 2019. Each of the wind turbines is proposed to be capable of producing at least one-quarter megawatt peak of electricity. The first wind turbine is proposed to be installed no later than 18-months after the following approvals are obtained: Federal Aviation Administration (FAA); DEQ; the County's Geotechnical Review Board; site plan, land development, and structural permits; Non-Residential Use permit; and other applicable approvals/permits that may be determined. It is noted that because of evolving technology and/or precedent being set, additional approving agencies or approvals may later be identified since such technology/approvals may not exist or be applicable at that time. The second and third turbines are proposed to be installed within 36 months after having obtained the necessary approvals (described above). The three proposed wind turbines are proposed to operate for their useful life or until the initiation of Phase 5 landfilling activities require their removal (anticipated by the applicant to be approximately 2037).

According to Geosysntec, the combined annual electricity production of the three wind turbines is estimated to be approximately 585,139 kilowatt hours (kWh) of direct current (DC) and 450,557 kWh after the requisite conversion to alternate current (AC). Such conversion is required whether for use on-site at the landfill or for use when delivered from the electrical grid and results in a loss of energy produced by the wind turbines. As a result, the applicant has indicated a commitment to install an "inverter" or similar device to accomplish such conversion to AC. Staff has proposed this as a development condition and is proffered by the applicant as part of pending PCA 2000-MV-034.

The applicant proposes to retain a portion of the energy generated from the three Phase 1 wind turbines for electrical consumption by the landfill activities. Geosyntec estimates that during Phase 1, within the first year or two of full wind turbine operation, energy consumption by the landfill activities will be 213,488 kWh or approximately 47% of the electricity produced by the three wind turbines (450,557 kWh after conversion to AC). Geosyntec further estimates that in early Phase 2, annual electricity consumption will be approximately 340,652 kWh or approximately 76% of wind turbine AC production. The energy produced by the wind turbines is anticipated to produce electricity for the scale houses, scales, maintenance building, operations trailer, methane blower, and leachate tanks. Within 6 to 7 years after initiating operation of the three wind turbines, landfill electrical consumption is expected to exceed electricity production by the three wind turbines.

The applicant proposes to contribute to the County 50% of any revenue in excess of 2.5 cents per kilowatt hour that the applicant receives from the sale of the electricity produced from the three Phase 1 wind turbines to the electrical grid. For any electricity produced by the Phase 1 wind turbines and consumed on-site, the applicant proposes to contribute to the County 50% of the price (over 2.5 cents) it would have paid to a third party provider for the electricity supply service net of taxes and distribution charges.

By the end of Phase 5, the applicant proposes to have established an approximately 40-acre platform for the potential to establish up to 12 wind turbines or wind infrastructure sufficient to produce at least three megawatt peak electric power capacity to be provided by public and/or private entities with the applicant's agreement. A contribution to the County of 50% of the net profit from any renewable energy sales related to the Phase 5 wind and/or solar infrastructure on the landfill site (referred to as the full Green Energy Park by the applicant) is proposed. The wind turbines in both Phases 1 and 5 are proposed at a maximum height of 180 feet with the tower height approximately 120 feet, the rotor radius approximately 60 feet, and the tower base approximately 10 feet in diameter.

Solar Panels

In Phase 4, an approximately 10-acre area in the southern portion of the landfill is proposed for development of a solar panel farm by the applicant/owner and/or by others. By the end of Phase 5, the applicant proposes to have established an approximately 40-acre platform on the top of the landfill to provide a platform to establish additional solar panels or solar conversion infrastructure sufficient to produce at least 7.5 megawatt peak electric power capacity, to be provided by public and/or private entities with the applicant's agreement. The proposed solar panels contain approximate 1,250 square feet (50 feet in length and 25 feet in width) and are approximately 10 feet in height. The applicant indicates that the final size may be adjusted depending on the prevailing technology at the time of the installation, provided that the bulk regulations of the R-1 District are met.

Methane Gas

The applicant proposes to install a methane gas recovery system and associated connection to an off-site facility at the northwestern portion of the site in Phase 1. "Methane is produced from biological degradation of organic waste in landfills; rates of methane production are highest in freshly disposed wasted and decreased exponentially with time thereafter. Because the organic content of CDD is relatively low, CDD landfills produced less methane more slowly than other municipal waste landfill. Extending the total quantity of waste in place and period of waste placement in the landfill would

therefore not only increase the total methane yield, but also overcome limits on the scale and duration for which methane recovery is practical.[10]"

The applicant proposes to have sufficient methane gas available to the County to generate the equivalent of an average of two million kilowatt hours of electricity annually. Should the applicant fail to provide sufficient methane gas to generate the two million kilowatt hours in any given year, the applicant proposes to pay the County $0.125 for each equivalent kilowatt of electricity that cannot be generated due to the unsupplied methane gas, up to a maximum payment of $250,000 in any given year. After 2040, the applicant proposes to contribute to the County 50% of the methane gas that is recovered from the methane recovery system and proposes to continue to do so until the DEQ post-closure period ends.

Geothermal

The applicant proposes to install a geothermal recovery infrastructure in the southwestern area of the site in Phase 1 with the capacity to support 1 million square feet of building structures. The energy would be transferred to an off-site geothermal storage pad as part of pending PCA 2000-MV-034 at Tax Map 113-1((1)) 12 and 13. The County would be permitted to utilize the geothermal at no cost but would be responsible for providing the required infrastructure and equipment to connect to geothermal energy. If the County is unable to connect to the geothermal connection, then the energy would not be utilized. The applicant proposes to maintain the geothermal recovery infrastructure and related access point until the DEQ post-closure period ends.

Failure to Provide Electrical Generating Facilities

Staff and the applicant have worked on a development condition to address an inability or failure to provide the proposed electrical generating facilities. For any electrical generating facility not provided in the timeframe to be stated, the following shall be paid by the applicant to the Fairfax County Board of Supervisors for the respective renewable energy generating facility not provided within the timeframe specified in the following: (i) $1,000,000 for each Phase 1 wind turbine not installed within 4 years of necessary approvals for the landfill expansion; (ii) $6,000,000 should the methane recovery system not be installed within 4 years of receiving the necessary approvals for the landfill expansion (while still being committed to pay $250,000 or to supply two million kilowatt hours annually); and (iii) $1,000,000 should the geothermal not be installed as approved by DEQ within 4 years of receiving the necessary approvals for the landfill expansion. In lieu of the payment penalty, the applicant may expend one or more of the penalty amounts on the installation of on-site renewable energy technology other than that

10. Page 23 of the Feasibility Study, provided as Appendix 2B.

technology not timely provided, subject to a Board Motion authorizing such expenditure and installation. The Zoning Administrator may grant extensions to the above penalty payment periods if it is determined that the applicant diligently has pursued said necessary approvals. The necessary approvals include FAA, GRB, DPWES, DEQ, and applicable approval or permits.

Access and Transportation (Appendix 5)

The site's main entrance is located off of Furnace Road and currently provides both ingress and egress. The main entrance is proposed to remain unchanged in its location throughout the five phases of development.

In Phase 1, the applicant proposes to construct a right turn in-only entrance (no exit) south of the main entrance for trucks travelling northbound on Furnace Road to access the site. This is intended to improve on-site truck queuing, landfill operations, and internal circulation patterns. With the completion of the southern entrance by Phase 2, the site's existing main entrance is proposed to be used as an exit for trucks to turn left only onto Furnace Road.

The Virginia Department of Transportation (VDOT) recommends construction of a right turn lane to serve the new southern right-in access to improve the traffic flow on Furnace Road. The southern entrance is proposed to be a right-in turn lane, which addresses VDOT's recommendation. Upon entering the site, trucks follow the entrance road to the scale house where their loads are weighed and inspected. Currently, there is a queuing area for trucks approaching the scale house. A total of 24 queuing spaces are provided at the beginning of Phase 1. At the end of Phase 1, 26 queuing spaces are provided. In Phases 2 through 5, 38 truck queuing spaces are provided along the southern portion of the property. The number of truck queuing spaces is based on a truck length of 55 feet. With the queuing spaces provided, it is not anticipated that trucks would back up onto Furnace Road. Further, an existing development condition is proposed to remain that permits the applicant to allow trucks to queue on-site 1 ½ hours before landfill operations begin Monday through Friday and 1-hour earlier before the landfill opens on Saturdays to further ensure that trucks are not stacked on Furnace Road.

The Fairfax County Department of Transportation (FCDOT) recommended that the applicant add additional signage and traffic control devices to the site's main entrance to further emphasize that only left turns are permitted into the site from southbound Furnace Road and a left turn only from the site's main entrance. The applicant is proposing to provide additional signage to emphasize that only left turns are permitted. There is an existing concrete island at the site's main entrance, which prohibits trucks from making a left turn into the site from southbound Furnace Road. This concrete

island is not proposed to be removed. Staff has proposed development conditions to remedy this issue.

An emergency entrance is located approximately 100 feet north of the proposed southern entrance and is proposed to remain. However, VDOT recommends closing this entrance because it does not believe that it is necessary if the southern entrance is being constructed. VDOT suggested that the site's main entrance could be used as the emergency access. The applicant states a need for retaining the existing emergency entrance given the size of the site and size and slow movement of the trucks. Staff does not object to the emergency entrance remaining since it has already been established.

With each phase of development, internal gravel access roads are proposed to provide access to the active landfill areas and upper and lower berm roads are proposed with the construction of the vegetated berms to provide access and maintenance to the berm. The access roads may shift or move from the general location as depicted on the plat due to the general operation of the landfill during each of the proposed phases of development.

A total of 42 parking spaces are proposed in Phases 1-5 for landfill operations, maintenance, the baseball hitting range, and electrical generating facilities. At the end of Phase 5, after the landfilling activities have ceased, the number of parking spaces is reduced to 34 spaces. In Phase 6 with the active recreational uses, the total number of increases to 78 parking spaces. Two loading spaces are proposed in Phases 1-5 and no loading spaces are proposed in Phase 6.

A tire wash system currently exists at the site's main entrance and would remain. The tire wash system includes a wash rack/grate system to dislodge mud on truck tires. The applicant proposes to improve the tire wash by adding "cattle guards" to knock off mud and water in three locations: before the tire wash, immediately after the tire wash, and at the landfill exit. A development condition on the tire wash has been proposed.

Landscaping (Appendices 6 and 7)

Within the approximately 429 to 489-foot area between the north side of the berm to the northern property line, the applicant will maintain a 50-foot wide transitional screening area along the site's northern property line, adjacent to the Lorton Valley subdivision. Within the 50-foot wide transitional screening area, supplemental vegetation is proposed consisting of deciduous and evergreen trees. A 23,979 square foot reforestation area is shown in the northeastern portion of the site, south of the 50-foot transitional screening area and north of stormwater pond #3. Within the reforestation area, a mix of deciduous and evergreen overstory and understory trees are proposed and will be stabilized with a seed mix of native perennials and grasses. Figure 11 depicts the transitional screening and reforestation area along the northern property line.

In addition, along the southern property boundary from the southernmost point of the property to approximately 600 feet along the southwestern boundary and 800 feet along the southeastern boundary, a landscaped buffer of at least 100 feet is proposed to be maintained by the applicant. In any area along this boundary where a minimum of 100 feet of natural vegetation does not exist, the applicant proposes to provide additional landscaping for the review and approval of the Urban Forest Management Division (UFMD). It is noted that there is proposed to be a reduction in the distance along the southeastern boundary from an existing 1,600 feet to 800 feet for the construction of the vegetated berm in this area. Staff does not object to this reduction in distance since this area is outside of the EQC/RPA area and is adjacent to I-95. There would be no change to the existing landscaped buffer in the vicinity of Parcel 3, which contains a single family dwelling.

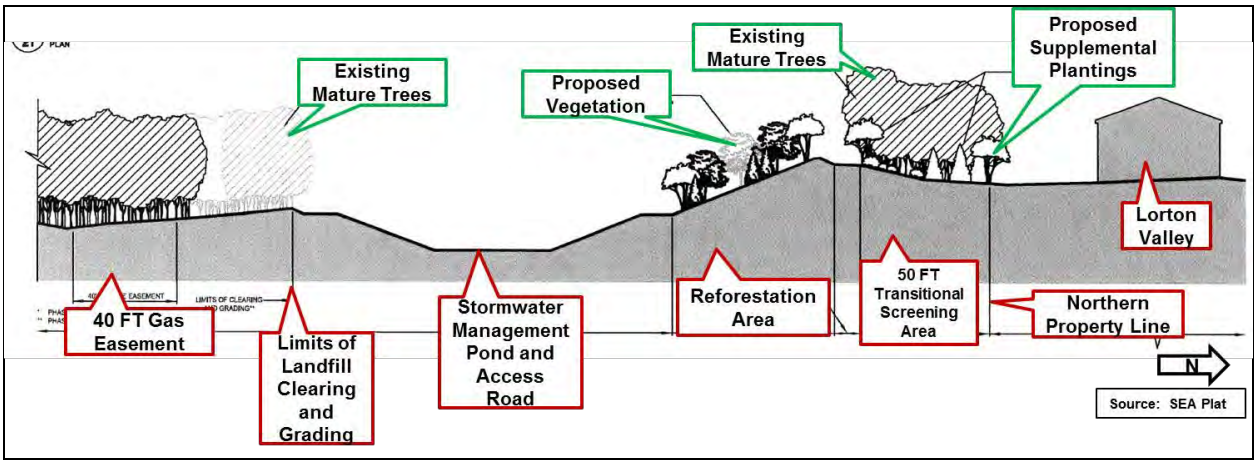

Figure 11: Transitional screening, reforestation, and proposed vegetation along the northern property line

To ensure that landscaping appropriately is installed, as part of the site plan submission the applicant is required to provide a landscape plan for review and approval by UFMD. UFMD has been working with the applicant to address the previous issues with the landfill landscaping and an action plan has been created and currently is being implemented to address those previous landscaping issues. At the time of site plan review, the applicant's arborist will develop an invasive species management plan for UFMD approval, in order to control non-native invasive vegetation and to promote the establishment of native species. In addition, staff has proposed a development condition at the time of site plan that the applicant provides cash, bond, or a letter of credit and payable to the County in an amount determined by UFMD to ensure that the approved landscaping is completed.

The applicant proposes that landscaping in one phase may begin before the completion of any prior phase to facilitate ongoing landfill operations. An interim vegetative cover will be provided in disturbed areas where landfill operations are complete and where an

interim landfill cap has been installed for any area regardless of the phase. Final cover material for the landfill will be provided in accordance with DEQ design requirements. Additional soil will be placed on top of the final cover in areas where tree plantings are to occur, subject to the review of UFMD and DEQ approval. The final landscaping of the landfill is proposed to occur within one year after the termination of landfilling operations and completion of the full landfill cap.

The subject property contains an existing tree canopy of 2,662,285 square feet. A 10-year tree canopy of 30% (3,264,617 square feet) is required. The applicant proposes to provide a total 10-year canopy area of 3,762,728 square feet with 1,734,528 square feet provided through tree preservation. A total of 4,393 deciduous trees and 8,787 evergreen trees are proposed for the subject property.

Primary and Intermediate Benches

The sides of the landfill are proposed to consist of a series of benches (also referred to as side slope terraces or tack-on benches) and slopes, which is intended to provide a more naturalistic planting scheme. The applicant stated that use of primary and intermediate benches of varying lengths avoids the long continuous lines of tree and shrub plantings, which allows plant material to be spread out over a larger area in order to provide a more complete and continuous view of the tree cover. Figure 12 depicts a typical primary and intermediate bench on the side slope of a landfill.

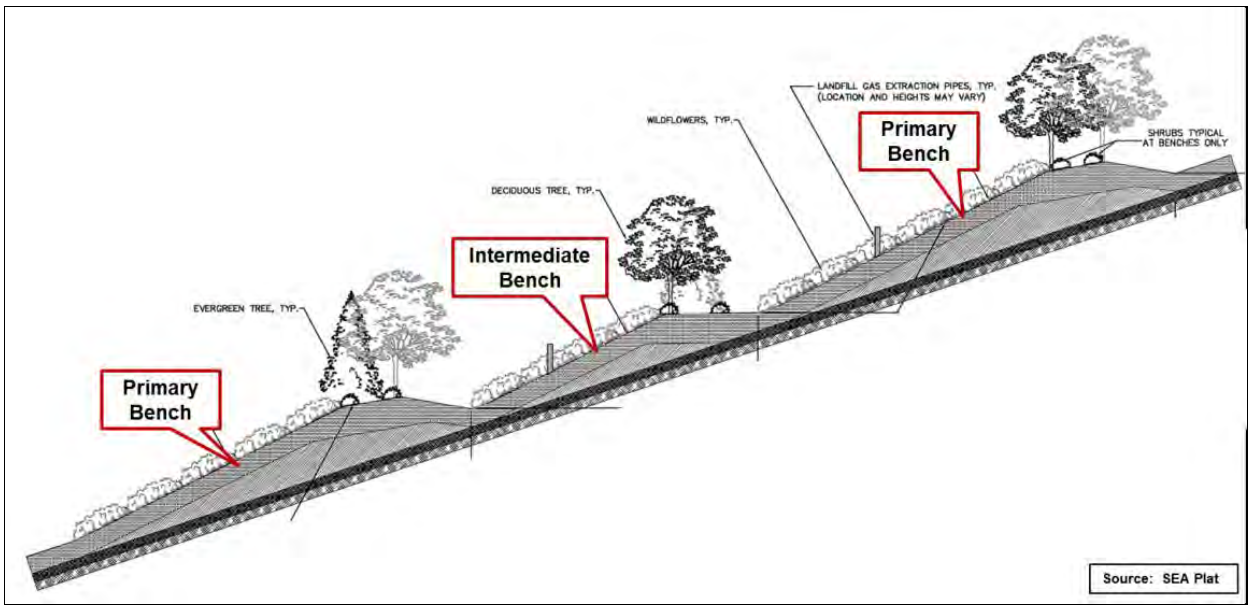

Figure 12: Typical primary and intermediate benches on a side slope of a landfill.

The slopes are designed at a 3:1 (horizontal: vertical) slope, as previously approved. The benches provide a relatively flat section of ground to the side slope of a landfill and

usually consist of structural fill material covered by a layer of topsoil. The major function of a primary bench is stormwater management and maintenance access. It is staff's understanding that the bench collects stormwater runoff in a drainage ditch that ultimately drains into a stormwater management/best management practices facility. A primary bench includes a gravel driveway to provide access for maintenance activities and a planting area to permit the planting of trees and shrubs. The applicant indicates that primary benches could extend across the face of the landfill at varying lengths and could be located approximately 40 feet vertically apart. Intermediate benches fill the gaps between widely spaced primary benches.

As shown on Sheet 15 of the SEA Plat, a typical proposed primary bench is approximately 67 feet in length and consists of a final cover system located above the CDD waste with a protective cover above. A minimum 3-foot layer of topsoil is located on top of the protective cover with an erosion control mat on top to provide protection to the slope of the bench. The slope terrace of the bench is approximately 22 feet in width and consists of a 10-foot planting bench with a 5-foot minimum topsoil planting depth, which would allow for vegetated plantings, and a 12-foot wide access and stormwater collection bench. The primary bench is approximately 22 feet in height. Landfill gas extraction pipes may be located on the primary bench. The locations and heights may vary.

Intermediate benches are proposed to provide additional planting areas in between the primary benches. As shown on Sheet 15 of the SEA Plat, a typical proposed intermediate bench is approximately 46 feet in length. Above the CDD waste is a final cover system with a protective cover above, a top soil cover above that, and a minimum of 3 feet of topsoil with an erosion control mat above to provide protection to the slope of the bench. The bench is approximately 15 feet in width, 10 feet consists of the planting bench with a 5-foot minimum topsoil planting depth for vegetated plantings and the bench could also include a gravel driveway. Unlike primary benches, intermediate benches are shorter in length and width and do not collect stormwater runoff.

Stormwater (Appendices 7 and 8)

<u>Best Management Practices (BMPs)</u>

The subject application is a redevelopment proposal in accordance with Chapter 118-1-6 of the Fairfax County Code, which defines redevelopment as "the substantial alteration, rehabilitation, or rebuilding of a property for residential, commercial, industrial, or other purposes where there is no net increase in impervious area by the proposed redevelopment within a Resource Protection Area (RPA) and no more than a net increase in impervious area within an Resource Management Area of 20% relative to the conditions prior to redevelopment." Therefore, the applicant is not

proposing an increase in impervious area within the RPA and there is less than a 20% increase in impervious area from existing conditions.

A total of 37.25 acres of privately maintained open space has been placed within conservation easements, floodplain, and storm drain easements along the northern and eastern boundaries of the site. The applicant proposes a stormwater management pond and some recreational amenities within an existing 8.54 acre conservation area located along the site's northern property line. To offset the addition of amenities in this existing conservation area, the applicant proposes a nearly in kind 8.24 acre offsite conservation easement at the applicant's adjacent vacant 17 acre R-1 property located across Furnace Road at Tax Map Parcel 113-1 ((1)) part 5. Staff has indicated that this in kind offset is adequate and would provide a water quality benefit for the proposed application. The proposed off-site conservation easement would receive 100% phosphorus removal efficiency, giving a total site phosphorus removal efficiency of 15%, which is greater than the 10% required for BMPs.

The site also contains existing BMPs consisting of a 3.89 acre on-site conservation easement located along the western portion of the northern boundary and an existing 23.81 acre floodplain easement located along the eastern portion of the site. BMPs in the form of conservation and floodplain easements were provided with the current special exception amendment and associated approved site plan to meet the redevelopment requirement. This SEA proposes to delete the public park use and to add electrical generating facilities, among other site improvements. Because the electrical generating facilities do not result in any more impervious area than the public park use, the BMPs provided with the previously approved SEA still adequately serve the property. Currently, the site achieves 15% phosphorous removal but will have to meet a minimum of 20% phosphorous removal, which exceeds the current PFM requirement to meet the new stormwater regulations. The applicant has not provided such calculations for the new Public Facilities Manual requirements on the SEA Plat since the new stormwater regulations were adopted after the submission of the SEA Plat. The applicant maintains that the new stormwater regulations can and will be met. Staff notes that that the new stormwater regulations are anticipated to be in effect on July 1, 2014, and the applicant will be required to meet the new stormwater regulations, if not grandfathered.

Stormwater Detention

There are seven existing stormwater management ponds on-site, numbered 2-6, 8, and 9. Six of the seven ponds drain to Giles Run before crossing under I-95. The southernmost pond (stormwater pond #9) drains into an unnamed tributary of Belmont Bay. The entire site is within the Mill Branch watershed and there are no water quality control plans on the subject property.

The existing stormwater management ponds were designed to provide erosion and sediment control during the ongoing landfill operations. As part of the proposed expansion of the landfill, the seven existing stormwater management ponds would be consolidated into four dry stormwater management basins. Existing ponds #4-6, located along the eastern portion of the site, are proposed to be removed. To compensate for the loss of storage volume, existing ponds #2, 3, and 8 will increase in volume and relocate near their original footprints as stormwater basins. Existing stormwater management pond #9 will not be disturbed.

Approximately 191.62 acres of runoff from the landfill is proposed to be collected in a series of benches that will direct the water to down drains. The down drains will convey the water from the landfill slopes to a collection of four proposed stormwater basins. The original outfalls to all existing seven stormwater management ponds is proposed to remain and the pre-development controlled flow and their corresponding outfall would be matched in post-development conditions.

Stormwater management basin #2 is proposed to have an area of 1.33 acres with a dam height of 22 feet and located on the north side of the landfill. It has been designed to manage 34-acres of runoff from the site. This basin is proposed to replace an existing stormwater management pond identified as existing pond #2 and the basin is proposed to be reconstructed with a new outfall structure and the new outfall would remain within the existing channel.

Stormwater management basin #3 is proposed to have an area of 2.40-acres with a dam height of 14 feet and located in the northeastern corner of the site on the north side of the landfill. It has been designed to manage 79.50-acres of runoff from the site. This basin would replace four existing stormwater management ponds, existing ponds #3-6, in order to reduce land disturbing activity and environmental impacts within the limited space between the proposed landfill expansion and existing floodplain. Stormwater basin #3 is located outside of an existing 40-foot wide gas easement located along the site's northern boundary. Two above grade stormwater aerial outfall steel pipes are proposed from the base of the landfill to basin #3. Basin #3 is proposed to be designed to meet or exceed proportional improvement design requirements for the four existing stormwater management ponds. Loss of vegetation will occur for development of basin #3 and its associated access road. The applicant provided on Sheet 21 of the SEA Plat and shown as Figure 11 in this staff report an illustration demonstrating the location of stormwater basin #3 to Lorton Valley, existing/proposed vegetation, and a 50-foot transitional screening area, and an existing ridge that shields visibility to the basin.

Stormwater management basin #8 is proposed to have an area of 35,760 square feet with a dam height of 15 feet and located in the southeastern corner of the site on the east side of the landfill. It has been designed to manage 31.33-acres of runoff from the

site. This basin would replace existing stormwater management pond #8 and is proposed to be reconstructed with a new outfall structure with the new outfall remaining within the existing channel.

Existing stormwater management pond #9 consists of 1.34-acres with a dam height of 18 feet and located in the southern-most corner of the site. The existing pond would not be disturbed. The pre-development and post-development drainage area, impervious area, and runoff volume would remain unchanged.

Each of the four proposed stormwater management basins have been designed for the 2 and 10-year storm events and the applicant has demonstrated that the stormwater release would be less than the pre-development conditions. Staff noted that there was a 2005 downstream complaint at 10201 Richmond Highway; however, most of that property lies within a 100-year floodplain. No other downstream drainage complaints were on file.

Outfall

As previously discussed, the proposed landfill expansion would consolidate seven existing stormwater management ponds into four proposed basins. Stormwater pond #9 will not be disturbed and would function as originally designed. Some internal drainage divides have been altered from the existing conditions so that runoff would be diverted into larger ponds to minimize the reconstruction of smaller ponds should natural divides be maintained. Environmental impacts would be minimized with this diversion. Basin #2 would collect runoff from most of the drainage area serving existing pond #2. Proposed basin #3 would collect the remaining runoff from existing pond #2, the runoff from the drainage area serving existing pond #3, and runoff from the drainage areas collected by existing ponds #4-6 (on the western portion of the site), which are proposed to be removed. The drainage area serving existing pond #9 would not change. The overall drainage divide for the site has been maintained from the existing conditions. Therefore, the applicant provides that stormwater outfall has been addressed pursuant to Sections 6-0203.3A and 4C of the Public Facilities Manual.

Section 15.2-2232 of the Code of Virginia Analysis (Appendix 9)

The applicant's proposal includes electrical generating facilities: specifically, wind and solar infrastructures. As previously discussed, the County Attorney determined that a review of Section 15.2-2232 of the Code of Virginia (2232 Review) is required for the wind and solar electrical generating facilities but not for the proposed methane gas and geothermal energies.

Section 15.2-2232 requires that all public areas, public buildings or structures, and public utility or public service corporation facilities be in accord with the Fairfax County

Comprehensive Plan and be reviewed by the Planning Commission to determine if the general or approximate location, character, and extent are substantially in accord with the Comprehensive Plan. As such, the applicant filed a concurrent 2232 Application with this SEA and the 2232 Review has been included in this staff report as Appendix 9.

The Fairfax County Comprehensive Plan, 2013 Edition, Area IV, Lower Potomac Planning District, as amended through April 9, 2013, LP2 Lorton-South Route 1 Community Planning Sector, page 75 specifically states the following:

> *Recommended Land Use Plan*
>
> *The land use plan in the Lorton-South Route 1 area includes: "gateway" site and building design; low and high density residential areas; industrial areas; "Town Center" and related uses; public facility use; recreational area; and environmentally sensitive areas. Although these uses are generally contained in one or two distinct subareas of the sector, it is envisioned that they will work in concert to create a comprehensive and interrelated community. Descriptions of the general concepts and recommendations are summarized below.*
>
> *Recreational Area*
>
> *The largest area planned for recreation or public park uses in the sector is located south of Dixon Street, west of I-95 and east of Furnace Road. While the area currently contains a large private debris landfill, it is envisioned that when landfill operations cease that this area will be developed with private or public recreational uses such as a golf course.*
>
> *Sub-unit B4*
>
> *Sub-unit B4 contains a private debris landfill. To help mitigate any visual impacts upon the surrounding area, buffers should be maintained around the landfill. When the landfill is built-out, it is recommended that the site ultimately be developed with active recreational uses such as a golf course.*

It is noted that the subject property also is located within Sub-unit B5 of the Lorton-South Community Planning Sector of the Comprehensive Plan. Since no landfill activities are proposed in this sub-unit, the land use recommendation for Sub-unit B5 is not applicable.

Location

Three wind turbines are proposed in Phase 1 located in the southern portion of the landfill and are proposed to be removed in Phase 5 to enable completion of landfill operations in the area where the wind turbines are located. An approximately 10-acre area in the southern portion of the landfill will be available for a potential solar panel farm by the applicant/owner and/or by others in Phase 4. Additionally, during the landfill post-closure period, up to 12 wind turbines and/or solar panels could be installed by the applicant/owner and/or by others on the 40-acre platform on the top of the landfill.

While the subject property is not located in a historic district, during the 2232 Review, staff stated that there are two National Register of Historic District in the vicinity of the subject property – the Town of Occoquan and the D.C. Workhouse and Reformatory. The applicant documented the potential visibility of the proposed wind turbines on the Town of Occoquan. Staff noted that if federal licensing or permitting for the installation of the proposed solar panels and wind turbines are required, this may require a review based on Section 106 of the National Historic Preservation Act of 1966 (NHPA), and the applicant should contact the Virginia Department of Historic Resources for guidance. Section 106 of the NHPA requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve. Further, when authorized by federal statute non-federal entities may be delegated legal responsibility for Section 106 compliance. The applicant indicated that a Section 106 review is not required since no federal permits are required. Staff forwarded the application to the Town of Occoquan for review but has not received any comments.

As part of the 2232 Review, the applicant provided a report entitled "Feasibility Study for Renewable Energy Technologies Lorton Energy Park, Lorton Landfill, Virginia," (subsequently referred to as the Feasibility Study) dated August 17, 2011, prepared by Geosyntec Consultants, which evaluated the feasibility of renewable energy technologies at the subject property. A copy of the Feasibility Study is provided as Appendix 2B.

The Feasibility Study indicated that constructing the proposed berm would allow for an increase landfill capacity and would create a height that would increase the potential for generation of the renewable energy at the landfill site. At the landfill location "consistent wind speeds for optimal wind power exploitation occur above a 475 feet above mean sea level, about 250 feet above the average surrounding ground surface. Placing a turbine on top of this landfill with the rotor above this level would provide access to steady winds.[11]" Geosyntec states that "this site is located outside of mapped areas of high wind power potential in Virginia but potentially within the zone of "good" wind availability associated with the Chesapeake Bay.[12]" For the proposed wind turbines, the

11. Page 18 of the Feasibility Study, provided as Appendix 2B.
12. Page 34 of the Feasibility Study, provided as Appendix 2B.

study indicated that "increasing the top deck area available at the highest elevation of the landfill (final debris elevation of 412 feet above sea level) will facilitate installation of wind turbines with rotor heights above the surrounding land surface where wind speeds are higher, more constant, and reliable throughout the year, without the need to construct excessively tall turbine towers.[13]"

With respect to the proposed solar panels, "construction of the berm and resulting increased of the landfill surface area would provide significantly increase area of southward facing side slopes, which provide a larger area for deployment of solar arrays with higher incident of solar radiation exposure.[14]"

The applicant maintains that the three proposed wind turbines at the southern end of the landfill in Phase 1 will not be visible to the residents of Lorton Valley, the residential community closest to the landfill. The applicant indicates that the only homes that will be able to view the three wind turbines are located a significant distance from the landfill across I-95 and on high points of land. Only those homes with a view of the north slope not impeded by intervening topography, trees, or structures may experience perceptible visual difference in the profile of the landfill, depending upon the respective distance from and angle to that slope.

The applicant provided multiple photographic simulations depicting the existing and projected conditions of the subject property in 2013, 2019, 2033, 2040, and 2050. The photo simulations are provided as part of Appendix 9. Based on a review of the photo simulations, it is staff's opinion that the proposal would not appear to have an adverse negative visual impact given the distance from residential properties. Also depicted in the photo simulations, the proposed landscaping provides a more natural screening effect on the north and east slopes of the landfill. A vegetated berm and a 50-foot wide vegetated buffer are located between the closest residential neighborhood to the north and softens the appearance of the proposed Phase 5 wind turbines at their proposed elevation.

Character

Although the placement of wind turbines atop the landfill may be visible from adjacent property, staff does not believe it would cause an adverse visual impact due to the location of the proposed wind turbines and staff believes that the subject property is a suitable location for this type of use. The proposed wind turbines would be situated at a height and location that would minimize visual impacts to residential neighborhoods to the north in Phase 5 and the D.C. Workhouse and Reformatory Historic District to the west/northwest of the landfill. Interstate-95 to the east serves as a buffer, as does the existing landfill and open space to the south and west to minimize the visual impact.

13. Page 40 of the Feasibility Study, provided as Appendix 2B.
14. Page 40 of the Feasibility Study, provided as Appendix 2B

The solar panels are proposed to be 10 feet in height and placed low to the ground and fixed in their locations and are not anticipated to create a negative visual impact to adjacent properties.

Extent

The Feasibility Study also addressed concerns associated with the proposed solar and wind infrastructures. With wind turbines, there are environmental concerns, such as visual impact, noise, and risk of bird collisions. The Feasibility Study indicates that the installation of wind towers would require identification of known airports and landing strips in the vicinity of the landfill and installation of aviation warning light on the towers. In addition, the Federal Aviation Administration (FAA) conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning the installation of the three wind turbines proposed at the southern portion of the landfill in Phase 1. The Phase 5 proposed wind turbines were not included in the FAA review. The FAA concluded that the three Phase 1 wind turbines do not exceed obstruction standards and would not be a hazard to air navigation and such determination is provided as Exhibit 10 of Appendix 2B. It is noted that the FAA determination expires on June 10, 2014, and the applicant acknowledges that it will need to reapply for another FAA determination.

The Feasibility Study also indicated that visual and aesthetic concerns commonly are expressed concerns with wind turbines and that determination of adverse visual impact is highly subjective as it depends on the values, beliefs, and experiences of individual views.

The applicant demonstrated that no substantial noise impacts are expected to emanate from the proposed wind turbines. According to Geosyntec, "at a distance of 1,600 feet away from the turbines, the noise (at less than 40dBA) would be only 1/16th that of nearby traffic on I-95 (at about 80 dBA) and less than that of a normal conversation (at about 50 dBA). The turbines would not add any noise above the ambient level of suburban residential areas at night.[15]"

In addition to visual and noise effects commonly associated with wind turbines, bird collisions have been raised as a concern. According to Geosyntec, "the collision rate of birds with turbines is reportedly very low, similar to that from electrical transmission lines.[16]" Geosyntec further states that "[b]uildings (particularly with glass facades), communications towers, traffic, and house cats are responsible for far greater numbers of bird deaths per year than wind turbines.[17]"

15. Exhibit 6 of the Feasibility Study.
16. Exhibit 2 of the Feasibility Study.
17. Exhibit 2 of the Feasibility Study.

Concern has been raised on the potential impact of the proposed wind turbines on migratory bird patterns and on wildlife. In particular, a bald eagle has been reportedly spotted at the subject property. While bald eagles are no longer an endangered species, they are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. On March 23, 2012, the U.S. Fish and Wildlife Service released "Land-Based Wind Energy Guidelines," (Guidelines) which are voluntary guidelines designed to help wind energy project development avoid and minimize impacts of land-based wind projects on wildlife and their habitat (located at http://www.fws.gov/windenergy/docs/WEG_final.pdf). This guideline replaces interim voluntary guidelines that had been in place since 2003. The Guidelines are intended to help smart siting, design, and operation of wind energy infrastructure.

The U.S. Fish and Wildlife Service states that "[t]he Guidelines use a "tiered approach" for assessing potential adverse effects to species of concern and their habitats. The tiered approach is an iterative decision-making process for collecting information in increasing detail; quantifying the possible risks of proposed wind energy projects to species of concern and their habitats; and evaluating those risks to make siting, construction, and operation decisions. During the pre-construction tiers (Tiers 1, 2, and 3), developers are working to identify, avoid and minimize risks to species of concern. During post-construction tiers (Tiers 4 and 5), developers are assessing whether actions taken in earlier tiers to avoid and minimize impacts are successfully achieving the goals and, when necessary, taking additional steps to compensate for impacts." Briefly, the tiers address:

- Tier 1 – Preliminary site evaluation (landscape-scale screening of possible project sites);
- Tier 2 – Site characterization (broad characterization of one or more potential project sites);
- Tier 3 – Field studies to document site wildlife and habitat and predict project Impacts;
- Tier 4 – Post-construction studies to estimate impacts;
- Tier 5 – Other post-construction studies and research.

The applicant is willing to commit to Tiers 1 and 2. Staff has proposed a development condition requiring the applicant to submit reports based on the five tiers identified in the Guidelines, as may be applicable, at various points of the wind turbine development, as provided above.

Potential impacts with solar panels include glare and reflectivity. According to Geosyntec, "most solar panels are now designed with at least one anti-reflective layer and may have multiple layers thereby further reducing reflectivity. According to one

study, the reflectivity of solar panels is less than dry sand.[18]" Geosyntec stated that no special precautions are needed for aircraft and that reflection on airplanes has been reported to be less than that from large industrial rooftops and significantly less than from lakes or seas. Geosyntec noted that there is no evidence of solar panels causing significant issues for birds. In staff's opinion, the applicant has demonstrated that no substantial visual, noise, or bird impacts are anticipated with the proposed wind turbines and solar panels.

Solid Waste Management (Appendices 10 and 10A)

The County's Solid Waste Management Plan 2004-2040 (SWMP) was published in 2004 and describes the County's integrated strategy for the management of non-hazardous solid waste generated within the County over the next 20 years. The SWMP is available at http://www.fairfaxcounty.gov/dpwes/swmp/.

According to Solid Waste Management staff, County-generated CDD waste is primarily disposed at three private CDD landfills in the County: Hilltop Sand and Gravel Company Debris Landfill (located in Newington); Lorton CDD Landfill (the subject property); and Rainwater Concrete Company Landfill (located in Lorton). Hilltop Sand & Gravel has since closed, and Rainwater accepts a limited amount of CDD waste and is nearing its capacity. In addition, two CDD landfill facilities in neighboring counties also receive the County's CDD waste: Potomac Landfill (located in Dumfries) and Fauquier County Corral Farm Municipal Solid Waste Landfill (located in Warrenton). The CDD landfills are privately operated, with the exception of the Corral Farm Landfill. Most CDD is transported directly from the generation site to the landfill. The private CDD landfills accept material from a wide area, including out-of-state sources.

With the decline of the economy in 2007, the quantity of construction debris waste also declined. As such, the applicant indicates that it did not experience "normal" waste volumes, which affected the applicant's ability to fill and properly close the landfill by January 1, 2019. According to the applicant, assuming a return to and maintaining of "normal" waste volumes and types, based on the estimated remaining capacity, the applicant would need a closure date of 2020 to 2022 in order to properly close the landfill. However, the applicant is requesting a closure date of 2040, which would increase the fill capacity and permit the installation of the vegetated berms needed to establish a 40-acre platform at the top of the landfill for the proposed wind and solar infrastructures.

In addition, the applicant indicates that if this proposed application is not approved and the closure date of the landfill remains on January 1, 2019, then the applicant would increase recycling activities at its currently approved mixed waste reclamation facility

18. Exhibit 2 of the Feasibility Study.

located across Furnace Road from the landfill. According to the applicant, this facility would receive an increase in trucks, which currently go to the landfill to dispose of waste. At the applicant's mix waste reclamation facility, the waste would be sorted then transferred to sites where it could be reused or disposed. The applicant has noted that the truck restriction from Lorton Road to southbound Furnace Road does not apply to the mixed waste reclamation facility, as it does with the landfill. The applicant maintains that the benefits of extending the useful life of the landfill provides CDD disposal capacity to support the County's needs, retains environmental benefits of not having to transfer waste to out-of-County landfills, and supports the County objectives for renewable energy.

Solid Waste Management staff finds the benefits of continued operation of the landfill in the County difficult to quantify. As indicated earlier, the Rainwater Landfill is the other active CDD landfill in the County. The subject landfill accepted 845,000 tons of material in 2012 compared with 24,000 tons accepted at the Rainwater Landfill. The annual report filed by the subject landfill with the State indicated that approximately 400,000 tons of CDD originated in Virginia, but the specific jurisdiction is not required to be obtained/reported. In general terms, the benefit of continued operation of the subject landfill would be assured CDD disposal capacity for the next 27 years, offsetting the need for longer transport of up to 400,000 tons per year of material. Should the subject landfill close, the Rainwater Landfill in the County, the Potomac Landfill in Dumfries, and the recycling facilities in Manassas could provide some nearby alternatives for some of the material. Local recycling facilities, such as the one the applicant operates across from the landfill or transfer operations will most likely be needed to facilitate the disposal of waste material.

It is noted that given the detail and complexity of the proposed landfill expansion, electrical generating facilities, and post-closure plans for the landfill, staff proposes to carry forward and expand upon a development condition that would require proposed landfill expansion and the electrical generating facilities proposed in Phase 1 to be subject to the review and approval of the County's Geotechnical Review Board (GRB) prior to site plan approval.

In addition, the applicant is subject to the Virginia Solid Waste Management Regulations (VSWMR) contained in Virginia Administrative Code, Title 9, Agency 20, Chapter 81(9VAC20-81), which provides the standards and procedures pertaining to the management of solid waste by providing the requirements for siting, design, construction, operation, maintenance, closure, and post-closure care of solid waste management facilities in Virginia.

DEQ Permitting Process

The Virginia Waste Management Act (VWMA) requires that all solid waste management facilities obtain a permit to operate and for expansions from DEQ. The applicant previously obtained a solid waste permit for the subject landfill. The applicant indicated that should this special exception amendment be approved, it would then initiate the DEQ application process for a Major Permit Amendment to the existing waste permit in accordance with the VSWMR and as detailed in a fact sheet published by DEQ entitled "The Landfill Permitting Process in Virginia," provided as Appendix 10A. It is noted that this fact sheet pertains to new sanitary waste landfills, but the general process remains applicable.

The DEQ permit process requires that the local government first make a decision to approve or to deny construction of or modification to a landfill. After the local government approval, an applicant would notify DEQ of an intent to establish or to modify an existing permit (Major or Minor Permit Amendment), which includes three separate document submissions: The Notice of Intent, Part A Application, and Part B Application. The following is from DEQ's Solid Waste Permit Manual, located at: http://www.deq.virginia.gov/Portals/0/DEQ/Land/Guidance/revswpm.pdf.
DEQ's Solid Waste Permit Manual reflects DEQ policy and regulations contained in the 9VAC20-81-450-470 and provided as part of Appendix 10A.

In general, the Notice of Intent includes submission of the following:

- Disclosure Statement – requires a disclosure statement for each key personnel of the company.
- Certification by the Local Governing Body – states that the location and the operation of the proposed facility or modification is consistent with the applicable local or regional solid waste management plan and is in accordance with all local ordinances.
- Permit Application Fee.
- Disposal Capacity Guarantee – applicable to a new sanitary landfill or expansion of an existing sanitary landfill.
- Host Community Agreement – applicable to construction of a new sanitary landfill or to expand an existing sanitary landfill; and
- Director's Determination of Need – requires a determination that there is a need for the additional capacity.

Once the Notice of Intent has been found to be complete, the applicant may submit the Part A Application, which includes the following:

- Proof of ownership.
- Facility Location Requirements – requires solid waste management facilities to be properly located to ensure that their performance will not lead to unapproved releases to the environment and to not disturb areas where the public and sensitive natural environments may be adversely affected.
- Hydrologic and Geotechnical Report.
- Description of the Site's Geology – requires a catalog of aquifers and geological features that might affect the operation of the facility.
- Notification Statement – requires written notice to adjacent property owners or occupants.
- Other information that may be requested by DEQ.
- Virginia Department of Transportation Adequacy Report – applicable to new sanitary landfills.
- Landfill Impact Statement – applicable to new sanitary landfills.
- Consistent with the Local Solid Waste Management Plan – requires facilities to be consistent with the local solid waste management plan.
- Public Interest Served – requires facilities to serve the public interest.

Once the Part B Application is deemed technically adequate, the applicant may submit the Part B Application, which includes the following:

- Plans – includes Design Plans, Closure Plan, and Emergency (Contingency) Plan.
- Design Report – explains and supplements the design plans and shows all the design calculations.
- Construction Quality Assurance Program Plan – ensures the constructed waste facility meets or exceeds all design criteria, plans and specifications in the permit.
- Operations Manual – details procedures by which the landfill operator shall implement the design plans and specifications.
- Permit Application Fee.
- Financial Assurance Documentation – demonstration of compliance with the Financial Assurance Regulations for Solid Waste Facilities.

After DEQ deems the Part B Application to be administratively and technically complete (which includes DEQs own technical analysis), DEQ will advise the applicant whether it will prepare a draft permit for public participation. When the draft permit is ready, a notice of availability of the draft permit and a solicitation of public comments will be advertised in a local newspaper. A public hearing is held by DEQ with a 30-day public comment period. After the public comment period ends, DEQ has 90-days to respond to the public comments and to render a decision on the Major Permit Amendment. DEQ issues a certificate to operate once it has concluded its review process and has deemed

the operation of the landfill in accordance with State and Local regulations. Approval of the permit ensures that the requirements of the VWMA and VSWMR are met.

As noted in the Part B Application, a financial assurance is required in accordance with the Financial Assurance Regulations for Solid Waste Disposal, Transfer and Treatment Facilities (9VAC20-70) to assure that owners and operators of permitted or unpermitted waste management facilities are financially responsible for the closure, post-closure care and corrective action at their facilities. The purpose of this financial assurance is to ensure that should the owner/operator of the landfill walk away, file bankruptcy, or for some reason cannot close the landfill or conduct post-closure activities, then DEQ will have the money available to complete the necessary closure and post-closure care activities at the landfill. For CDD landfills, post-closure activities generally last approximately 10 years. DEQ also determines the amount of financial assurance to be posted based on the cost estimate for all aspects of closing and conducting post-closure care. Once DEQ has approved the facility's certification of completion of closure and post-closure activities, the financial assurance is returned to the owner/operator. As such, this provides the assurance that the landfill will be left in a safe condition and in such a state that it can be used for development of the property in accordance with the adopted comprehensive plan.

Park Authority Analysis (Appendix 11)

The applicant proposes to contribute $3.2 million to the Fairfax County Park Authority no later than January 31, 2019, for recreational facilities in the Lorton/South County area. The Park Authority is satisfied with the applicant's proposed contribution. In addition, the applicant proposes to delete the previously approved development condition to dedicate the entire subject property to the Park Authority following the DEQ post-closure period. The Park Authority does not object to deletion of the existing development condition for the public park dedication.

In addition, Park Authority recommends that the applicant use locally-common native plants for landscaping and restoration efforts; control non-native, invasive vegetation on-site; and establish a vegetative management plan to control invasive species and promote native plant species. Staff has proposed to carry forward an existing development condition that requires a landscape plan to be submitted for review and approval by the Urban Forest Management Division of the Department of Public Works and Environmental Services.

The Park Authority also recommends a Phase 1 archeological study for the areas proposed to be disturbed. Staff proposes to carry forward an existing development condition that addresses this issue. Additionally, the Park Authority recommends detaining and treating stormwater runoff to preserve water quality and to protect the environmental health of parkland and the Giles Run watershed. As previously discussed

in the Stormwater section of this report, the applicant proposes to consolidate seven existing stormwater ponds into four stormwater basins and such basins have been designed for the 2 and 10-year storm events for stormwater detention. In addition, water quality will have to be met in accordance with the new stormwater regulations, which the applicant maintains that it can and will meet.

Finally, the Park Authority recommended that the applicant coordinate with State and local regulatory authorities to assess the environmental impacts of the proposed wind turbines to birds. As previously discussed in the 2232 Review, staff has proposed a development condition that requires the applicant to provide reports based on the five tiers identified in the U.S. Fish and Wildlife Service's "Land-Based Wind Energy Guidelines," and to address each tier at various points of the wind turbine development, as recommended in the Guidelines. With the proposed development conditions the issues have been addressed.

Health Department Analysis (Appendix 12)

The Health Department indicated that property located at Tax Map Parcel 113-1 ((1)) 7, (10209 Furnace Road) is served by an onsite sewage disposal system; as well as, by private well water supply. The Health Department stated that the septic and well are not to be affected by the expanded operation of the landfill. Parcel 7 is an approximately 1-acre property that is owned by the applicant and is vacant. It is not expected that the landfill operations will affect the septic and well on this property.

ZONING ORDINANCE PROVISIONS

Standards for all Category 2 Heavy Public Utility Uses (Sect. 9-204)

In addition to the general standards set forth in Sect. 006 of the Zoning Ordinance, all Category 2 special exception uses shall satisfy the following standards. The CDD landfill and the electrical generating facilities (solar, wind, methane gas, and geothermal) are Category 2 uses.

Standard 1: All uses shall comply with the lot size requirements of the zoning district in which located.

The subject property is located in the R-1 District, which requires a minimum lot area of 36,000 sq. ft. and a minimum lot width of 150 feet. With a lot area of approximately 250-acres and a lot width well in excess of 150 feet, this standard has been satisfied.

Standard 2: All buildings and structures, except below-ground facilities, shall comply with the bulk regulations of the zoning district in which located.

As previously discussed, the proposed solar panels and methane and geothermal infrastructures are proposed to meet the bulk regulations. However, the wind turbines are proposed to be a maximum height of 180 feet and exceed the maximum permitted building height of 60 feet in the R-1 District. As previously noted in the applicant's Statement of Justification, approximately 47% of wind turbine alternate current energy initially would be consumed by the landfill; however, early in Phase 2 the landfill electrical consumption is expected to exceed the electricity produced by the three wind turbines proposed in Phase 1. As such, given that the wind energy being generated by the three Phase 1 wind turbines will be used primarily to power activities conducted at the landfill, the Zoning Administrator has determined that the three Phase 1 wind turbines may be considered accessory to the landfill use. The Zoning Administrator previously determined that a wind turbine that is designed and used for the purpose of providing electrical energy to the principal use on a property on which it is located be permitted as an accessory use and is exempt from the maximum height limitations in accordance with the provisions of Sect. 2-506 of the Zoning Ordinance. Such use, however, is subject to the location restrictions of Par. 12 of Sect. 10-104 of the Zoning Ordinance, which requires that the wind turbines be located outside of the minimum required front yard and side yards for the zoning district in which located and must be set back a distance equal to its height from the rear lot line. The proposed three Phase 1 wind turbines meet this requirement.

In Phase 5 (estimated to be 2037) the three Phase 1 wind turbines would be removed, closure of the landfill operation will have commenced and an approximately 40-acre platform for the potential to establish up to 12 wind turbines or wind infrastructure sufficient to produce at least three megawatt peak electric power capacity would be created. It is clear that the establishment of the proposed12 wind turbines would not be deemed an accessory use to the closed landfill operation, but would be an electrical generating facility and would be required to meet the bulk regulations of the zoning district including the maximum building height. Currently, the Zoning Ordinance does not provide for a modification or waiver to the bulk regulations for Category 2 Heavy Public Utility Uses; a variance approval by the Board of Zoning Appeals (BZA) would be needed to permit the Phase 5 wind turbines at the proposed height on the subject property. However, with renewable energy sources such as wind turbines becoming more prevalent, the Zoning Administrator has indicated that an amendment to the Zoning Ordinance to allow the Board of Supervisors to consider an increase in building height for Category 2 Heavy Public Utility Uses as part of the special exception approval process rather than through a variance application would be a more appropriate mechanism to address similar requests going forward. Therefore, staff has drafted a proposed development condition that allows the 12 wind turbines proposed after closure of the landfill to be permitted based on a future amendment to the Zoning Ordinance or in the absence of such an amendment, a variance application would need to be submitted and approved by the BZA prior to installation of the 12 wind turbines. In staff's opinion, with the proposed development condition, this standard is satisfied.

<u>Standard 3</u>: No land or building in any district other than the I-5 or I-6 District shall be used for the storage of materials or equipment, or for the repair or servicing of vehicles or equipment, or for the parking of vehicles except those needed by employees connected with the operation of the immediate facility.

No storage of materials, equipment, or for the repair or servicing of vehicles or equipment, or for the parking of vehicles except those needed by employees connected with the operation of the use are proposed. As such, this standard has been satisfied.

<u>Standard 4</u>: It shall be conclusively established that the proposed location of the special exception use shall be necessary for the rendering of efficient utility service to consumers within the immediate area of the location.

The CDD landfill does not provide utility service to consumers. The proposed utilities (solar, wind, methane, geothermal) are proposed as a renewable energy demonstration project that are not intended to be a primary utility service but as interim uses during both the landfill operations and post-closure periods. As such, this standard is not applicable.

<u>Standard 5</u>: Before establishment, all uses, including modifications or alterations to existing uses, shall be subject to the provisions of Article 17, Site Plans.

A development condition is proposed that the proposed uses shall be subject to the provisions of Article 17, Site Plans, of the Zoning Ordinance. In addition, as previously discussed, staff proposes that at the time of site plan review, the applicant shall provide a geotechnical report of the landfill expansion and the proposed electrical generating facilities to the County's Geotechnical Review Board (GRB) for its review and approval. With the proposed development condition, this standard has been met.

Additional Standards for Landfills (Sect. 9-205)

The following standards shall apply to all landfills that are not owned and/or operated by a public agency.

<u>Additional Standard 1</u>: No special exception for a landfill shall be valid unless the Virginia Department of Environmental Quality approves the site for landfill use.

As previously discussed in the Background section of this report, since 1976, a debris landfill was established on a portion of the subject property pursuant to the approval of a grading permit. The existing DEQ permit for the landfill, Waste Permit #331, was issued in 1981, with subsequent amendments. As previously discussed, DEQ will require a Major Permit Amendment for the applicant's proposed special exception amendment uses. This standard has been addressed.

Additional Standard 2: Every special exception for a landfill shall be deemed to incorporate as specific conditions all other provisions of law related to such use.

Development conditions for the landfill were approved when the Board of Supervisor's approved the special exception for the landfill in 1981 and when the Board of Supervisors approved the special exception amendment in 2007. Staff has proposed development conditions for this special exception amendment. With the proposed development conditions, this standard has been met.

Additional Standard 3: No special exception shall be granted unless the applicant demonstrates conclusively through comprehensive soil and groundwater investigations and subsequent design methods that no unacceptable pollutants will be introduced into surface or groundwater or otherwise cause a potential health hazard.

There is an existing development condition that requires the applicant to prepare and implement a Groundwater Monitoring Program in accordance with Virginia's Solid Waste Management Regulations. This includes testing for non-methane volatile organic compounds. This condition requires that all water test results be submitted to DEQ, the County's Health Department, and the Solid Waste Program, DPWES. The development condition also requires that if any off-site private well is adversely affected by the landfill operation, as determined by DEQ or Fairfax County, then the landfill owner must provide an adequate potable water supply to any affected property within 48-hours of being notified of such a determination. Staff is unaware of unacceptable pollutants having been introduced into the surface or groundwater or otherwise cause a potential health hazard. With the proposed development conditions, this standard has been addressed.

Additional Standard 4: Every landfill shall be subject to such additional regulations as may be adopted by the Board of Supervisors. The Board may limit the type of debris and materials to be deposited and may require a degree of soil compaction adequate to support ultimate use of the property in accordance with the adopted comprehensive plan.

The applicant has been subject to a development condition in which the subject landfill can only receive construction, demolition, and debris materials, as defined in Section 104 of the County Code and as deemed permissible by DEQ. In addition, the applicant is subject to the Unauthorized Waste Control Plan, required by the Virginia Solid Waste Management Regulations, which provides the waste materials that are prohibited. No waste materials are proposed to be burned on-site. In addition, dredged soils may be deposited at the landfill so long as the dredged soils entering the site meet the DEQ definition of acceptable waste for construction, demolition, and debris landfills. The development conditions described are proposed to remain. With the continuation of these development conditions, this standard has been addressed.

<u>Additional Standard 5</u>: The Board shall establish the amount, per acre and total, of surety and bond adequate to guarantee the planned restoration.

An existing development condition is proposed to remain that requires at the time of site plan approval, cash, bond, or a letter of credit payable to the County of Fairfax in an amount to be determined by the Urban Forest Management Division of DPWES is required to ensure that the approved landscaping plans are completed.

As previously discussed, a financial assurance is required in accordance with the Financial Assurance Regulations for Solid Waste Disposal, Transfer and Treatment Facilities (9VAC20-70) to assure that owners and operators of permitted or unpermitted waste management facilities are financially responsible for the closure, post-closure care and corrective action at their facilities. Such financial assurance is required as part of DEQ's Major Permit Amendment process in which the applicant would be required to provide a financial assurance to be used in the issuance and continuation of permits to construct, operate, modify, close, or provide post-closure care and to be used in the performance of corrective actions by DEQ.

Given that DEQ requires landfill owners/operators to provide a financial assurance to assure that funds are available to properly close the landfill facility, staff is not proposing a surety or bond for the landfill above and beyond what is typically required by DPWES. Staff has proposed a development condition on the planned landscaping/revegetation of the landfill site. With the development condition, this standard has been addressed.

<u>Additional Standard 6</u>: The Director shall make an annual inspection of each landfill and shall make a report of the findings to the Board. Such report shall include the following:

A. A statement of whether or not the operation is in compliance with all of the requirements of the special exception.
B. A statement of changes which have occurred in the vicinity since the granting of the application, such as new development in the area.
C. A statement on the condition of roads in the area which might indicate the spillage of materials from trucks.

The applicant is subject to an existing development condition that the site shall be made available to the Director of DPWES or representative in preparation of an annual report to the Board of Supervisors. As a result of the annual inspection, the Director of DPWES may recommend additional restrictions and limitations on the use to the Board. This development condition is proposed to remain. Staff from the Zoning Inspection Branch of the Department of Planning and Zoning conducted an inspection of the landfill on July 19, 2013, to determine compliance with the development conditions and found the landfill to be in conformance with applicable zoning conditions. A copy of the

inspection report is provided as Appendix 13. While an annual report on the inspections to the subject landfill has not been made to the Board, it is staff's understanding that DPWES performs site inspections twice a month or after major rain events. A copy of the DPWES site inspection reports related to the approved 2009 site plan from 2010 to present are provided as part of Appendix 13.

Additional Standard 7: As a result of the annual inspection, the Director may find it necessary, for the health, safety and welfare of the general public, to recommend additional restrictions and limitations on such use. In such event, the Director shall transmit the findings to the Board which shall hold a public hearing, following notice in accordance with the provisions of Sect. 18-110.

As previously discussed, it is staff's understanding from DPWES that site inspections are done twice a month and after major rain events at the subject landfill. While not an additional restriction or limitation, DPWES determined that an action plan for the revegetation/landscaping of the landfill in order to properly landscape the landfill was required. Such an action plan is in place and being monitored by DPWES based on the past failed landscaping.

Additional Standard 8: Upon completion of operations, the land shall be left in a safe condition and in such a state that it can be used for development of the property in accordance with the adopted comprehensive plan. Further, sufficient drainage improvements shall be provided so as to prevent water pockets or erosion, and such improvements shall be designed in accordance with plans and specifications approved by the Director in conformance with the provisions of the Public Facilities Manual. Where restoration has not been accomplished, or where the restoration done was not in conformance with the approved restoration plan, the Director shall take appropriate action, including demand for performance or payment by the surety on the bond.

According to DEQ, it annually inspects all permitted landfills with a post-closure plan, such as the subject landfill. Post-closure refers to the time period following the shutdown of a waste management facility during which it must be monitored. Post-closure care requirements typically include ground water and landfill gas monitoring or control and maintenance of the landfill cap. A landfill cap is a layer of clay or other material installed over the top of a landfill when it is closed. Should a landfill facility be found in violation of Virginia's laws, regulations, or permit conditions, DEQ will take action to bring it into compliance again.

As previously discussed, a financial assurance is required in accordance with the Financial Assurance Regulations for Solid Waste Disposal, Transfer and Treatment Facilities (9VAC20-70) to assure that owners and operators of permitted or unpermitted waste management facilities are financially responsible for the closure, post-closure care and corrective action at their facilities. Such financial assurance is required as part of

DEQ's Major Permit Amendment process in which the applicant would be required to provide a financial assurance to be used in the issuance and continuation of permits to construct, operate, modify, close, or provide post-closure care and to be used in the performance of corrective actions by DEQ.

As previously discussed, development conditions are proposed to remain that address stormwater management, drainage, and Best Management Practices to ensure that sufficient drainage improvements shall be provided to prevent water pockets or erosion in accordance with the Public Facilities Manual and subject to DPWES review and approval.

Also as previously discussed, to ensure that the approved landscaping plans are completed, an existing development condition is proposed to remain that requires cash, bond, or a letter of credit and payable to the County of Fairfax in an amount to be determined by the Urban Forest Management Division of DPWES at the time of site plan approval. This would ensure that where landscaping has not been accomplished, or where the landscaping done was not in conformance with the approved landscape plan, the Director could take appropriate action, including demand for performance or payment by the surety on the bond.

Additional Standard 9: No improvements shall be constructed in or upon any landfill for a period of twenty (20) years after the termination of the landfill operation without the approval of the Board of Supervisors. No such approval shall be granted unless the applicant demonstrates that:

A. Any residual post-construction settlement will not affect the appearance or structural integrity of the proposed improvement.
B. The nature and extent of corrosion-producing properties, the generation and escape of combustible gases and potential fire hazards of the constituent material, considering its state of decomposition, has been provided for adequately and will not create an unsafe or hazardous condition in or around any of said proposed improvements.

As previously discussed, unlike sanitary and municipal waste landfills that require an approximately 20 to 30-year post-closure period, a CDD landfill requires an approximately 10-year post-closure period. The applicant is requesting a modification to the 20-year post-closure period, which is discussed further in the Waivers and Modifications section of this report. During the post-closure period, the applicant is required to perform post-closure monitoring activities for review by DEQ.

An existing development condition is proposed to remain that requires that the Geotechnical Review Board determine in writing that any residual post construction settlement will not affect the structural integrity of the proposed improvements. In

addition, prior to the installation of the Phase 5 and Phase 6 active recreational uses, DEQ, the County's Fire and Rescue Department and/or DPWES has determined the nature and extent of corrosion producing properties, the generation and escape of combustible gases and potential fire hazards of the constituent material, considering its state of decomposition, has been provided for adequately and will not create an unsafe or hazardous condition in or around any of said proposed improvements. In addition, the applicant is subject to a Gas Management Plan to monitor the control of decomposition gases from the landfill.

Further as part of the DEQ Major Permit Amendment process, DEQ reviews a landfill owner/operator's closure and post-closure plans to ensure that the landfill is properly and safely closed so that corrosion-producing properties, the generation and escape of combustible gases, and potential fire adequately has been provided for and will not create an unsafe or hazardous condition in or around any proposed improvements. With the proposed development conditions, this standard has been addressed.

Standards for all Category 3 Uses (Sect. 9-304)

All Category 3 special exception uses shall satisfy the following standards. The applicant is proposing a private club/benefit association use (radio controlled aircraft field), which is a Category 3 use.

Standard 1: For public uses, it shall be concluded that the proposed location of the special exception use is necessary for the rendering of efficient governmental services to residents of properties within the general area of the location.

This standard is not applicable since the proposed Category 3 use is a private club and not a public use.

Standard 2: Except as may be qualified in the following Sections, all uses shall comply with the lot size requirements of the zoning district in which located.

The subject property meets the R-1 District lot size requirements.

Standard 3: Except as may be qualified in the following Sections, all uses shall comply with the bulk regulations of the zoning district in which located; however, subject to the provisions of Sect. 9-607, the maximum building height for a Category 3 use may be increased.

In the R-1 District, the maximum building height is 60 feet. No structures are proposed with the radio controlled aircraft field. As such, this standard is not applicable.

Standard 4: All uses shall comply with the performance standards specified for the zoning district in which located, including the submission of a sports illumination plan as may be required by Part 9 of Article 14.

Staff has proposed that no outdoor lighting will be permitted with the proposed radio controlled aircraft field. With the proposed development condition, this standard has been addressed.

Standard 5: Before establishment, all uses, including modifications or alterations to existing uses, shall be subject to the provisions of Article 17, Site Plans.

The applicant is subject to Article 17, Site Plans, and staff has proposed a development condition that site plan approval is required for the proposed use.

Standards for all Category 5 Uses (Sect. 9-503)

All Category 5 special exception uses shall satisfy the following standards. The applicant is proposing a baseball hitting range and golf driving range, which are Category 5 uses.

Standard 1: Except as qualified in the following Sections, all uses shall comply with the lot size and bulk regulations of the zoning district in which located.

The subject property meets the R-1 District lot size requirements.

Standard 2: All uses shall comply with the performance standards specified for the zoning district in which located, including the submission of a sports illumination plan or photometric plan as may be required by Part 9 of Article 14.

Since a sports illumination plan was not submitted as part of the SEA application for staff review, staff has proposed a development condition that there shall be no outdoor lighting associated with the proposed baseball hitting range and golf driving range. As such, this standard has been addressed.

Standard 3: Before establishment, all uses, including modifications or alterations to existing uses, shall be subject to the provisions of Article 17, Site Plans.

Staff has proposed a development condition that site plan approval shall be obtained for the proposed baseball hitting range and golf driving range. With the proposed development condition, this standard has been addressed.

Additional Standards for Golf Driving Ranges (Sect. 9-529)

Additional Standard 1: Except for containment structures approved pursuant to Part 6 of Article 9 and light poles, no structure used in connection with the use shall be located closer than 100 feet to any lot line.

No structure is proposed closer than 100 feet to any lot line. Since a sports illumination plan was not provided as part of the SEA application for staff review, staff has proposed a development condition that no outdoor lighting shall be permitted. With the proposed development condition, this standard has been addressed.

Additional Standard 2: No off-street parking or loading space shall be located within 50 feet of any adjoining property which is in an R district.

No off-street parking or loading space is located within 50 feet of any adjoining property that is an R District. This standard has been addressed.

General Standards (Sect. 9-006)

In addition to the specific standards set forth with regard to particular special exception uses, all such uses shall satisfy the following general standards. The proposed uses include the CDD landfill, electrical generating facilities, and private club (radio controlled aircraft field), baseball hitting range, and golf driving range.

General Standard 1: The proposed use at the specified location shall be in harmony with the adopted comprehensive plan.

The subject property is within Sub-unit B4 of the Lower Potomac Planning District in the Comprehensive Plan, which identifies the property as a private debris landfill and recommends that buffers should be maintained around the landfill to help mitigate any visual impact on the surrounding area. The Comprehensive Plan further recommends that when the landfill is built-out, the site ultimately should be developed with active recreational uses such as a golf course.

The subject property is developed with a private landfill that has operated on the subject property since the 1970s and received special exception approval from the Board of Supervisors in 1981, and the Board approved an amendment to the special exception in 2007.

As noted above, the Comprehensive Plan recommends that buffers should be maintained around the landfill to help mitigate any visual impact on the surrounding area. As previously described in the Landscaping section of this report and shown as Figure 11, the applicant is proposing to provide landscaped buffers around the perimeter

of the landfill. Such buffering consists of the required 50-foot wide transitional screening area within an approximately 429 to 489-foot wide area from the northern side of the berm to the northern property line. Within the 50-foot wide transitional screening area supplemental vegetation is proposed consisting of deciduous and evergreen trees. In addition, a reforestation area approximately 23,979 square feet is shown in the northeastern portion of the site, south of the 50-foot transitional screening. Within the reforestation area a mix of deciduous and evergreen overstory and understory trees are proposed and stabilized with a seed mix of native perennials and grasses.

In addition, along the southern property boundary from the southernmost point of the property to approximately 600 feet along the southwestern boundary and 800 feet along the southeastern boundary, a landscaped buffer of at least 100 feet is will be maintained. In any area along this boundary where a minimum of 100 feet of natural vegetation does not exist, the applicant proposes to provide additional landscaping with the review and satisfaction of the Urban Forest Management Division (UFMD).

Along the eastern property line the Giles Run resource protection area, environmental quality corridor, and floodplain, are also located along the eastern property line and provide an additional buffer. Along the western property line a 39 to 50 buffer is provided from Furnace Road.

In addition, in the 2232 Review, staff indicated that the proposed landscaping gives a more natural screening effect on the north and east slopes of the landfill and also indicated that the proposed vegetated berm and 50-foot wide transitional screening area softens the appearance of the proposed wind turbines on the 40-acre platform at the top of the landfill. As previously discussed, the applicant also provided multiple photographic simulations depicting the existing and projected conditions of the subject property in 2013, 2019, 2033, 2040, and 2050. Based on the photo simulations, staff concluded that this proposal does not appear to have an adverse negative visual impact given the distance from residential properties.

The Comprehensive Plan also recommends that when the landfill is built-out that the site ultimately be developed with active recreational uses, such as a golf course. Staff recommended that in order to be in harmony with the Comprehensive Plan land use recommendation, the proposed active recreational uses should be provided during the post-closure monitoring period and not tied to the cessation of the potential establishment of up to 12 wind turbines and/or solar panels on the 40-acre platform. As such, the applicant proposes that an outdoor baseball hitting range may be provided at the end of Phase 5 as shown on Sheet 14 of the SEA Plat. In addition, after the landfill post-closure period at the end of Phase 5, active recreational uses constructed and operated by lessees are proposed in Phase 6. Such active recreational uses include a baseball hitting range with the potential for a second nine station batting range, a golf driving range and/or radio controlled aircraft field.

As previously discussed in the 2232 Review, it is staff's opinion that the proposed wind turbines and solar panels are substantially in accord with the provision of the adopted Comprehensive Plan and satisfies the criteria of general or approximate location, character, and extent as specified in Section 15.2-2232 of the Code of Virginia. With the proposed development conditions, the proposed use and proposed active recreational uses are in harmony with the Comprehensive Plan land use recommendation for Sub-unit B-4.

General Standard 2: The proposed use shall be in harmony with the general purpose and intent of the applicable zoning district regulations.

The proposed uses are located in the R-1 District where the purpose and intent is to provide single family detached dwellings and to allow other selected uses that are compatible with the low density residential character of the district. Other selected uses include, by special exception approval, a landfill, electrical generating plants and facilities, private clubs, and golf driving ranges, all of which are uses that the applicant is proposing as part of this application.

The applicant's proposal includes a minimal amount of structures, which would not increase the intensity of the development. When the landfill operations cease, the intensity on the site will decrease from an existing 5,000 square feet to 1,300 square feet in Phase 6 since the structures (maintenance building, scale houses, and operations trailer) will be removed.

The applicant previously demonstrated with the Board's approval of the previous special exception and current special exception amendment that the landfill is in harmony with the general purpose and intent of the R-1 District.

Additionally, the proposed solar panels, methane gas and geothermal infrastructures are low intensity uses. No structures are proposed with the radio controlled aircraft field and the baseball hitting range and golf driving range are proposed to have low intensity structures. In addition, the active recreational uses are proposed as limited access uses and not anticipated to generate a significant amount of vehicular trips. In staff's opinion, the proposed uses are in harmony with the general purpose and intent of the R-1 District.

General Standard 3: The proposed use shall be such that it will be harmonious with and will not adversely affect the use or development of neighboring properties in accordance with the applicable zoning district regulations and the adopted comprehensive plan. The location, size and height of buildings, structures, walls and fences, and the nature and extent of screening, buffering and landscaping shall be such that the use will not hinder or discourage the appropriate development and use of adjacent or nearby land and/or buildings or impair the value thereof.

As previously discussed, the landfill has existed at its present location since the 1970s and previously has been determined to be in harmony with the Comprehensive Plan with the approval of the previous special exception applications. In addition, with the approval of the previous special exception applications, the Board of Supervisors' approved a series of development conditions intended to regulate the landfill and its impact on the surrounding area. Since the Board's approval of the 2007 special exception amendment, there does not appear to be new development adjacent to the subject property, although an application has been filed to the north of the subject property (RZ 2011-MV-033).

The structures associated with the landfill operations are limited to an operations trailer, a maintenance building, and scale houses and would meet the bulk regulations of the R-1 District. These structures are proposed to be removed in Phase 5 when the landfilling operations cease. As such, these structures are not anticipated to hinder or discourage the appropriate development and use of adjacent or nearby land and/or buildings or impair the value.

As previously discussed a vegetated berm up to 70 feet in height is proposed around the perimeter of the landfill. The distance between the berm to the property line varies along each side of the landfill since there are areas that are wider and narrower. In general, the distance from the site's property line to the berm is:

- Along the northern property line: approximately: 429-489 feet, as shown on Sheet 11 of the GDP. The adjacent use is the Lorton Valley subdivision;
- Along the southern property line: 479 feet, as shown on Sheet 13. The adjacent use is a single family dwelling, Occoquan Regional Park, and the applicant's parcels that are part of this application but do not contain landfill activities;
- Along the western property line: 39-50 feet, as shown on Sheets 11 and 12. The adjacent uses are a 17-acre I-6 property and an 8.89 acre R-1 property, which is the subject of a pending PCA application to permit a solar electrical generating facilities (a solar panel farm). Both of these parcels are owned by the applicant.
- Along the eastern property line: 44-369 feet, as shown on Sheets 12 and 13. The adjacent use is I-95 but the Giles Run resource protection area, environmental quality corridor, and floodplain, are also located along the eastern property line and provide an additional buffer from the property line to the berm. Seven retaining walls are proposed on the east side of the berm that provides an additional buffer to Giles Run.

In staff's opinion, the berm would be most visible along Furnace Road since along this area of the property there is not as significant a distance from the property line to the berm as there is with the site's other boundaries. However, given the significant distances, except as noted along the western property line, the impact of the proposed vegetated berm on adjacent or nearby land and/or buildings is reduced. The vegetation

of the berm will help to soften its appearance. In particular as shown in Figure 11, along the northern property line, the combination of the 429 to 489-foot distance from the berm access road to the property line, existing and proposed supplemental vegetation, and a 50-foot transitional screening area collectively screen and provide a buffer to Lorton Valley.

As previously discussed, the proposed methane gas, geothermal infrastructure, and solar panels are proposed to be placed underground or low to the ground and fixed in their locations and are not anticipated to create a negative visual impact to adjacent properties. As such, these proposed uses are not anticipated to hinder or discourage the appropriate development and use of adjacent or nearby land and/or buildings or impair the value thereof.

According to the applicant, the proposed wind turbines atop the landfill in Phase 1 would not be visible to the Lorton Valley subdivision due to their location on the southern platform of the landfill. In Phase 5, the wind turbines may be visible from residential property across I-95; however, in the 2232 Review, staff does not believe it would cause an adverse visual impact due to the location of the proposed wind turbines and believes that the subject property is a suitable location for this type of use. Staff further stated that the proposed wind turbines will be situated at a height and location that would minimize visual impacts from residential neighborhoods to the north and the D.C. Workhouse and Reformatory Historic District to the west/northwest of the landfill; I-95 to the east serves as a buffer, as does the existing landfill; and open space to the south and west. Further, photographic simulations were taken from 10 different vantage points surrounding the subject property. The photo simulations depict minimal visual impact to the Lorton Valley subdivision, which is the closest residential development to the subject property. Neighborhoods across I-95 could have some visual impact. These photographic perspectives provide the vantage point of a person standing on a street or sidewalk and looking at the landfill as increasingly dense tree growth occurs over the next 30 years.

The applicant also demonstrated that auditory noise from the wind turbines would be minimal and not discernible above the noise from I-95. Staff concluded in the 2232 Review that the proposed wind turbines and solar panels satisfy the criteria of general or approximate location, character, and extent of the Comprehensive Plan as specified in Section 15.2-2232, as amended, of the Code of Virginia.

With regard to the proposed limited access Phase 6 active recreational uses (baseball hitting range, radio controlled aircraft field, and golf driving range), they are not anticipated to adversely affect the use or development of neighboring properties since these uses are located at the top of the landfill with limited visual impact on the surrounding areas and no outdoor lighting would be permitted.

With regard to landscaping, a development condition has been proposed that a 50-foot continuous transitional screening buffer of existing trees shall be maintained along the northern boundary of the site and shall be supplemented with additional plantings. This transitional screening area is within an approximately 429 to 489-foot buffer between the north side of the berm access road and the northern property line. Along the southern property boundary a development condition is proposed that requires a landscaped buffer of at least 100 feet to be maintained. Also discussed earlier in the Landscaping section of this report, the applicant is providing significant landscaping in the quantity of vegetation proposed, tree canopy, and through the use of benches and slopes on the sides of the landfill in order to create a more natural landscaped appearance.

It is difficult to assess whether this application, specifically extending the landfill operation until December 31, 2040, will impair the value of appropriate development and use of adjacent or nearby land and/or buildings. Staff recognizes that surrounding landowners made financial decisions in and around 2007, and subsequent to the Board's 2007 approval of the special exception amendment, which provided January 1, 2019, as the end date for landfill operations. However, staff recognizes that prior to and since 2007, development around the landfill has occurred where property has been bought, sold, and leased. According to the County's Department of Tax Administration (DTA), the Residential Analysis for the 2013 Tax Assessment Year for the Lorton area indicates that there was a 5.02% increase from the 2012 mean residential tax assessment of $332,476 to $349,150 in 2013, (second largest tax increase in the County) and such analysis is included as Appendix 14. Further according to DTA, commercial properties showed an overall equalization increase of 0.14% in the 2013 tax assessment year. Changes in the commercial tax assessment by zip code was not available. As such, it does not appear that the landfill has hindered surrounding development and a continuation of landfill operations until 2040, does not appear to preclude reasonable use of land or impair its value. With the proposed development conditions, staff does not believe that the proposed changes to the operation of the landfill, the proposed electrical generating facilities, and private, limited access active recreational uses would hinder or discourage the appropriate development and use of adjacent or nearby land and/or buildings or impair the value thereof.

General Standard 4: The proposed use shall be such that pedestrian and vehicular traffic associated with such use will not be hazardous or conflict with the existing and anticipated traffic in the neighborhood.

Limited or no pedestrian traffic is anticipated with the proposed uses. The applicant is requesting a waiver of the trail requirement along Furnace Road since a trail connection on either side of the applicant's property does not exist and because of the proximity of such a trail to landfill activities.

As previously discussed, an existing development condition is proposed to remain that restricts truck traffic from travelling between the site's main entrance on Furnace Road and Lorton Road. Trucks are required to enter the landfill only from the south on northbound Furnace Road and exit by turning left only onto southbound Furnace Road. It is staff's understanding that the applicant enforces these limitations through notices to truck drivers and on-site signage. An example of such notice is provided as part of Appendix 13. The site's main entrance has been designed to restrict the ability of trucks from making left turns from Furnace Road into the site and there is an existing concrete island at the site's main entrance that prevents trucks from turning right onto Furnace Road. Additionally, the applicant has proposed to construct a new southern right turn in only for truck traffic travelling north on Furnace Road at the end of Phase 1 for the duration of the landfill operations. No left turn in or exits is permitted from this location. Exits would continue as left turn only from the main entrance. An existing development condition prohibits access to the subject property for any landfilling purpose through adjoining properties to the north and this condition is proposed to remain.

A development condition is proposed to remain that the gates to the landfill would open 1 ½ hours earlier Monday through Friday and 1-hour earlier on Saturday to allow trucks to queue on-site before landfill operations begin. As such, vehicular queuing on Furnace Road is not anticipated.

In addition, an existing development condition is proposed to remain that requires the applicant to provide a tire wash system to dislodge mud on truck tires in order to ensure that mud is not tracked from the landfill onto the surrounding roads. With the proposed development conditions, this standard has been met.

General Standard 5: In addition to the standards which may be set forth in this Article for a particular category or use, the Board shall require landscaping and screening in accordance with the provisions of Article 13.

The applicant's proposed landscaping, screening, and buffering were described earlier in the staff report. The applicant has been working with staff and continues to work with staff to address the existing landscaping issues through a landscape action plan that has been implemented and future landscaping of the landfill. Staff has proposed development conditions to address landscaping and screening. A development condition also is proposed that would require the applicant to provide cash, bond, or letter of credit and payable to the County to ensure that the appropriate landscaping plans are completed. With the proposed development conditions, this standard has been met.

General Standard 6: Open space shall be provided in an amount equivalent to that specified for the zoning district in which the proposed use is located.

The subject property is zoned R-1, which does not have an open space requirement. This standard is not applicable.

General Standard 7: Adequate utility, drainage, parking, loading and other necessary facilities to serve the proposed use shall be provided. Parking and loading requirements shall be in accordance with the provisions of Article 11.

Adequate utilities are provided to the site. As previously described, adequate stormwater drainage is being provided. Two loading spaces are proposed in Phases 1 through 5 and no loading spaces are proposed in Phase 6. However, truck queuing spaces are provided on-site and the applicant has demonstrated how on-site truck queuing would function with 24 queuing spaces proposed in Phase 1, increasing to 36 queuing spaces proposed in Phases 2 through 5. A development condition is proposed to remain that permits on-site queuing before the start of the hours of operations for the landfill to prevent queuing onto Furnace Road.

As previously discussed, the applicant is requesting approval to permit an off-site visitor parking lot for the Observation Point on the applicant's adjacent I-6 property at Tax Map Parcels 113-1((1)) 12 and 13, which is the subject of pending PCA 2000-MV-034. The active recreational uses are proposed as limited access uses with an on-site parking area at the top of the landfill. Such parking is proposed to meet the parking requirements of Article 11 of the Zoning Ordinance and was described earlier in this report. This standard has been addressed.

General Standard 8: Signs shall be regulated by the provisions of Article 12; however, the Board may impose more strict requirements for a given use than those set forth in this Ordinance.

Article 12 of the Zoning Ordinance regulates signage and all signage shall be subject to the provisions of Article 12 of the Zoning Ordinance.

Waivers, Modifications, or other Board of Supervisors' Motion

The applicant requests the following waivers and modifications:

Modification of Par. 9 of Sect. 9-205 of the Zoning Ordinance to permit improvements less than 20 years after the termination of landfill operations

Par. 9 of Sect. 9-205 of the Zoning Ordinance provides that "[n]o improvements shall be constructed in or upon any landfill for a period of 20 years after the termination of the landfill operation without the approval of the Board of Supervisors."

The applicant has stated that Par. 9 of Sect. 9-205 more appropriately applies to municipal solid waste landfills that require a post-closure period of approximately 20-30 years. Post-closure refers to the time period following the shutdown of a waste management facility during which it is monitored by DEQ. Post-closure care requirements typically include ground water monitoring, landfill gas monitoring or control, leachate management, and maintenance of the landfill cap. As previously discussed for CDD landfills, post-closure activities generally last approximately 10 years. As such, the applicant is requesting a waiver of the 20-year post closure period in favor of an approximately 10-year post-closure period. In 2007, the Board previously granted the modification since DEQ determines the amount of time that post-closure activities are required and would review whether any residual post-construction settlement will affect the appearance or structural integrity. As such, staff supports the modification request for an approximately 10-year post-closure period, as determined by DEQ.

Waiver of Par. 11 of Sect. 11-102 of the Zoning Ordinance for a dustless surface

Par. 11 of Sect. 11-102 of the Zoning Ordinance provides "[a]ll off-street parking areas, including aisles and driveways, except those required for single family detached dwellings, shall be constructed and maintained with a dustless surface…"

The applicant requests a waiver of Par. 11 of Sect. 11-102 and provides that by its nature, the landfill is characterized by changing internal circulation patterns due to the need to fill particular cells and volumes, weather, and other unique factors. As such, the internal roads are not proposed to be paved but are proposed as temporary gravel roads. The requested waiver would allow for on-site roads and parking areas in all phases of development to continue to remain as gravel roads and parking areas and not to be constructed of a dustless surface. Gravel, concrete, or some other recycled material has been used for the on-site roads and such material is proposed to continue to be used. Staff does not object to the dustless surface waiver request for the on-site roads and parking areas.

Waiver of the peripheral and interior parking lot landscaping requirement pursuant to Par. 6 of Sect. 13-202 and Par. 3 of Sect. 13-203 of the Zoning Ordinance

Par. 6 of Sect. 13-202 of the Zoning Ordinance provides that the Board may approve a waiver or modification of the interior parking lot landscaping requirement for an interim use or where such waiver or modification will not have any deleterious effect on adjacent properties. Par. 3 of Sect. 13-203 provides that the Board may approve a waiver or modification of the peripheral parking lot landscaping for an interim use or where such waiver or modification will not have any deleterious effect on adjacent properties.

Interior parking lot landscaping is required for any parking lot containing 20 or more spaces with interior landscaping covering not less than 5 percent of the total area of the parking lot. A total of 42 parking spaces are proposed in Phases 1-5 for landfill operations, maintenance, the baseball hitting range, and electrical generating facilities. At the end of Phase 5, after the landfilling activities have ceased, the number of parking spaces is reduced to 34 spaces. In Phase 6 with the active recreational uses, the total number of increases to 78 parking spaces.

Due to the unique nature of the proposed landfill, renewable energy, and recreational end uses, the elevation of the non-landfill uses, and the lack of public parking or travel on the site, any deleterious effect on existing or planned development on adjacent properties is not anticipated. Staff does not object to the requested waiver for interior parking lot landscaping.

Peripheral parking lot landscaping is required for any parking lot containing 20 or more spaces where transitional screening is not required. A parking lot that contains 20 or more spaces is proposed in Phase 5 and in Phase 6. Given that the uses are at the top of the landfill, UFMD has determined that no transitional screening is required since the uses are not contiguous to a property line. Staff does not object to the waiver of peripheral parking lot landscaping given that the parking lot is proposed to be on top of the landfill and is not anticipated to have a significant visual impact at an elevation of 412 feet above sea level.

Modification of the transitional screening and waiver of the barrier requirements pursuant Sect. 13-305 of the Zoning Ordinance

Par. 3C of Sect. 13-303 of the Zoning Ordinance provides that Transitional Screening 3 consisting of an unbroken strip of open space a minimum of 50 feet wide is required adjacent to single family detached dwellings. The applicant is not requesting a reduction in the minimum required transitional screening width along the northern property line, but is requesting a modification to use existing, mature trees in the transitional screening area rather than removing existing vegetation and replanting with the planting schedule set forth in Par. 3C of Sect. 13-303. Staff from UFMD did not object to the retention of existing vegetation and requested supplemental understory plantings subject to UFMD approval, which is shown on the SEA Plat. A similar modification was approved in 2007, and staff does not object to this modification request.

A single family dwelling is located at the southern end of the landfill at Tax Map Parcel 113-3 ((1)) 3 and is surrounding on three sides by landfill parcels along the northern, eastern, and southern property lines. Parcel 3 is screened by approximately 100-foot minimum buffer and tree preservation area, which is proposed as a development condition to be retained. No landfill activity is proposed to take place within this buffer area. As such, the applicant requests a modification to use existing,

mature trees in the required 50-foot wide transitional screening area. A similar modification was previously approved in 2007, and staff does not object to this modification request.

The applicant requests a modification of the transitional screening requirement along the western and eastern sides of the subject property to that shown on the SEA Plat. The western portion of the site is adjacent to Furnace Road, which abuts the County's I-95 Landfill in the R-C District; the applicant's vacant 17 acre parcel in the R-1 District; and the applicant's parcel in the I-6 District, which is the subject to a pending PCA application to permit a solar panel farm. The eastern side of the property consists of the Giles Run EQC, RPA, and floodplain and is bordered by I-95. Staff does not object to the transitional screening modification request.

Additionally, the applicant requests a waiver of the barrier requirement pursuant to Pars. 5, 7, 11, and 12 of Sect. 13-305 of the Zoning Ordinance. These paragraphs provide that transitional screening and barriers may be waived or modified where adjoining land is designated in the adopted comprehensive plan for a use that would not require transitional screening, where the adjoining property is used for any public purpose other than a school or hospital, where the subject property abuts a railroad or interstate highway right-of-way, where the typography of the providing lot and protected lot is such that a barrier would not be effective.

Along the southern property line, Barrier D (42 to 48-inch chain link fence), Barrier E (6-foot tall wall, brick, or block), or Barrier F (6-foot high solid wood fence) is required adjacent to the existing single family dwelling located at Tax Map Parcel 113-3((1)) 3. This residential property is screened by an approximately 100-foot minimum buffer and tree preservation area and no landfill activity is proposed within this buffer area. The existing single family dwelling on Parcel 3 is located approximately 479 feet from the proposed berm.

Along the eastern property line, Barrier D, E, or F, as described above, is required. The property abuts I-95. Along the western property line, Barrier D, E, or F, as described above, is required. The property is adjacent to Furnace Road, which is adjacent to the County-owned I-95 Landfill in the R-C District; and the applicant's vacant 17 acre parcel in the R-1 District; and the applicant's property in the I-6 District, which is the subject to a pending PCA application for a proposed solar panel farm. The applicant requests a waiver of the barrier requirement along the southern, eastern, and western property lines given the buffers and distances to other uses and the non-residential character of the land located to the west and east. Staff does not object to the requested waiver of the barrier requirement.

It is noted that along the northern property line, Barrier D, E, or Barrier F is required. Barrier F currently exists along the northern property boundary and is proposed to remain.

In addition, the applicant requests a waiver of the transitional screening and barrier requirements for the proposed Phase 6 uses. UFMD determined that transitional screening is not required for the proposed Phase 6 uses since they are proposed to be located at the top of the landfill and are not contiguous or across the street from other land uses. As such, the transitional screening and barrier requirement contained in Article 13 of the Zoning Ordinance are not required.

Waiver of the Countywide Trails Plan recommendation for an 8-foot wide major paved trail along the east side of Furnace Road

The applicant requests a waiver of construction of an 8-foot wide major paved trail along the east side of Furnace Road, which is recommended on the County-wide Trails Plan pursuant to Par. 2 of Sect. 17-201 of the Zoning Ordinance, which provides for the need for construction of trails or walkways in accordance with the general location shown on the adopted comprehensive plan. The applicant requests the waiver because of the limited land area between Furnace Road and the proposed landfill berm and because of the on-site vehicular activity. Such recommended trail would not connect to an existing trail. The applicant has constructed a trail on the western side of Furnace Road along the frontages of Parcels 12 and 13. The Board of Supervisors previously granted the requested waiver in 2007, with the approval of the special exception amendment. Staff does not object to the waiver request.

Modification of the invasive species management plan requirement pursuant to Section 12-0404.2C of the Public Facilities Manual (PFM)

Section 12-0404.2C of the PFM provides that if invasive plants exist in forested areas to be preserved, then tree preservation plans and narratives shall address how invasive plants will be managed. The applicant requests this modification to ensure that the required invasive species management plan is reasonable in scope and includes reasonable and cost effective requirements that are appropriate for a larger landfill operation. However, the applicant has not provided a specific modification request to the requirements for staff to evaluate.

In staff's opinion, modifications to the PFM are more appropriate at the time of site plan review than at the time of zoning approval. Typically modifications and waivers of the PFM are requested during site plan review where more detail evaluation is performed and approval is at the discretion of the Director of DPWES on whether such a modification or waiver is appropriate. In addition, in staff's opinion, an invasive species management plan is important to identifying and addressing invasive species to ensure

the success that the proposed landscaping will successfully grow and will not impact the landfill cap. Such request appears to be contrary to providing successful landscape growth on the landfill. Staff would work with the applicant to develop an invasive management plan that is reasonable in scope at the time of site plan. As such, staff does not support the requested PFM modification at the time of zoning approval. This request is more appropriate at the time of site plan review.

Modification of the submission requirements for a tree inventory and condition analysis pursuant to Section 12-0503.3 of the Public Facilities Manual (PFM).

Section 12-0503.3 of the PFM provides that the Director may allow a modification of the tree inventory and condition analysis submission requirements if the plan meets or exceeds the minimum level of tree preservation identified by the Tree Preservation Target. The applicant indicates that the tree inventory far exceeds the minimum level of required tree preservation. In staff's opinion, a modification of the PFM is more appropriately sought at the time of site plan than at the time of zoning approval. A more detailed evaluation maybe done at the time of site plan review and should be at the discretion of the Director of DPWES to make the determination on whether such a modification is appropriate. Staff notes that the applicant has not provided specific submission requirements for staff to evaluate. As such, staff does not support the requested PFM waiver at the time of zoning and should be reviewed at the time of site plan.

Board of Supervisors' approval to permit off-site vehicular parking for the Observation Point on Tax Map Parcels 113-1 ((1)) 12 and 13 pursuant to Sect. 11-102 of the Zoning Ordinance

As previously discussed, the applicant requests the Board of Supervisor's approval to permit a 19-space, off-site vehicular parking area for visitors to the applicant's proposed Observation Point on the applicant's 8.86 acre property that is the subject of a pending PCA application to permit a proffered solar electrical generating facility.

The applicant cites safety concerns with having the general public park on an active landfill site. The applicant proposes to provide a shuttle service from the proposed off-site parking area on the PCA site to the Observation Point at no cost to visitors and proffered to provide an easement for the duration of the Observation Point use for parking related to the off-site Observation Point. Likewise, staff has proposed a development condition requiring the applicant to provide a parking easement prior to the establishment of the proposed Observation Point. Staff does not object to the request for the Board's approval of off-site parking for the Observation Point.

CONCLUSIONS AND RECOMMENDATIONS

Staff Conclusions

Staff concluded in the 2232 Review that the applicant has demonstrated that the proposed wind turbines and solar panels satisfies the criteria of general or approximate location, character, and extent as specified in Section 15.2-2232, as amended of the Code of Virginia. Therefore, staff recommended that Application 2232-V13-18 is substantially in accord with the provision of the adopted Comprehensive Plan.

The applicant's renewable energy consultant stated that the proposed renewable energies (wind, solar, methane gas, and geothermal) represent significant firsts in renewable energy development at a landfill. It is noted that the applicant has only committed to providing the methane gas and geothermal infrastructures, as well as, installation of three wind turbines in Phase 1.

Staff concludes that with the proposed development conditions, the proposed application is in harmony with the Comprehensive Plan and applicable Zoning Ordinance provisions.

Recommendation

Staff recommends that the Planning Commission find that the solar and wind electrical generating facilities proposed under 2232-V13-18 satisfies the conditions of location, character, and extent as specified in Section 15.2-2232 of the Code of Virginia, as amended, and is in accord with the Comprehensive Plan.

Staff recommends approval of Special Exception Amendment SEA 80-L/V-061-02, subject to the proposed development conditions contained in Appendix 1.

Staff recommends approval of the following waivers and modifications:

- Waiver of Par. 9 of Sect. 9-205 of the Zoning Ordinance to permit improvements less than 20 years after the termination of landfill operations;
- Waiver of Par. 11 of Sect. 11-102 of the Zoning Ordinance for a dustless surface;
- Waiver of the interior parking lot landscaping requirement pursuant to Par. 3 of Sect. 13-203 of the Zoning Ordinance;
- Waiver of the peripheral parking lot landscaping requirement pursuant to Par. 6 of Sect. 13-202 of the Zoning Ordinance;
- Modification of the transitional screening and waiver of the barrier requirements pursuant Sect. 13-305 of the Zoning Ordinance, as shown on the SEA Plat;
- Waiver of the Countywide Trails Plan recommendation for an 8-foot wide major paved trail along the east side of Furnace Road; and

- Board of Supervisors' approval to permit off-site vehicular parking for the Observation Point on Tax Map Parcels 113-1 ((1)) 12 and 13 pursuant to Sect. 11-102 of the Zoning Ordinance.

Staff recommends denial of the following requested waivers and modifications:

- Modification of the invasive species management plan requirement pursuant to Section 12-0404.2C of the Public Facilities Manual; and
- Modification of the submission requirements for a tree inventory and condition analysis pursuant to Section 12-0503.3 of the Public Facilities Manual.

It should be noted that it is not the intent of staff to recommend that the Board of Supervisors, in adopting any development conditions, relieve the applicant/owner from compliance with the provisions of any applicable ordinances, regulations, or adopted standards.

The approval of this special exception amendment does not interfere with, abrogate or annul any easement, covenants, or other agreements between parties, as they may apply to the property subject to this application.

It should be further noted that the content of this report reflects the analysis and recommendations of staff; it does not reflect the position of the Board of Supervisors.

APPENDICES

1. Proposed Development Conditions
2. Statement of Justification
2A. Turbine Foundation
2B. Feasibility Study
2C. Berm Cross Sections
2D. Wind Turbine Accessory Use Information
2E. Geosyntec Consultants' Memorandum
3. Affidavit
4. Land Use Analysis
5. Transportation Analysis
6. Urban Forest Management Analysis
7. Environmental Analysis
8. Stormwater Management
9. 2232 Review
10. Solid Waste Management Analysis
10A. DEQ Landfill Permit Process
11. Park Authority Analysis

12. Health Department Analysis
13. Zoning and DPWS Inspection Reports
14. Residential Tax Assessment Analysis
15. Glossary

APPENDIX 1

STAFF PROPOSED DEVELOPMENT CONDITIONS

SEA 80-L/V-061-02

February 13, 2014

If it is the intent of the Board of Supervisors (Board) to approve SEA 80-L/V-061-02 located at Tax Map Parcels 113-1((1)) part 5 part, 7, and 8 and 113-3((1)) 1, 2, and 4 (10201, 10209, 10215, 10219, and 10229 Furnace Road) to amend a special exception amendment previously approved for a landfill pursuant to Sect. 3-104 to permit modifications to the landfill and development conditions and the addition of electrical generating facilities (wind, solar, methane gas, and geothermal), radio controlled aircraft field, baseball hitting range(s), and golf driving range pursuant to Sections 3-104, 9-201, 9-301, and 9-501 of the Fairfax County Zoning Ordinance in to permit an increase in the maximum height of the landfill from 290 feet above sea level to 412 feet above sea level and other site modifications and to permit a quasi-public park, sStaff recommends that the Board condition the approval by requiring conformance with the following development conditions. These development conditions incorporate and supersede all previous development conditions and become effective as of issuance of a non-RUP implementing this SEA by authorizing the maximum height to reach 412 feet above sea level, and thus to exceed 290 feet above sea level or as otherwise specified in these development conditions. Previously approved conditions carried forward, some updated, are marked with an asterisk (*).

1. This Special Exception Amendment is granted for the location indicated in the application and is not transferable to other land.*

2. This Special Exception Amendment (SEA) is granted for the location and uses outlined in the application as amended by these conditions. A revised site plan incorporating these conditions shall be submitted to the Department of Public Works and Environmental Services (DPWES).*

3. A copy of this Special Exception Amendment shall be posted in a conspicuous place within the operations trailer and scale houses along with the Non-Residential Use Permit on the property of the use and be made available to all Departments of the County of Fairfax during the hours of operation of the permitted use.*

4. Submission and approval of a site plan prepared in accordance with the provisions of Article 17, is required prior to the start of any landfilling activity approved as part of this Special Exception Amendment in any new operational areas beyond that approved pursuant to SE 80-L/V-061,and for the proposed electrical generating facilities (wind, solar, methane, and geothermal), radio controlled aircraft field, baseball hitting range(s), and golf driving range. including elevation greater than 290 feet above sea level. Any site plan submitted pursuant to this special exception amendment shall be in substantial

conformance with the approved Special Exception Amendment Plat (SEA Plat) entitled "Lorton Green Energy Park and Debris Landfill," ~~Overlook Ridge,~~ prepared by BC Consultants, Inc., ~~which is~~ dated ~~February 2006~~March 22, 2013, as revised through ~~November 20, 2006~~ January 22, 2014, and these conditions. Minor modifications to the approved Special Exception may be permitted pursuant to Par. 4 of Sect. 9-004 of the Zoning Ordinance.*

5. Prior to site plan approval, ~~a geotechnical report of the landfill, and~~ the proposed landfill expansion to include the electrical generating facilities proposed in Phase 1, shall be submitted to the Geotechnical Review Board (GRB) for its review and approval. Any and all recommendations of the GRB within its purview shall be implemented; if these recommendations cannot be implemented in substantial conformance with the SEA Plat, this Special Exception Amendment shall be null and void. If the GRB determines that any portion of the review is outside of its purview, that portion shall be forwarded back to DPWES for review prior to site plan approval.

   Prior to site plan approval for the solar panels proposed in Phase 4, the wind turbines and/or solar panels proposed in Phase 5, and for each of the proposed active recreational uses proposed in Phases 5 and 6 (radio controlled aircraft field, baseball hitting range(s), and golf driving range) each use shall require the review and approval by the Geotechnical Review Board (GRB). Any and all recommendations of the GRB within its purview shall be implemented. If these recommendations cannot be implemented for any of the above Phases 4-6 uses then that use shall not be permitted. If the GRB determines that any portion of the review is outside of its purview, that portion shall be forwarded back to DPWES for review prior to site plan approval.

6. No construction of the Phase 5 and Phase 6 active recreational facilities on top of the landfill, as depicted in the SEA Plat, shall take place until the applicant has been released from its post-closure monitoring and maintenance requirements by the Virginia Department of Environmental Quality (DEQ) ends and the following takes place: ~~, except for trails as depicted on each phase of the SEA Plat shall take place until:~~

   - The GRB has determined in writing that any residual post construction settlement will not affect the ~~appearance or~~ structural integrity of the proposed improvements; and

   - ~~The~~ DEQ, the County's Fire and Rescue Department and/or DPWES has determined that the nature and extent of corrosion producing properties, the generation and escape of combustible gases and potential fire hazards of the constituent material, considering its state of decomposition, has been provided for adequately and will not create an unsafe or hazardous condition in or around any of said proposed improvements.

7. If any of the currently undisturbed areas of the landfill along the northern and eastern portion of the site (as depicted on Sheet 3 of the SEA Plat) are proposed to be disturbed for any reason (including installation of utility lines, detention ponds, access roads, etc.), then, prior to any such disturbance, a tight interval (30-foot intervals between shovel tests) Phase I archaeological survey shall be performed prior to site plan approval for those areas proposed to be disturbed and not previously the subject of a Phase 1 archaeological survey using a scope of work approved by the Cultural Resource Management and Protection Section of the Fairfax County Park Authority (FCPA). If any archaeological resources are found by the Phase I survey and are determined to be potentially significant and disturbance of these resources cannot be avoided, then a Phase II study shall be performed to assess the significance of the such resources in the Phase I study area. If deemed necessary by FCPA, a Phase III data recovery shall be performed in accordance with a scope approved by the Cultural Resource Management and Protection Section, FCPA. Any Phase III scopes shall provide for public interpretation of the results. Draft and final archaeological reports produced as a result of the Phase I, II, and/or III studies shall be submitted for the review and approval of by the Cultural Resource Management and Protection Section of FCPA.*

8. Stormwater management and Best Management Practices (BMPs) for the subject property shall be provided as depicted on the SEA Plat and in conformance with the applicable Public Facilities Manual (PFM) standards, unless waived and/or modified by DPWES.*

9. If deemed necessary by DPWES during site plan review, a Water Quality Impact Assessment (WQIA) shall be provided for encroachments into the Resource Protection Area for the purpose of providing adequate outfall and/or redevelopment of the existing stormwater management facilities. Should any such encroachment be necessary, the limits of disturbance shall be no greater than that permitted by these development conditions, irrespective of that shown on the SEA Plat.*

Conditions on the Operation of the Landfill

10. At the time of initialPrior to site plan submission, a copy of the current Closure Plan (which addresses leachate control) approved by the Virginia Department of Environmental Quality (DEQ) shall be provided to the Department of Planning and Zoning (DPZ), the Division of Solid Waste ProgramDisposal and Resource Recovery (DSWRR), DPWES of the Department of Public Works and Environmental Services (DPWES) and the Mount Vernon District Supervisor's office. A copy of the approved Closure Plan shall be maintained on-site and made available. Amended versions of the Closure Plan shall be submitted to the above mentioned agencies and offices as revisions occur and with any subsequent site plan submissions. In addition, the applicant shall initiate its Major Permit Amendment with DEQ. A letter confirming said initiation shall be provided to the above referenced agencies and office. A copy of the Major

Permit Amendment shall be maintained on-site and be made available upon demand. A letter confirming subsequent amendments to said Major Permit Amendment shall be submitted to the above referenced agencies and office as revisions occur and with any subsequent site plan submissions.

11. The landfill shall be operated in conformance with all sections of Virginia Administrative Code (VAC) applicable to the proposed landfill operations, except as waived or modified by DEQ.* ~~There shall be no future expansion of the landfill, beyond that outlined by the SEA Plat and permitted by these development conditions.~~

12. The height of the landfill prior to the installation of final cover (cap) of the landfill, vegetation, and "structures" as shown on the SEA Plat, shall not exceed the proposed final debris elevation, as shown on the SEA Plat. All landfill disposal activities shall cease when the final debris elevation of 412 feet above sea level ~~as shown on the SEA Plat~~ is reached, or ~~January 1, 2019~~December 31, 2040, whichever occurs first. ~~The~~ Such debris height ~~of~~ across the landfill shall not exceed the elevations depicted by the proposed topography shown on the SEA Plat, except for (i) any temporary berms or temporary stockpiles ~~which~~ that may be required or approved by DEQ or by the Director of DPWES for operational reasons, visual screening or noise attenuation or capping and (ii) to provide adequate drainage from the center of the landfill.*

13. The landfill shall receive only construction~~/~~ demolition debris materials, as defined in Section 104 of the County Code and as deemed permissible by Federal, State and County regulations. Unacceptable landfill materials shall be prohibited on-site in accordance with the implementation of the Unauthorized Waste Control Plan as required by Virginia's Solid Waste Management Regulations and approved by ~~the Virginia Department of Environmental Quality~~DEQ.

14. Waste materials shall not be burned nor allowed to be burned at the site.*

15. A liner system shall be installed in all landfill cells as required in accordance with Virginia Solid Waste Management Regulations.*

16. A tire wash system, including a wash rack/grate system to dislodge mud on truck tires, shall be provided as depicted on the SEA Plat in order to ensure that mud is not tracked from the landfill onto the surrounding roads. The tire wash system may move from its location as shown on the SEA Plat. However, the tire wash system shall be in a location that will wash truck tires prior to exit from the subject property. In the event that one of the access points to the subject property becomes an additional truck exit, that exit shall contain a tire wash system as described below. ~~This installation shall occur within 120 days of SEA approval or prior to the issuance of the Non-Residential Use Permit (Non-RUP), whichever occurs first.~~ The tire wash system shall be maintained in accordance with the manufacturer's recommendations. Adequate resources (including spare parts)

shall be maintained on-site in order to ensure that any needed repairs are made within a 24-hour period. ~~The area between the site's main entrance and the location of the tire wash shall be paved as depicted on the SEA Plat in order to~~ To ensure that the truck tires remain clean after ~~being washed.~~washing, a minimum of 400 feet of pavement shall be installed immediately after the tire wash and shall be followed by gravel between said pavement area and the exit at Furnace Road. In addition, "cattle guards" shall be employed to knock off mud and water in three locations: (i) before the tire wash; (ii) immediately after the tire wash; and (iii) at the landfill exit. Should the tire wash be inoperable, alternative (and equivalent) methods of removing mud from the tires shall be employed. Should said alternative methods be unavailable, no landfill materials shall be accepted until the tire wash is back in operation. Said new tire wash system shall be installed and in operation by December 31, 2014, unless DPWES determines that approval of a site plan revision or site plan amendment is necessary; then it shall be installed within six months after obtaining such approval.

~~17. In order to eliminate standing water from collecting in front of the site's entrance and to convey such water away from the site entrance, a drain (or other such improvement) properly functions to the satisfaction and approval as approved by DPWES shall be installed. This review shall occur prior to improvement shall be made prior to the issuance of the Non-RUP.~~

~~18.~~17. Prior to landfilling in any new operational areas beyond ~~the elevation~~those allowed pursuant to SEA 80-L/V-061 (290 feet above sea level), sediment basins meeting State and County regulations shall be ~~made prior to the issuance of the Non-RUP~~ provided in the Phase shown on the SEA Plat and maintained.*

~~19.~~18. All dikes, basins and stockpiles shall be seeded and mulched as soon as they are constructed.*

~~20.~~19. ~~Along the toes of slopes being worked~~Litter shall be controlled by the use of litter fences at the top of the landfill on each side of the active debris dumping areas along the working face~~, debris shall be controlled by the use of litter fences~~. Furthermore, a Litter Control program shall be prepared and implemented in accordance with Virginia's Solid Waste Management Regulations.*

~~21.~~20. A Groundwater Monitoring Program shall be prepared and implemented in accordance with Virginia's Solid Waste Management Regulations. A copy of all water test results, including groundwater, surface water and water quality, submitted to DEQ, shall also be submitted at the same time to the Fairfax County Health Department and the Solid Waste Program, DPWES. If, upon determination by DEQ and/or Fairfax County, any off-site private well is adversely affected by the landfill operation, the landfill owner will provide an adequate potable water supply to any affected property within ~~five (5) days~~48 hours of being notified of such a determination.*

~~22.~~21. Dredge soils may be deposited at the landfill so long as the dredge soils entering the site meet the DEQ definition of acceptable waste for Construction and Demolition Debris landfills. Dredge soils from the Lake Barcroft Water District and from the Lorton Station Homeowners' Association, which meet the DEQ definition cited above, shall be accepted at the landfill at no cost. Dredge soils may be accepted after the cessation of landfill disposal activities and during the post-closure period in connection with landscaping improvements and installation of the final cap.*

~~23.~~22. The control of decomposition gases from the landfill shall be monitored through the implementation of a Gas Management Plan in accordance with Virginia's Solid Waste Management Regulations. A coarse aggregate gas collection layer with collection pipe and gas vents above breathing zones shall be installed as part of the cap in areas that are proposed for Phase 5 and Phase 6 recreational uses on top of the landfill, including parking areas~~, exercise stations, the overlook, the amphitheater, the pavilion, and the kite flying area~~, as reviewed and approved by DPWES. All proposed ~~recreational~~ structures on top of the landfill ~~, such as the gazebo, picnic shelters and amphitheater,~~ shall be open air, self-venting construction in order to prevent the buildup of landfill gases. Any closed structures ~~(except restroom facilities)~~, such as the leachate pump houses, shall be locked to prohibit public access.*

23. Recycling of construction and demolition debris (and related materials) shall continue to be carried out on the landfill as an accessory use. Recycling shall include the sorting, separation, storing, and processing (such as chipping, crushing, augmenting) of debris and recyclable materials (including, without limitation, the sorting of cardboard, metal, wood and inert material).

~~24. Cardboard recycling collection containers shall be provided on-site within 120 days of SEA approval or prior to the issuance of the Non-RUP, whichever occurs first. All cardboard must be pre-sorted from other wastes prior to entering the site. In addition, other facilities may be provided on-site within 120 days of SEA approval or prior to the issuance of the Non-RUP, whichever occurs first, as approved by DPWES and DEQ to support the separation, processing and marketing of recyclable materials.~~

~~25.~~24. A yearly contribution of $60,000 shall be provided to the County for use by DPWES for public outreach and education associated with recycling activities applicable to construction and demolition debris. Contributions shall begin August 1, 2009, and shall continue annually until the cessation of landfill disposal activities.*

~~26.~~25. An Emergency Contingency Plan shall be prepared and implemented in accordance with Virginia's Solid Waste Management Regulations. A list of the landfill's equipment operators and their telephone numbers shall be made available to the County's Emergency Operations Center and kept current by the landfill operator.*

~~27.~~26. Landfill materials may be accepted and clearing or grading of any kind may take place on the site only between the hours of 7:00 A.M. to 5:~~00~~ 30 P.M. Monday through Friday and between 7:00 A.M. and ~~12~~3:00 PM ~~(noon)~~ on Saturdays. ~~However, within 120 days of SEA approval or prior to the issuance of the Non-RUP, whichever occurs first, t~~The landfill gates shall be permitted to open to customers at 5:30 A.M. Monday through Friday and at 6 A.M. on Saturdays to allow customers to queue on-site while waiting for landfill activities to commence. However, in no case shall landfill operations begin until the commencement of the normal business hours listed above. With prior approval from the Director of the Department of Public Works and Environmental Services, or his designated agent, the applicant may operate until 5:00 P.M. on Saturday on an emergency basis. This approval shall not be granted more than ten times per calendar year. In the event of a significant community emergency, as determined in writing by the County Executive, the landfill may temporarily operate outside of normal business hours.*

~~28.~~27. In an effort to solve mutual problems, the operator will work with, and will, as necessary, meet on a regular basis with the Mount Vernon Council and/or the South County Federation and/or any other groups (such as neighboring homeowner associations) as designated by the Mount Vernon District Supervisor.*

~~29.~~28. Per Sect. 9-205 of the Zoning Ordinance, the site shall be made available to the Director of DPWES or his representative in preparation of the annual report to the Board of Supervisors. As a result of the annual inspection, the Director of DPWES may recommend additional restrictions and limitations on the use to the Board.*

Buffering, Landscaping and Screening Conditions

~~30.~~29. Irrespective of the notation on the SEA Plat that says "approximate limits of clearing and grading~~",~~," the limits of clearing and grading as depicted on the SEA Plat shall be strictly adhered to. No new waste (debris) placement activity shall take place within ~~150~~ 75 feet of the greater of the RPA or the 100-year floodplain of Giles Run. There shall be no disturbance within the RPA except in those limited areas depicted on the SEA Plat and/or as permitted under the Chesapeake Bay Preservation Ordinance.*

~~31.~~30. Notwithstanding the limitations of other development conditions, the applicant shall be permitted to encroach into the limits of clearing and grading and/or the RPA without an SEA in order to conduct environmental monitoring and/or remediation activities to ameliorate a potential environmental and/or public health hazard. Prior to the commencement of any such disturbance, the applicant shall obtain all necessary approvals from DPWES for the actions to be taken, and immediately following any such activities, shall restore the disturbed area to the extent required, ~~subject to the approval of DPWES~~.*

~~32.~~31. All permanent berms located within buffer areas shall be landscaped to the satisfaction of the Urban Forest Management Division (UFMD), DPWES~~Department of Public Works and Environmental Services (DPWES)~~. The materials used and their separation shall be in conformance with the landscaping standards of Article 13 of the Zoning Ordinance as may be applicable and as determined and approved by UFMD.*

~~33.~~32. A 50-foot wide continuous transitional screening ~~An undisturbed~~ buffer of existing trees shall be maintained along the northern boundary of the site as depicted on Sheet 21 of the SEA Plat and subject to UFMD approval.*

~~34.~~33. Along the southern property boundary, i.e., from the southernmost point of the property to a point approximately: (i) 600 feet along the southwestern boundary and (ii) ~~1,600~~800 feet along the southeastern boundary, a landscaped buffer of at least 100 feet shall be maintained. In any area along this boundary where a minimum of 100 feet of natural vegetation does not exist, additional landscaping shall be planted ~~and/or the existing berm extending to provide and eight (8) foot high landscaped berm. Both~~The landscaping ~~and the berm~~ shall be designed to the satisfaction of UFMD, DPWES. The materials used and their separation shall comply with the landscaping standards of Article 13 of the Zoning Ordinance, as determined by UFMD, DPWES.*

~~35. Sound levels emanating from the site shall not exceed those applicable levels specified in Chapter 108, Noise, of the County Code.*~~

Conditions for the Landscaping~~Restoration~~ of the Property

~~36.~~34. A landscape plan for all phases shall be prepared and submitted for the review and approval ~~of~~ by UFMD, DPWES as part of the site plan approval for the landfill use. ~~prior to each phase of the development and with each submission of the site plan.~~ The landscape plan shall provide for revegetation~~/reforestation~~ of the landfill as depicted on the SEA Plat and~~. Reforestation~~ shall include suitable varieties of trees and shrubs ~~which are~~ to the satisfaction of and approval by UFMD, DPWES, consistent with that shown on the SEA Plat.* ~~No new phase may be started prior to approval of its landscape plan.~~

~~37.~~35. Prior to site plan approval ~~of the first site plan for any expansion of the landfill~~, an invasive species ~~vegetation~~ management plan shall be developed by the applicant's arborist for approval by UFMD ~~and established~~ in order to control non-native, invasive vegetation and promote the establishment of native ~~meadow~~ species. This plan shall be reviewed and approved by UFMD, DPWES~~, in consultation with FCPA~~.*

~~38.~~36. All landscaping installed by the applicant shall be maintained in good health by the applicant. Any such landscaping that should die within the initial three growing seasons shall be replaced by the operator/applicant within the first

growing season after ~~six months of~~ its death, or as determined appropriate by UFMD.*

~~39.~~37 At the time of site plan approval~~, a~~ cash, bond, or a letter of credit and payable to the County of Fairfax shall be posted to ensure that the approved landscaping and revegetation plans are completed in an amount determined by UFMD, DPWES.*

38. Landscape planting shall be installed according to the landscape plan for each phase as generally depicted on the SEA Plat. Landscaping in one phase may begin before the completion of any prior phase to facilitate ongoing landfill operations. An interim vegetative cover shall be provided in disturbed areas where active landfill operations are complete and an interim landfill cap has been installed for any given area regardless of phase. Final landscaping, according to the approved landscape plan, shall be provided at the beginning of the first full planting season following the installation of the final landfill cap, subject to review and approval by UFMD. Final cover material shall be provided in accordance with DEQ design requirements, as approved in the Major Permit Amendment. Additional soil shall be placed on top of the final cover in those locations where the planting of trees is to occur, subject to the review and approval by UFMD and DEQ.

~~40. The approved revegetation/reforestation program shall be executed. Revegetation and reforestation of disturbed areas shall occur when the active landfilling operation is no more than two lifts above any previous revegetation/reforestation area, or face of the slope. (A lift is defined as the compacted layer of waste and the top layer of cover material.) As the faces of any two lifts are completed, the faces shall be compacted, seeded, mulched and tacked within ten days of the lifts' completion or as soon thereafter as feasible give weather conditions.~~

~~41. During the first full planting season following completion of each phase, the surface of such phase shall be covered with soil and planted with ground cover on an interim basis, and the shall be replanted in accordance with the landscape plan, subject to review and approval by UFM. Final cover material shall be provided in accordance with DEQ design requirements as approved in the Closure Plan. Additional soil shall be placed on top of the final cover in those locations where planting of trees is proposed. The final location, depth and composition of the additional soil shall be subject to the review and approval by UFM and DEQ.~~

~~42.~~39. Final ~~restoration~~ landscaping of the landfill shall be completed within one year after ~~of~~ the termination of landfilling operations on the property and completion of the full landfill cap.*

~~43. The height of the berm along Furnace Road shall not exceed 11 feet and the height of the fence on top of said berm shall not exceed 8 feet. The installation~~

~~of the proposed berm and fencing shall be subject to VDOT and/or DEQ approval.~~

Transportation Conditions

~~44.~~40. Commercial ~~T~~truck traffic to and from the site ~~from the east, north and south shall be required to use only that portion of Furnace Road between U.S. Route 1 and the site entrance.~~ shall enter the site only from the south. ~~Truck traffic entering the site from the west via Route #123 shall use the section of Furnace Road between the site entrance and Route #123. Truck traffic entering the site from any direction shall avoid that section of Lorton Road between Furnace Road and I-95 (in the vicinity of Lorton School).~~ Commercial truck traffic shall be prohibited from making left turns into and right turns out of the landfill. The applicant shall retain its existing approved design at its main entrance and shall provide a similar restrictive design (as approved by the Virginia Department of Transportation) at its new southern entrance to accomplish this restriction. Signage shall be posted indicating the traffic restrictions at each of the site's entrances/exits. The operator shall ~~post this condition at the site entrance and~~ inform all regular customers of these restrictions in writing at least twice a year.*

~~45.~~41. Right-of-way to 44 feet from the existing centerline along the site's Furnace Road frontage and any ancillary easements shall be reserved for dedication to the Board of Supervisors in fee simple without encumbrances at no cost as shown on the SEA Plat. This right-of-way shall be dedicated upon demand ~~of~~ by Fairfax County and/or the Virginia Department of Transportation (VDOT)~~, but no later than January 1, 2019. Within 180 days following dedication, the proposed berm and fence within the reservation area shall be removed, as will the proposed raised concrete island at the site entrance, subject to approval by, and unless otherwise directed by VDOT~~. Should this right-of-way dedication be required prior to completion of landfill activities, the ~~berm and vegetated screening shall be permitted to remain until cessation of landfill activities subject to the execution of a license agreement between the applicant and Fairfax County~~raised concrete island at the main entrance to the landfill shall be permitted to remain, subject to VDOT approval.

~~46. If prior to site plan submission, an alternative to a left turn land from southbound Furnace Road has not been determined to be acceptable to the Virginia Department of Transportation (VDOT) and the Fairfax County Department of Transportation (FCDOT), a left turn lane into the site entrance shall be provided to a standard required by VDOT. Said turn lane (or alternative as determined acceptable by VDOT and FCDOT) shall be constructed and open to traffic prior to the issuance of the Non-Residential Use Permit (Non-RUP).~~

~~47. A right turn lane into the main entrance shall be provided as reviewed and approved by FCDOT and by VDOT. In order to provide adequate sight distance at the main entrance, grading improvements shall be provided as directed by VDOT. These improvements shall be made prior to the issuance of the Non-~~

~~RUP.~~

~~48.~~42. There shall be no access to the property for any landfilling purpose through the adjoining properties to the north. Pedestrian access shall not be permitted, except a trail connection to Lorton Valley may be provided in Phase 1 solely at the option of the Lorton Valley Homeowners Association, as depicted on the SEA Plat. ~~, as shown on the SEA Plat shall be permitted. *~~

~~49.~~43. Effective dust and gravel control measures shall be installed and maintained by the operator of the landfill. At a minimum, these measures shall include the full-time availability of a water tank truck and sweeper vehicle on-site.*

44. As depicted on the SEA Plat, beginning at the end of Phase 1 of operations after the berm is completed in that area, a second right turn in-only lane shall be constructed by the applicant, as approved by VDOT, as a new southern entrance-only for truck traffic travelling north on Furnace Road. No left turn into nor exits from the landfill shall be permitted at this second/southern entrance.

~~50. Prior to site plan approval, it shall be demonstrated that no trucks will be able to leave the site in a northbound direction. Any improvements needed to ensure the provision of an adequate turning radius at the site entrance for a right in and left out turn only for trucks shall be made prior to the issuance of the Non-RUP.~~

~~51. Subject to VDOT approval, maintenance of the existing ditch on the east side of the Furnace Road right-of-way shall be performed by the applicant prior to the issuance of the Non-RUP. Maintenance shall be limited to removing silted debris from the existing ditch sections for a portion from the site entrance to a point approximately 200 yards south to improve their ability to convey stormwater runoff from the surface of Furnace Road. This maintenance shall only be performed by the applicant once. The applicant shall diligently pursue permission from VDOT to perform this maintenance and shall commence such pursuit prior to the submission of any site plan. If unable to obtain such permission, the applicant shall demonstrate the failed attempts in writing to DPWES. Should VDOT not permit the applicant to perform this maintenance within 120 days of SEA approval, this development condition shall be null and void.~~

Renewable Energy Program

45. The applicant shall establish a Green Energy Park (GEP) on portions of the landfill as generally shown on the SEA Plat. Said GEP shall consist of renewable energy generation facilities including wind, geothermal infrastructure and methane gas collection systems and potentially solar panels, as interim uses during both the landfill operations and post-closure periods, as described below:

A. The applicant shall erect three wind turbines by the end of Phase 1 (the Phase 1 wind turbines, as depicted on Sheet 6 of the SEA Plat). Each of the three wind turbines to be installed on-site by the applicant during Phase 1 shall be capable of producing at least one-quarter megawatt peak

of electricity. The first turbine shall be installed no later than 18 months after all necessary Federal, Virginia, and Fairfax County approvals are obtained for the wind turbine, to include, but not limited to: (i) FAA and/or other Federal, State and County approvals; (ii) all requisite DEQ approvals, including the Major Permit Amendment; (iii) all requisite County approvals such as GRB, site plan, land development and structure permits, non-DEQ bonding, and Non-RUP, have been obtained; (iv) and any other approvals not noted for the wind turbines to operate on the landfill. The above referenced approvals are collectively referred to as Necessary Approvals. Necessary Approvals shall diligently be pursued by the applicant. The second and third turbines shall be installed within 36 months after having received all Necessary Approvals.

The applicant shall install an inverter or similar device in order to convert the electricity produced by the Phase 1 wind turbines from direct current to alternate current. During Phase 2 of development, at least 75% of electricity generated by the Phase 1 wind turbines after conversion to alternate current shall be consumed on-site by landfill facilities or activities.

Fifty percent of any revenue, in excess of 2.5 cents per kilowatt hour, the applicant receives from the sale of the electricity produced shall be contributed to the County of Fairfax (the County) within 30 days after receipt of such revenue. The applicant shall submit a quarterly report to DPWES documenting the electricity produced.

For any electricity produced by the Phase 1 wind turbines and consumed on-site, the applicant shall contribute to the County 50% of the price (over 2.5 cents) it would have paid to a third party provider for the 'electricity supply service' net of taxes and distribution charges.

The applicant shall construct a foundation for the Phase 1 wind turbines, the design for which shall be reviewed and approved by DEQ. The Phase 1 wind turbines shall be operated for their useful life or until the initiation of Phase 5 landfilling activities requires their removal.

B. The applicant also shall install a methane gas recovery system within the landfill and shall deliver to the County, at a mutually agreed upon nearby location (such as Landfill Energy Systems, Inc.), methane gas sufficient to generate the equivalent of an average of two million kilowatt hours annually of electricity, with the intent that it will be used by the County to generate electricity sufficient for the normal operating needs of County-owned facility(ies) and/or for use by County-owned facilities as a fuel for operations, such as the Noman Cole Water Pollution Control Plant. The applicant shall pay the incremental cost, if any, of processing the methane gas so that it is suitable for combustion by industry-standard co-generation infrastructure. Delivery of the methane gas shall begin within 18 months

of site plan, Non-RUP, and DEQ approvals for the SEA landfill expansion and continue until the cessation of landfill activities or until December 31, 2040, whichever occurs first. Should the applicant fail to provide sufficient methane gas to generate the 2 million kilowatt hours in any given calendar year, it must pay the County $0.125 for each equivalent kilowatt of electricity that cannot be generated due to the unsupplied methane gas, up to a maximum payment of $250,000 in any given calendar year. After 2040, the applicant shall provide to the County 50% of the methane gas that is recovered from the methane recovery system and will continue to do so each year until the DEQ post-closure period ends.

C. Within 24 months after having received all necessary approvals for implementation of the SEA landfill expansion and approval of PCA 2000-MV-034 at Tax Map Parcel 113-1 ((1)) 12 and 13 (the PCA Property), as proposed, the applicant shall install a geothermal recovery infrastructure at the landfill with capacity to support 1 million square feet of building structure(s) and shall provide an access point for hook-up to such systems by the County on the boundary of the PCA Property. The Applicant shall maintain the geothermal recovery infra-structure and related access point until the end of the DEQ post-closure period ends.

D. As depicted on the SEA Plat, in Phase 4, the applicant shall create an approximately 10-acre platform within the southern portion of the operations area to facilitate the provision of solar panels by the applicant and/or others.

E. By the end of Phase 5, the applicant shall have established an approximately 40-acre platform to facilitate future creation of a larger GEP, which may include the potential for up to 12 wind turbines (or wind infrastructure sufficient to produce at least 3 megawatt peak electric power capacity), solar panels (or solar conversion infrastructure sufficient to produce at least 7.5 megawatt peak electric power capacity) and/or more advanced technologies (referred to as the Full Green Energy Park "Full GEP") to be provided by public and/or private entities with the applicant's agreement.

F. Prior to establishment of the Phase 5 wind turbines, the applicant and/or others, as appropriate, shall file a variance request to allow the wind turbine to exceed the height limitation in the R-1 District or should the Board of Supervisors amend the Zoning Ordinance to permit an increase in height for Category 2 electrical generating facilities the applicant shall be subject to the approved Zoning Ordinance Amendment.

46. Wind turbines on the subject property shall not exceed 180 feet in height (to include the rotor blades) and shall be in general accordance with the maximum dimensions, as shown on Sheet 14 of the SEA Plat.

47. The following shall be paid by the applicant to the Fairfax County Board of Supervisors for the respective renewable energy generating facility not provided within the timeframe specified, in the following amounts in lieu of said facility: (i) $1,000,000 for each Phase 1 wind turbine not installed within 4 years of necessary approvals for the landfill expansion; (ii) $6,000,000 should the methane recovery system not be installed within 4 years of receiving the necessary approvals for the landfill expansion (while still being committed to pay $250,000 or to supply two million kilowatt hours annually); and (iii) $1,000,000 should the geothermal not be installed as approved by DEQ within 4 years of receiving the necessary approvals for the landfill expansion. In lieu of said payment penalty, the applicant may expend one or more of the penalty amounts on installation on-site of renewable energy technology other than that technology not timely provided, subject to a Board motion authorizing such expenditure and installation. Said funds shall be payable to Fairfax County with consideration toward local community needs in the Lorton/South County area, as determined by the Board. The Zoning Administrator may grant extensions to the above penalty payment periods if it is determined that the applicant diligently has pursued said necessary approvals.

Other Public Contributions by the Applicant

48. Subject to the receipt of the necessary approvals for the landfill expansion, the applicant has agreed to contribute $15,000,000 to the Board in installments of $750,000 each per year beginning no later than January 31, 2019, and ending no later than January 31, 2038. Said funds shall be payable to Fairfax County with consideration toward local community needs in the Lorton/South County area, as determined by the Board. These funds shall be in addition to the separate recreation contribution below and the other Green Energy Program expenditures and contributions to the County committed herein by this applicant.

49. In addition to the above contribution, the applicant shall contribute $3,200,000 to the Fairfax County Park Authority no later than January 31, 2019, for use for recreational facilities in the Lorton/South County area subject to all necessary approvals for the landfill expansion.

50. As shown on Sheets 6 through 14 of the SEA Plat and subject to DEQ approval, an "Observation Point" shall be installed by the applicant during Phase 1 in the general location of the Phase 1 wind turbines and be open for visitors within 120 days after the three turbines begin operation. The Observation Point and an ancillary shuttle service shall only be available for controlled access and remain in operation until the DEQ post-closure period ends, in accordance with the following:

A. Access to the Observation Point shall be controlled solely by the applicant via shuttle service at no cost to visitors. The applicant may require that each visitor execute a liability waiver and release. Visitors shall park at the

solar farm located on the contiguous PCA 2000-MV-034 property located at Tax Map Parcels 113-1((1)) 12 and 13 (PCA Property) and travel on-site via the applicant's shuttle service and escorted by the landowner up to the Observation Point.

B. The applicant shall provide a parking easement at the PCA Property for the duration of the operation of the off-site visitor parking/shuttle service area. The parking easement shall be recorded in the land records with a copy provided to DPWES.

C. Parking at the off-site parking area on the PCA Property shall only be permitted for the Observation Point visitors and shuttle service and for maintenance vehicles while providing maintenance to the electrical generating facilities at the PCA Property and to the PCA property.

D. The applicant shall provide for two established times (and duration) for tours each month from April 1 to November 30 and also allow a limited number of additional tours to be scheduled with ample notice. Each regular and additional tour may require a minimum of five (5) and may be limited to no more than twenty (20) visitors to occur. The frequency of regularly scheduled tours may be reduced upon demonstration by the applicant to the Zoning Administrator to reflect actual demand and/or current weather conditions. The applicant may implement a pre-registration system.

E. In addition to the above tours, the applicant shall collaborate with the County upon request by any member of the Board of Supervisors to host pre-scheduled community special events at the Observation Point. For each special event considered, the applicant shall determine whether the proposed scope, timing and number of participants may be accommodated in a safe manner that does not interfere with landfill and other operations, including the Green Energy Park. Scheduling shall be proposed through the applicant and shall be limited as to the number of special events (not to exceed three in any calendar year) and the number of participants at each, as determined by the applicant. Special events shall be restricted to the Observation Point area and occur only from April 15 to November 15, outside of landfill operating hours (unless otherwise agreed to by the applicant). The County shall be responsible for security and all other logistics. The events shall be consistent with the nature of a working landfill and the GEP, and shall not involve erection of tents or other structures, or involve food or alcohol. Each participant may be required to execute a release of liability in favor of the applicant and shall be transported to and from the site only in shuttle-type vehicles approved by the applicant and the applicant shall not be responsible to provide such transportation. The applicant, in its sole discretion, may decline or cancel proposed special events due to safety, inclement weather and/or other conditions or concerns related to landfill and other operations. The

applicant shall attempt to accommodate such special events until the DEQ post-closure period ends.

F. Outdoor style wooden bench seating shall be provided for up to 20 visitors, with a lectern at the head of the benches to provide for speakers.

G. Tourist style telescopes (on posts) shall be provided at the east and west flanks of the Observation Point area. Actual location of each telescope could vary from edge of the seating area to ridges of the elevation.

H. Information signs describing the "Green Energy Triangle," history of the area and local attractions shall be provided.

I. The Observation Point shall be open for tours beginning during Phase 1 (as provided above) until the beginning of Phase 5, generally as depicted on the SEA Plat. At the beginning of Phase 5, when the Phase 1 wind turbines are removed (to permit filling and capping within the southern platform area), the Observation Point and its related features shall be relocated northward, with the understanding that its location likely will need to be further moved as Phase 5 landfill operations and capping proceed toward closure. Thus, during Phase 5 there may be gaps and transition periods (not to exceed 18 months cumulatively) during which no Observation Point shall be available due to filling, settling and capping activities.

51. The applicant shall provide, within 12 months of having received all necessary approvals for the Phase 1 wind turbines, $200,000 to the Board as a contribution toward an educational feature available to the public which describes the renewable energy operations on the applicant's properties as well as those renewable energy activities occurring on neighboring County land, and provides information on renewable energy.

52. The applicant shall provide to the County operational data (operating cost, productivity, weather and revenue information) equipment specifications, and maintenance data related to its renewable energy park on an annual basis over the GEP's operating life. Said data shall be available electronically for access and use by the general public and academic bodies, and for research.

53. The applicant's consultant shall prepare a study, consistent with U.S. Fish & Wildlife Service's Land-Based Wind Energy Guidelines (Guidelines), which provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development and examines migratory bird patterns, including endangered species. The Guidelines consist of 5 tiers and the applicant shall submit a report based on each tier to the Department of Planning and Zoning (DPZ) and to DPWES with Tiers 1-3 submitted prior to the issuance of the building permit for installation of the first

Phase 1 wind turbine. Tiers 4-5 shall be submitted prior to the end of Phase 5. Should the 12 wind turbines be installed in Phase 5, the applicant or operator shall be subject to the Guidelines and shall submit reports in accordance with each of the five tiers.

Recreational Uses

54. As generally depicted on Sheet 21 of the SEA Plat, in Phase 1 an approximately 5.2 acre private recreation area shall be provided by the applicant at the sole option of the Lorton Valley Homeowners' Association (LVHOA) and made available for use solely by LVHOA residents and their guests; if provided, said private recreation area and land area shall be conveyed in fee simple to LVHOA. In the event LVHOA chooses not to accept said private recreation area, then the recreation area shall not be constructed and this land shall not be conveyed, and shall remain in undisturbed open space. Regardless of conveyance, a 50-foot-wide treed buffer shall be provided along the entire northern property boundary and consist of a combination of existing, mature trees and supplemental plantings shall be installed by the applicant and shall be subjected to a conservation easement prior to conveyance of the recreation area to LVHOA. Grading shall be permitted within this buffer area, as determined by UFMD, as necessary for installation of the adjacent natural surface trail and/or other improvements identified immediately below. Adjacent to this buffer area, a natural trail and any off-site trail connection, exercise stations along the trail, a multi-purpose open space area, a dog park, and/or picnic tables shall be provided by the applicant at the sole option of and if agreed to by the LVHOA at any time prior to installation of the third Phase 1 wind turbine.

55. As generally depicted on Sheets 10 and 14 of the SEA Plat, an outdoor baseball hitting range/cages may be provided during the Phase 5 DEQ post-closure period, if permitted by DEQ, or after the DEQ post-closure period ends. No outdoor lighting shall be permitted.

56. As generally depicted on Sheet 45 of the SEA Plat, and as approved by DPWES on separate site plan submission(s), active recreation uses consisting of baseball hitting range(s), a golf driving range and/or a radio controlled aircraft field may be provided by the applicant or lessee during Phase 6 of development either: (a) subsequent to cessation of the potential 12 wind turbines and/or solar panels on the 40-acre platform or a portion thereof, or (b) upon the end of DEQ post-closure period. There shall be no outdoor lighting permitted for these uses.

57. If requested, the applicant shall assist with site preparation for a 2 to 3-acre area designated in Apple Orchard Recreation Area or in the vicinity of Laurel Hill Park, for community garden use. Site preparation shall be limited solely to clearing and grading no more than three acres of land to be used for such garden. The applicant shall not be responsible for any additional support (except as specifically provided below), including any road improvements or impervious

surface improvements, construction of any structure or any other site improvements. In collaboration with the entity managing said community garden, the applicant shall provide for use at the community garden throughout the landfill's operating life, from its recycling operation, reasonable amounts of recovered soils, crushed stone, mulch and other recovered materials to support garden activities. The applicant shall make a onetime contribution of $50,000 to the entity managing the garden operation for the materials and fees related to creation of the garden if and when all County approvals have been secured by such entity to construct and operate the garden. As may be requested by such entity, the applicant shall provide soil testing on a one time basis for quality, composition, and drainage provided such testing occurs in conjunction with any testing the applicant carries out as part of its landfill site plan approval process. This development condition shall be null and void and the applicant shall not be bound to provide such support if the garden is not established prior to January 1, 2019.

~~52. The proposed park is for passive recreation use only. All park improvements shall be provided by the applicant as depicted on the SEA Plat with each applicable phase of development and shall be constructed to FCPA standards in consultation with FCPA staff.~~

~~53. Written notice shall be given to FCPA, DPWES, and the Department of Planning and Zoning (DPZ) when formal release of the landfill property owner from liability is granted by DEQ. The entire site shall be dedicated in fee simple to the FCPA within 30 days following the formal release of the landfill property owner from liability by DEQ. Prior to the site becoming a public park, a 2232 shall be submitted by FCPA for the review and approval of the Planning Commission.~~

~~54. Interim public access easements shall be provided over all trails and those on-site park facilities intended for public access as depicted on the SEA Plat, prior to transfer of the entire site in fee simple to FCPA. Prior to site plan approval, an agreement shall be executed between FCPA and the applicant regarding issues such as liability and maintenance for areas subject to public access prior to dedication of the property to FCPA.~~

~~55. Off-site trail connections to the north and west shall be provided by the applicant as depicted on the SEA Plat and the attached exhibit. The connection to the north is subject to the granting of necessary easements from the Lorton Valley Homeowners Association (HOA). In addition, an off-site trail shall be constructed to the Laurel Hill parkland, Greenway, and Sportsplex area, subject to the granting of rights of entry by Fairfax County. This proposed public access trail shall be an eight-foot wide asphalt trail (Type I) within a public-access trail easement of 12 feet. The exact location of the trail connection to portion of Laurel Hill Park shall be determined in cooperation with the FCPA Trails Coordinator and FCPA. Prior to site plan submission, the applicant shall diligently pursue acquisition of these easements and permissions, and, if unable to obtain such permission, shall demonstrate the failed attempts in writing to DPWES. Should the necessary easements and permissions not be provided to permit the off-site~~

~~trail connections within 90 days of site plan approval, the applicant shall be relieved of this commitment.~~

~~56. If the proposed restroom facilities are to be served by anything other than public sewer and water (such as an onsite sewage disposal system and/or a water well system), then installation of these facilities shall be coordinated with and approved by the Health Department.~~

The above proposed conditions are staff recommendations and do not reflect the position of the Board of Supervisors (Board) unless and until adopted by the Board.

This approval, contingent on the above noted conditions, shall not relieve the applicant from compliance with the provisions of any applicable ordinances, regulations, or adopted standards. The applicant ~~himself~~ shall be responsible for obtaining the required Non-Residential Use Permit through established procedures, and this Special Exception Amendment shall not be valid until this has been ~~complied with~~ accomplished.

Pursuant to Section 9-015 of the Zoning Ordinance, this special exception amendment shall automatically expire, without notice, ~~30~~ 48 months after the date of approval unless ~~a site plan has been approved for landfilling in any new operational areas beyond the elevation allowed pursuant to SE 80-L/V-061 (290 feet above sea level).~~ the use has been established or construction has commenced and been diligently prosecuted. The Board of Supervisors may grant additional time to establish the use or to commence construction if a written request for additional time is filed with the Zoning Administrator prior to the date of expiration of the special exception amendment. The request must specify the amount of additional time requested, the basis for the amount of time requested and an explanation of why additional time is required.

FURNACE ASSOCIATES, INC.
APPLICANT'S STATEMENT
SPECIAL EXCEPTION AMENDMENT SEA 80-L/V-061-2
January 22, 2014

Pursuant to Sections 3-104, 9-201, 9-301 and 9-501 of the Zoning Ordinance, Furnace Associates, Inc. (alternatively, "**Furnace**" or the "**Applicant**") requests Fairfax County Board of Supervisors' (the "**Board**") approval to amend Special Exception Amendment SEA 80-L/V-061 ("**SEA-1**") on Fairfax County Tax Map Parcels 113-1-((1))-5(pt.), -7 and -8, and 113-3-((1))-1, -2 and -4 (the "**Property**" or "**Application Property**") to (i) establish renewable energy electric generation facilities including wind, solar, geothermal infrastructure and methane gas collection systems as "interim uses" to further the County's "Green Energy Triangle" initiative; (ii) extend the useful life of the existing construction debris landfill to continue land filling activities until December 31, 2040; (iii) remove the previously-approved public park uses and facilities and the dedication requirement rescinded by the Fairfax County Park Authority Board (Park Authority Board and Staff collectively "**FCPA**") in March 2009; (iv) entitle three alternative private, limited-access active recreation "end uses;" and (v) create and operate an "Observation Point" as a private, controlled access accessory use. This landfill "Observation Point" would be accessed solely via shuttle service operated by the Applicant from visitor parking located on Furnace's adjacent I-6 zoned tract (Tax Map Parcels 113-1-((1))-12, -13) (the "PCA Property"), which is the subject of pending Proffered Condition Amendment PCA Application 2000-MV-034 (the "**PCA**"). No increase in maximum final elevation of the landfill is being requested in this Application.

The approximately 250-acre Property, zoned R-1, is occupied by a Construction Demolition Debris ("**CDD**") landfill which is classified as a "Category 2" Special Exception ("**SE**") use. A CDD landfill has been operated on the property since at least the 1970s, and ultimately in accordance with SE 80-L/V-061, approved on November 16, 1981 and amended by the Board in SEA-1 on January 8, 2007, subject to 56 development conditions. The landfill is inspected at least quarterly by the Virginia Department of Environmental Quality ("**DEQ**"). CDD landfills accept inert materials, such as concrete, rock, asphalt and glass, as well as scrap lumber, drywall, trees, brush, and other debris from construction sites and land clearing activities, as approved in the Property's DEQ waste permit. While no landfill may be permitted by DEQ without local government land use approval, no landfill use may be established without DEQ engineering review, approval, bonding requirements, operational limitations, environmental, monetary and reporting requirements, inspections and enforcement. No owner/operator of a DEQ permitted landfill can be released from its operational, maintenance, and monetary obligations until DEQ is satisfied, after typically ten (10) years of post-closure monitoring and inspections, that the landfill has completed settlement satisfactorily, the landfill cap is intact, and there is no existent environmental degradation or any indication thereof.

The Application Property generally is located between Interstate 95 and Furnace Road, south of Lorton Road and east of the County landfill, incinerator, and the Landfill Energy Systems ("**LES**") facility (formerly known as Michigan Co-Generation Systems, Inc.). In conjunction with this amendment application SEA 80-L/V-061-2 ("**SEA-2**"), Furnace has submitted a proposed, revised Plat dated March 22, 2013, as revised through January 22, 2014, consisting of 45 sheets and prepared by BC Consultants. Furnace is proposing revised

development conditions dated January 22, 2014 ("**Proposed Conditions**") which carry forward most of the previous commitments that are relevant, suggest changes based upon lessons learned and make new commitments described in this document. The Applicant's Proposed Conditions have been submitted under separate cover, as requested by staff.

The Applicant also owns two tracts adjacent to the Property which never have been used for landfilling, approximately 9 acres and 17 acres in size, respectively, and located on the west side of Furnace Road outside the boundaries of the Application Property. Furnace had proposed to construct and dedicate passive public recreation uses on the 17-acre, R-1 zoned tract (Tax Map Parcel 113-1-((1))-5(pt.)) which is part of the landfill Tax Map Parcel, but is now proposing to contribute $3.2M in lieu of that dedication in response to FCPA's specific request. Furnace is proposing to relinquish its already-entitled mixed waste reclamation use and instead to construct an extensive solar panel farm and other renewable energy generating infrastructure on the PCA Property contingent upon Board approval of SEA-2 and the PCA.

Two 2232 Applications also have been filed with the Department of Planning Zoning for the wind turbine and solar panel electric generating facilities on the SEA-2 Property and the solar panels PCA Property.

SEA-1 permits excavation, grading and filling associated with a CDD landfill, subject to 56 Development Conditions. Condition #12 limits the height of the landfill, prior to the installation of final cover, vegetation and structures, to a final waste fill elevation of 412 feet above sea level, and requires cessation of landfill operations on or before January 1, 2019 or upon reaching maximum height of fill, whichever occurs first. SEA-1 allowed quasi-public park uses on the Property and required its dedication to the FCPA after completion of post-closure monitoring by DEQ. Subsequent to imposition of these conditions by both the FCPA and the Board, in March 2009 the FCPA determined that it would not accept the future dedication of "Overlook Ridge." FCPA's reversal negated the underlying understanding of all three parties that the public park use would be owned and operated by the FCPA and that the liability associated with public access for recreational purposes would be the FCPA's.

In SEA-2, the Applicant seeks approval to add a vegetated berm in order to develop a near-level 40 acre platform by filling between the existing slope and that berm, and to extend the landfill's useful life to December 31, 2040. The Applicant also is requesting approval and committing to erect three initial wind turbines, create solar (on the PCA Property), all within Phase 1;" create renewable energy through electric generation facilities using wind, solar (on the PCA Property), methane (plus heat and cooling capability through geothermal facilities) all within Phase 1; and establish the near-level platform for future creation by others of a larger "Green Energy Park" which could include up to 12 wind turbines, up to 50 acres of solar panels, and/or more advanced technologies to be provided by public or other private entities with the Applicant's agreement.

In addition, after significant outreach with representatives of the Lorton Valley Homeowners Association located adjacent on the north to the Application Property, Furnace has committed to provide a recreation facility for use solely by Lorton Valley residents, to be conveyed to their HOA. This approximately 5.2 acre park and facilities would be provided as determined solely by the Lorton Valley HOA. Given the limited open space available within

Lorton Valley, this park would provide a desirable, permanent amenity to Association residents within walking distance of their homes. Should Lorton Valley elect to decline these facilities, they will not be provided and it will not be necessary to convey the land.

SEA-2 complies with the "General Standards" for all SE uses and with the "Additional Standards for the Category 2, 3 and 5 Uses" being requested.

A. <u>Type of Operation</u>.

The Applicant proposes continuation of the existing CDD landfill activities over a phased plan of development that includes an extensive landscape planting program, as proposed on SEA-2 Plat Sheets 16 through 25, to be implemented both during Phases and after cessation of landfill operations. The new, proposed interim and ultimate landscape planting designs will establish an attractive buffer with a forested appearance. The extensive amount of landscape plantings currently provided on the slopes of the landfill, as well as the additional landscaping proposed over five phases in SEA-2, has presented a unique challenge to establish and maintain; many lessons have been learned. The Urban Forestry Management Division ("**UFMD**") has been working closely with the Applicant's Arborist regarding adjustments to planting types and design as reflected in this SEA-2 Application, incorporating lessons learned over the past several years to determine which trees and shrubs have the highest survivability rate. These principles will be used to maximize the creation of tree canopy and greening of the landfill. Maintaining the health and survivability of the extensive amount of vegetation is in the best interest of all parties. The amount of planting proposed is unprecedented for a landfill, which is not conducive for landscaping due its size, steep slopes, wind impacts, and deer.

This proposed extension of the only CDD landfill in the region with a significant remaining useful life, to a closure date of December 31, 2040, is consistent with and fulfills the goals set forth in the Fairfax County Solid Waste Management Plan ("**SWMP**"). The SWMP identifies a significant shortfall in landfill capacity for CDD generated in the County; specifically, the SWMP cites a need for 18 to 21 million tons of disposal capacity through 2024 (the end of its study period). The SWMP recommends the projected shortfall be addressed through continued use/expansion of local landfills and/or encouraging a regional approach to CDD disposal. The Applicant's projection is confirmed by Joyce Doughty, Assistant Director of the Solid Waste Management Program, who in her memorandum to ZED Staff dated November 6, 2013, states that, "In general terms, the benefit of continued operation of the Lorton Landfill would be assured CDD disposal capacity for the next 27 years, offsetting the need for longer transport of up to 400,000 tons per year of material." There were two other CDD landfills in the County. One of these has closed since filing of this SEA-2. The other site's capacity is practically exhausted. Standing alone, it could handle the CDD demand from the County for less than one year as of its available capacity today. Long-term CDD disposal capacity is critical to the economic vitality, economic development, and revitalization goals of the County. The continued availability of Applicant's landfill is crucial to solving the County's anticipated near-term exhaustion of CDD capacity.

The Applicant proposes to create a vegetated berm around the perimeter of the landfill and to fill the space between this berm and the existing side slope to develop the landfill's capacity over five, overlapping phases of operation. Reinforcement material, consisting of a

geo-synthetic such as a "geo-grid" (commonly high density polyethylene which is the same material used in landfill liners), would be laid horizontally, adding strength and stability to the berm and requiring less earth material within a smaller footprint than a comparable earth-only berm. Facing materials also would include a geo-synthetic and be designed to promote vegetative growth. The vegetated berm and ground-level and upper-level access roads would be completed over five phases as depicted on Sheets 6 through 13 of the SEA-2 Plat. The Applicant also requests approval to add a southern "Right-In Only" access point, which would improve on-site queuing, filling and circulation patterns. As depicted on the Landscape Plans (Sheets 16 through 23 of the SEA-2 Plat), nearly 8,787 trees would be planted on primary and intermediate benches, mostly on the northern and eastern slopes of the landfill, with some on the western slope, by the completion of Phase 5. This would result in 4,276 more trees being planted on the landfill in SEA-2 than approved in SEA-1.

Instead of becoming merely a "closed landfill," this proposal creates a unique opportunity for renewable, green energy-producing facilities that functionally relate to the surrounding County infrastructure and provide environmental sustainability and economic benefits to the County. The Applicant proposes to locate a renewable or "Green Energy Park" on the landfill in accordance with the recommendations of the County's Energy Task Force (renamed the "Energy Alliance Task Force") and the broader, long-term sustainable energy goals established by the Board. One recommended goal of the Task Force was to establish a "Green Energy Triangle" as a transformational energy project in Lorton. In addition to installing and operating three wind turbines (Category 2 SE Electric Generating Facilities) during Phase 1 as "accessory uses" (the "**Initial Turbines**"), as well as geothermal and methane recovery facilities, the SEA-2 Plat provides in Phase 5 a 40 acre platform (enabled by the vegetated berm) for the potential of up to 12 wind turbines and/or a 40 acre solar panel farm ("**Full GEP**"), which may be provided by the Applicant/Owner and/or others after landfill closure, subject to Board approval of a Zoning Ordinance Amendment to allow the 12 turbines. During Phase 4, the Applicant will also create a 10 acre area to accommodate additional solar infrastructure, for a total solar potential of 50 acres.

Each of the Initial Turbines to be installed on-site by the Applicant will be capable of producing at least one-quarter megawatt peak of electricity on that interim, southern portion of the platform as depicted on Sheet 6 of the SEA-2 Plat. The first turbine will be installed no later than 18 months after all necessary approvals for implementation of SEA-2, to include, but not limited to, (i) FAA and/or other Federal, State and County approvals of the wind turbines; (ii) all requisite DEQ approvals of the landfill, including the Major Permit Amendment; (iii) all requisite County approvals such as GRB, site plan, land development and structure permits, non-DEQ bonding, and Non-RUP, have been obtained (all collectively, Necessary Approvals). The second and third turbines will be installed within 36 months after having received all such approvals. Fifty percent of any revenue, in excess of 2.5 cents per Kilowatt-hour, the Applicant receives from the sale of the electricity produced by these Initial Turbines will be donated to the County. The Applicant shall share 50% of the net profit from any renewable energy sales related to the "Full" GEP (as defined in paragraph 45(F) below) wind and/or solar infrastructure on the landfill site.

The Applicant also will install a methane gas recovery system within the landfill and will deliver to the County methane sufficient to generate the equivalent of two million kilowatt hours

annually of electricity, with the intent that it will be used by the County to generate electricity sufficient (i) for the normal operating needs of County-owned facilities such as the former Lorton Workhouse site ("**Workhouse Arts Center**"), thereby reducing the financial burdens for that facility, or (ii) for use at some other County facility. Applicant will pay the cost of processing the methane gas so that it is suitable for combustion by industry standard co-generation infrastructure.

Additional, off-site proposals have been made by the Applicant in conjunction with this Application. The Applicant's I-6 PCA Property is already entitled for and operating a mixed waste reclamation use. The Applicant's business plan for the PCA Property is to accept the CDD currently accepted by the landfill, should the landfill cease operation on January 1, 2019 as required by SEA-1 Condition 12, sort and recycle that CDD, and continue to sort other mixed waste. Truck traffic currently entering the Applicant's landfill site is prohibited from approaching the site from Lorton Road, which is a major transportation artery for local residents. The PCA Property has no such restriction and has no required closure date. Cessation of landfill activity and redirection of related truck traffic to the PCA Property would result in a significant increase in truck traffic on Lorton Road and adjoining feeder roads. The mixed waste reclamation center would require, by its nature, that all material delivered to the site be transported out to end users or remote CDD landfills. This would increase the volume of truck traffic on neighboring roads (as opposed to the landfill use which does not require the transportation of CDD away from the site), and would require long distance transportation which would consume at least 34 million gallons of diesel fuel over a 22 year period and produce at least 377,000 tons of carbon dioxide equivalent. The benefit of these proposed revisions directly supports the County's objective to meet Clean Air Act National Ambient Air Quality Standards.

As proposed in the PCA, the Applicant is prepared to abandon this by-right "mixed waste reclamation" use and to erect a solar electric generating facility, complementary to green energy uses on the Property. Within 24 months after having received all Necessary Approvals for implementation of SEA-2, the Applicant will install and operate at least a one-half megawatt peak solar infrastructure on the PCA Property for distribution and sale on the electrical grid. All costs associated with the purchase, installation, operation, and electricity distribution of the solar infrastructure will be the responsibility of the Applicant. The infrastructure will be operated for its useful life, which is currently estimated to be 20 years. Fifty percent of any revenue, in excess of 2.5 cents per Kilowatt hour, the Applicant receives from the sale of the electricity produced by the solar infrastructure will be given to the County.

Remaining surface area on the I-6 site will allow for additional solar infrastructure, or other renewable energy operations, should the Applicant, or others with the Applicant's permission, elect to build out additional renewable energy capacity. Also on the PCA Property (see the PCA Application), the Applicant proposes to locate all visitor parking for the landfill "Observation Point." Access to the "Observation Point" would be strictly controlled by the property owner with limited access to the public, who would be required to sign liability waivers and releases and travel on-site in a shuttle from the PCA Property up to the "Observation Point."

Details for the Observation Point proposed to be established during Phase 1 and continue in several locations until DEQ release at the end of Phase 5, appear in the Applicant's Proposed Development Conditions. "Overlook Ridge," which was requested by the Applicant and the

FCPA, and approved by the Board in January 2007, is proposed to be eliminated in this SEA-2 Application to reflect the FCPA's decision in March 2009 to reject dedication of the landfill site by ESI to the FCPA. SEA-2 continues to provide for open space and recreation facilities, but to be constructed in the north side buffer zone (which would be accessed from a trail connection to Lorton Valley) if requested by the Lorton Valley HOA.

The SEA also contemplates that funding will be provided for an educational feature at the Workhouse Arts Center or elsewhere, as determined by the County, that relates to the renewable energy activities both on the Applicant's sites as well as on the neighboring County property.

As shown on Plat Sheets 6 through 11 and Sheet 14, an "Observation Point" would be installed by the Applicant during Phase 1 in the general location of the Initial Turbines and be open for visitors when these three turbines begin operation. Outdoor style, wooden bench seating would be provided for up to approximately 20 visitors, with a lectern at the head of benches to provide for speakers. Tourist style telescopes (on posts) would be provided at the east and west flanks of the "Point" area. Actual location of each telescope could vary from edge of seating area to ridges of the elevation, in which case stone dust type trails would lead to the telescopes. Information signs describing the "Green Energy Triangle," history of the area, and local attractions would be provided. This initial Observation Point would exist from the end of Phase 1 until the beginning of Phase 5.

At the beginning of Phase 5, when the Initial Turbines are removed (to permit filling and capping of the southern area), the Observation Point and its related features would be relocated northward with the understanding that its exact location likely will need to be adjusted as Phase 5 landfill operations and capping proceed toward closure. Please note that, for public safety, during Phase 5 operations there would have to be a gap or transition periods (not to exceed 18 months cumulative) during which no Observation Point will be available due to filling, settling and capping of the 40-acre top platform. The Observation Point and shuttle service would continue through approximately 2050 and cease to exist upon release of the Applicant by DEQ from post-closure monitoring and maintenance of the landfill. A dustless surface waiver has been requested to provide access to this use, both for the initial gravel access road during Phases 1-4 and the subsequent gravel access proposed to be provided in Phase 5 through the post-closure period.

As depicted on Plat Sheets 6 through 10 and on Sheet 2 of the Generalized Development Plan Amendment ("**GDPA**") filed in the PCA (and described in the plat notes), access to this Observation Point would be controlled by the Applicant solely via shuttle and with the requirement that each visitor execute a liability waiver and release. Consequently, parking on the landfill for this accessory use would be for the shuttle, and periodic maintenance (one space combined). Visitors would park at the solar farm located on the PCA Property. Section 11-102 of the Zoning Ordinance allows offsite parking on a contiguous site under the same ownership, subject to compliance with certain conditions as may be approved by the Board.

As stated in its Proposed Development Conditions, the Applicant is committing to scheduled tours and will also allow a limited number of tours to be scheduled on demand with ample notice. Both the regular and on-demand tours would require a minimum and maximum number of visitors to go forward, and the frequency of regularly scheduled tours may be reduced

to reflect actual demand. Scheduled day(s)/hours would enable the property owner to allow visitors during the landfill's less busy operational timeframes. Applicant may implement a pre-registration system to better organize the groups in terms of numbers, special needs, obtaining executed waivers and releases, etc.

This CDD landfill currently accepts select volumes of dredged soils from lakes, ponds, and storm water management facilities in the County that are either publicly or privately maintained. (Certain of these dredged soils are accepted by the landfill for free, which saves the County significant costs.) Over time, such facilities accumulate sediment which, if not removed, will severely reduce their ability to function effectively, resulting in a serious threat to County and regional water quality and storm water capacity. Extending the closure date to 2040 will provide a long-term outlet for dredged soils produced in the County, a critical environmental need since there are no dredged soil treatment facilities in the County or the region.

This SEA-2 has evolved over the course of 24 months of extensive discussion and negotiation with the South County Federation Land Use Committee ("**LUC**") pursuing an alternative to the pre-empted Overlook Ridge, and simultaneous outreach with other community and countywide stakeholders. The Applicant committed to development of a Green Energy Park ("**GEP**") with four robust re-usable energy components – wind, solar, methane, and geo-thermal – plus certain additional revenue-generated contribution commitments. The LUC discussions came to a halt in late May 2012 despite leadership representations of support up to that time. At the Countywide level, a recommendation by the County Energy Task Force resulted in Board adoption of a Green Energy Triangle concept[1] for the immediate landfill area and commitments to establishment of a national model for the location of substantial green energy infrastructure components on public and private land in that area.

The SEA-2 Application proposes to implement a key component of the February 5, 2013 County Staff Report to the Board Environmental Committee recommending development of the Green Energy Triangle in Lorton. A key objective in this County staff recommendation, as noted in the Task Force report, is to rebrand the Lorton area. The Applicant's proposal further manifests the County Executive's FY 2014 report to the Board, which specifically cites the Green Energy Triangle as "leading to a re-branding of the Lorton area, changing its identity from being a site of the County's waste and debris disposal facilities to becoming a tangible expression of the County's renewable commitment". The Applicant's renewable energy program is a direct result of the work of the Task Force, the Board's Environmental Committee, and other Board policies.

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[1] In a Motion on October 16, 2012, the Board enthusiastically and unanimously endorsed the Chairman's "Private Sector Green Energy Task Force" recommendations, stating a purpose of "*stimulating a transformational energy project*" and creating "*with the private sector, pilot projects to demonstrate the use of local alternative energy sources for small and large scale development. These projects should: a) Not require legislative changes, nor changes to county policy; b) Be revenue neutral for the county of have the potential for revenue generation and c) Could be initiated within 24 months. The Lorton Green Energy Triangle is a potential example.*"

The approval of SEA-2 would (i) avoid the increased truck traffic caused by the closure of the landfill that results from the need to transport all CDD out of the County to remote landfills; (ii) avoid the impact of unrecovered methane gas generated by both the Applicant's landfill and by the additional waste that will be transported to other CDD landfills in Virginia (which are not required to capture methane gas); and (iii) produce offsets to energy produced by fossil fuels due to the impact of energy produced by the solar and wind facilities. The combined benefit of the application to the environment is approximately 3.6 million tons of avoided green house gases (equivalent of 28,000 medium size cars per year or 210,000 tons of CO2 per year) which directly addresses the objectives called for in the County's adoption of the "Cool Counties" initiative.

In its "2013 Annual Report on the Environment" dated November 2013, the County's Environmental Quality Council ("EQAC") identifies key ways to reduce greenhouse gas emissions, including landfill gas to energy systems (pages 11-17)). In praising the work on a "Lorton Green Energy Triangle," the 2013 EQAC report states, "These cooperative planning and efforts to make more efficient use of existing energy sources and to create renewable energy within the county is commendable" (page 31-32). EQAC commends the County for recognizing the importance of reducing greenhouse gas emissions and promoting education and outreach programs (page 34). EQAC states on page 35 that it "strongly supports the continuation of work started by the Chair's Energy Task Force be continued through the Energy Alliance." This SEA-2 Application fulfills all of those goals.

Applicant's commitment to the LUC had been to the provision of the GEP infrastructure and other proposed amenities, some of it up front and the remainder through 2040, the proposed operational life of its landfill needed to support such an enormous expenditure. In late November 2012, the LUC requested that Applicant instead fund a Recreation Center at a cost, according to FCPA, of $50M (including debt service through 2040). The Applicant responded with a proposal to provide a significant but revised GEP infrastructure "up front," with a payment of $15M over time towards a specified community need.

As committed in this Applicant's Proposed Development Conditions, the Applicant will construct, during Phase I, wind, methane and geothermal infrastructure on the landfill, and solar on the PCA Property (on which it will relinquish its entitled mixed waste reclamation use); provide methane fuel to the County for the Workhouse Arts Center and/or other local County facility, over the operational life of the landfill, enabling to the County an avoided energy cost of approximately $7 million; donate to the County 50% of the revenue, in excess of 2.5 cents per Kilowatt-hour, resulting from sale of electricity generated by the proposed Phase 1 wind and solar infrastructure; donate to the County 50% of the profit resulting from the sale of electricity generated by the Full GEP wind and solar infrastructures; provide educational features related to renewable energy at the Workhouse Arts Center or at such other location as agreed upon with the Applicant; at the specific request of FCPA; contribute $3.2M to FCPA for recreational facilities in the Lorton Area, in lieu of Applicant's previous offer to dedicate a 17-acre parcel to the FCPA and provide recreational amenities on that parcel; and contribute $15M towards a specified local County/community need, in installments of $750,000 per year beginning in 2019 and ending in 2038.

As referenced above, the total cash and energy value being contributed to the County, FCPA, and community exceeds $25M, plus revenue sharing in electricity sales. The cost to the Applicant of the amenities and GEP infrastructure to be constructed exceeds $15M. These numbers do not include (i) the value of the I-6 land and entitle unlimited mixed waste reclamation use Applicant is willing to forego, and (ii) the long-term benefit that the Applicant's green energy park as a cornerstone provides in the rebranding of the Lorton area as one of the most progressive communities in the region, if not in the nation.

On August 15, 2013, the Applicant filed with County Staff a "Feasibility Study for Renewable Energy Technologies" prepared by Geosyntec and dated August 17, 2011, with six follow-up analyses performed since 2011. Preliminary foundation design information for the turbine installation and a diagram were prepared by Geosyntec and filed with the County Zoning Evaluation Division on June 24, 2013. The difficulty of placing waste and capping around existing turbines is a major driver for dismantling the Initial Turbines before proceeding with the potential installation of 12 turbines potentially at the end of Phase 5. The Initial Turbines are located in an area of the landfill that will be inactive for a significant period while other landfill areas are filled, and that will be filled and capped after relocation of the Initial Turbines. The entire landfill will be filled to final height and fully capped before installation of the 12 turbines. Due to potential issues with differential settlement, proper foundation design is critical for any large structure installed on a landfill. The foundation design for wind turbines on top of a landfill will require either deep foundations (drilled shaft or piles, which penetrate the final cover) or shallow foundations (concrete rafts, which do not penetrate the cover). Design selection will be based on the settlement characteristics and bearing capacity of underlying cover, waste, and soil/rock properties at a site, and regulatory conditions governing cover penetrations. Note that to avoid excessive movement of the wind turbines and transmission of high dynamic forces to the tower and foundation during high winds, automatic breaking and cut-off systems are built into the turbines' control systems which stop operating if wind speeds exceed a predetermined level.

As requested by the Planning Staff, Phase 5 of the SEA-2 (Sheets 10 through 14) have been revised to add the potential for a Category 5 "outdoor baseball hitting range" use after landfill operations have ceased, beginning after DEQ Release. This active recreation use during the end of Phase 5 could be established before or coterminous with the potential wind turbines in Phase 5 and be operated by a lessee who would assume liability for private use on the landfill.

Phase 6 (Plat Sheet 45) seeks approval of alternative private active recreation uses which will consist of either a Category 5 outdoor baseball hitting range and/or private golf driving range and/or a Category 3 model aircraft field, or similar private club or benefit association uses. One, two or three of these uses would operate either: (a) subsequent to cessation of the "interim" Green Energy Program, if installed or (b) if the GEP is never implemented, upon release of the Applicant by DEQ from post-closure monitoring and maintenance of the landfill. The lessees would assume liability for private use on the closed landfill property.

B. Hours of Operation.

Landfill Operations (Phases 1 – 5): Monday through Friday 7:00 a.m. to 5:30 p.m. and Saturday 7:00 a.m. to 3:00 p.m., with continuation of certain limited exceptions as permitted under the SEA-1 Development Condition #27.

Outdoor Baseball Hitting Range (Phases 5/6):

April 1 to October 31:	4:00 PM – 10:00 PM Monday – Friday
	10:00 AM – 10:00 PM Saturday & Sunday

Golf Driving Range (Phase 6):

All year round:	10:00 AM – 10:00 PM Sunday – Saturday

Model Airplane Flying Field - Private Club or Benefit Association (Phase 6):

April 1 to October 31:	9:00 AM – 8:00 PM Monday – Sunday
November 1 to March 31:	9:00 AM – 5:00 PM Monday – Sunday

C. Estimated Number of Patrons.

Landfill (Phases 1 - 5): No change from current and prior experience. The number of patrons varies with weather conditions, time of year and the prevailing economy, which directly impacts regional development activity and the amount of construction debris to be disposed.

Outdoor Baseball Hitting Range (Phase 5 end and possibly continuing and expanding in Phase 6): 125 patrons.

Golf Driving Range (Phase 6): 170 patrons.

Private Club or Benefit Association (Phase 6): 21 patrons.

There is little expectation all three will exist simultaneously.

D. Proposed Number of Employees.

Landfill (Phases 1 - 5): It is anticipated that there will be approximately 15 full-time equivalent employees working at the landfill during the operations time period.

Outdoor Baseball Hitting Range (Phase 5 end and possibly continuing and expanding in Phase 6): Two full-time equivalent.

Golf Driving Range (Phase 6): Two full-time equivalent.

Private Club or Benefit Association (Phase 6): One full-time equivalent.

There is little expectation all 3 will exist simultaneously.

E. Estimate of Traffic Impact of the Proposed Use.

No change to landfill operations is proposed, so there will be no change in related trip generation. As prepared by Wells + Associates, Inc., trip generation estimates associated with the proposed SEA-2 use are based on the 2011 load counts taken at the landfill truck scales and are as follows:

	Acres	Annual Loads	Average Daily Loads	Average Daily Trips
Existing Use	250	112,698	394	788
Proposed Use (estimated)	250	112,698	394	788
Net New Loads and Trips		0	0	0

FCDOT determined on July 31, 2012 that no Chapter 870 (formerly 527) study is required because no material increase in trip generation is projected.

Estimated traffic impact of the three alternative recreation uses would be relatively minimal, and would not occur until after landfilling activity has ceased. The following is based on ITE Trip Generation estimates:

Outdoor Baseball Hitting Range (Phase 5 end and possibly continuing and/or expanding in Phase 6): 220 Average Daily Trips.

Golf Driving Range (Phase 6): 341 Average Daily Trips.

Private Club or Benefit Association (Phase 6): 42 Average Daily Trips.

None of the three uses produces any material peak hour trips. There is little expectation all three will exist simultaneously.

F. Vicinity or General Area to be Served.

This is a regional CDD landfill which serves the entirety of Fairfax County.

G. Description of Building Façade and Architecture.

There are no architectural treatment considerations relevant to this Application. After creating the southern portion of the platform during Phase 1, the Applicant proposes to erect three (3) wind turbines (see SEA-2 Plat Sheet 6). Other minor "structures" consist of construction trailers, with all but one to be demolished or removed during the course of development. One permanent operations trailer with an associated parking lot will be located in the northwest corner of the property and remain subsequent to Phase 5 closure. Other facilities are leachate pump houses, gate houses and gates, portable scale houses, scales, and tire wash facilities which will be relocated on-site during phases as necessary when landfilling operations are adjusted over the five phases. These facility locations are identified by Phase on the SEA-2 Plat. Minimal structures as depicted on the SEA-2 Plat would be associated with the three proposed, alternative recreation uses described above.

H. Listing, If Known, of All Hazardous or Toxic Substances.

Hazardous and/or toxic substances currently stored and contained on-site are limited to products which are used for the general operation of the landfill, its equipment and vehicles. Methods for use and disposal shall adhere to County, State and/or Federal law.

I. Statement of Conformance with Applicable Ordinances, Regulations and Standards.

This Application shall comply with all applicable ordinances, regulations and standards, with the exception of requested waivers and modifications as outlined below and identified on the Plat. This Application shall comply with the "General Standards" for all Special Exceptions and with "Standards" for the Category 2 (Landfills and Electrical Generating Facilities), Category 3 (Quasi-Public Uses, Private Clubs and Public Benefit Associations) and Category 5 (Outdoor Baseball Hitting Ranges and Golf Driving Ranges) Special Exception uses set forth in the Zoning Ordinance. A detailed compliance analysis of the various "General Standards" and "Additional Standards" has been prepared by the Applicant and filed with County Staff on October 7, 2013.

The Applicant seeks a waiver of the dustless surface requirement for on-site roads, including for the initial gravel access road during Phases 1-4 and the subsequent gravel access proposed to be provided in Phase 5 through the post-closure period and for the Phase 6 active recreation uses. The upper and lower berm access roads also are proposed to be gravel. This waiver is appropriate given the unusually large site, the nature of the uses being proposed in the various phases and the fact that private vehicle access is strictly limited and controlled for landfill and for the other uses being proposed.

A waiver of the Countywide Trails Plan requirement for an eight-foot (8') wide trail along the east side of Furnace Road also is being requested. This waiver is appropriate due to the nature of the use, the lack of room between the right-of-way and the landfill berm, because such improvement would not connect to any portion of an established trail system, and a trail exists on the west side of Furnace Road along the frontage of Parcels 12 and 13.

As described in detail on the SEA Plat, the Applicant is requesting modifications of tree preservation requirements and of the transitional screening requirement and waiver of the barrier requirements in favor of those shown on the Special Exception Amendment Plat in accordance with Article 13, Section 13-305, subparagraphs -3, -5, -7, -11, -12 and -14, of the Zoning Ordinance. A minimum fifty foot-wide treed buffer shall be provided along the entire northern property boundary and consist of a combination of existing, mature trees and supplemental plantings which shall be installed and maintained by the Applicant in accordance with that shown on Plat Sheet 21. Minimal grading shall be permitted within this buffer area, as determined by the Urban Forestry Management Division, as necessary for installation of the below trail and/or other improvements. Adjacent to this buffer area, a natural trail and any off-site trail connection, exercise stations along the trail, a multi-purpose open space area, a dog park, and picnic tables shall be provided at the sole option of and to the extent determined by the Lorton Valley HOA. At the sole option of the Lorton Valley HOA, the recreation uses shown

may be eliminated or adjusted, provided that they do not encroach into the fifty foot wide buffer area.

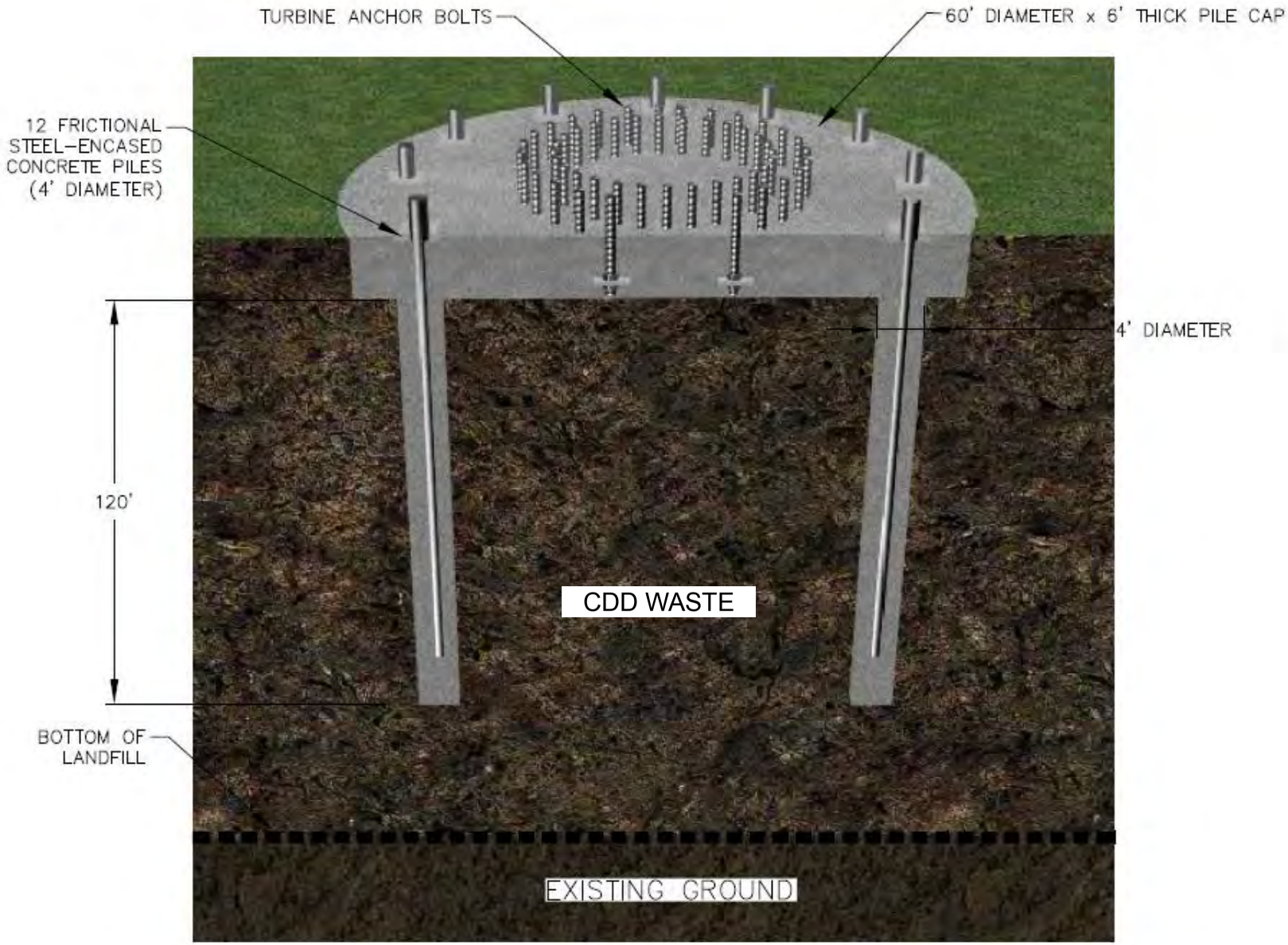
Pursuant to Section 11-102 of the Zoning Ordinance, the Applicant also is requesting Board of Supervisors' approval of an off-site parking and shuttle access to the "Observation Point" which would be strictly controlled by the Applicant with the requirement that each visitor execute a liability waiver and release. Consequently, parking on the landfill for this accessory use would be minimal. Visitors would park and board a shuttle at the solar farm located on the PCA Property. Section 11-102 of the Zoning Ordinance allows offsite parking on a contiguous site under the same ownership, subject to compliance with conditions as may be approved by the Board.

Finally, as granted by the Board of Supervisors on January 8, 2007 in the previous SEA approval, a waiver of Paragraph 9 of Section 9-205 of the Zoning Ordinance is requested to permit improvements as depicted on the SEA-2 Plat which are proposed after termination of landfill operations and prior to DEQ release. These improvements would include all those shown on the Plat, such as the Observation Point, trailer, and green energy uses. A summary chart of requested waivers and modifications is included in this Application.

Francis A. McDermott
Attorney for Applicant

Foundation Design

- 60 ft (diameter) x 6 ft (thick) reinforced concrete pile cap to support wind turbine.
- Concrete cap supported by 12 4-ft diameter piles.
- Each pile consists of 4-ft diameter steel casing filled with concrete.
- Pile foundation are designed to resist expected differential settlement, wind loading and seismic events with a factor of safety greater than 200%.
- Piles are embedded in waste. Sufficient buffer between tips of shafts and bottom of the landfill to avoid impacting existing liner system.



Note: Length of pile will vary with specific location conditions

Geosyntec consultants

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Columbia, Maryland 21046
PH 410.381.4333
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www.geosyntec.com

14 August 2013

Mr. Gary Hewes
Vice President, Operations Support
Furnace Associates, Inc.
10001 Furnace Road
Lorton, Virginia 22079-2604

Subject: Response to Zoning Information Request
Lorton Energy Park
Lorton, Fairfax County, Virginia

Dear Mr. Hewes:

Geosyntec Consultants (Geosyntec) has prepared this submittal as a follow-up to discussions with Fairfax County during our 25 July 2013 meeting. During this meeting, the County requested copies of documents previously prepared by Geosyntec to evaluate the feasibility of renewable energy technologies (RETs) to be considered for installation as part of the proposed Lorton Energy Park. Geosyntec has been working with Furnace Associates Inc., for the past two and a half years reviewing the feasibility of RETs at Lorton Landfill. A list of applicable documents prepared during this period that are enclosed with this letter is presented below:

Exhibit 1: Feasibility Study for Renewable Energy Technologies, Lorton Landfill, Virginia, dated 17 August 2011;

Exhibit 2: Memorandum related to Wind Energy Development dated 15 December 2011;

Exhibit 3: Memorandum related to Solar Energy Development dated 13 January 2012;

Exhibit 4: Preliminary Evaluation of Using Deep Foundation for Wind Turbines, dated 1 November 2012;

Exhibit 5: Fact Sheet: Plan for Installation of Solar Panels, Lorton Renewable Energy Park, Lorton Landfill, Virginia (undated, prepared January 2012);

Exhibit 6: Fact Sheet: Plan for Installation of Wind Turbines, Lorton Renewable Energy Park, Lorton Landfill, Virginia (undated, prepared January 2012);

Exhibit 7: Wind Turbine Systems at Landfills in the United States (undated, prepared January 2012);

Exhibit 8: Final Cover Geomembrane Puncture Resistance Calculation (to assess bearing capacity of final cover under loads expected from typical turbine construction vehicles, dated July 2013);

Exhibit 9: Lorton Energy Park Utility System Map, dated 22 March 2013 (submitted previously on 2 April 2013 as part of the Application package);

Exhibit 10: Determinations of No Hazard to Air Navigation issued by the Federal Aviation Administration in support of proposed installations of one (1) wind anemometer test tower (height 165 ft., base elevation 355 ft.) and three (3) wind turbines (tower height 160 ft., base elevation 380 ft.); and

Exhibit 11: Summary table outlining nine (9) operating and five (5) proposed landfill-based wind turbine projects worldwide.

In addition, during our discussions, there was a general question regarding the size of turbines that had been observed by some County personnel at a wind farm near Interstate 81 in Pennsylvania. Geosyntec identified this wind farm as the Bear Creek Wind Park near Wilkes-Barre in northern Pennsylvania. This facility includes twelve 2.0 megawatt (MW) model G87 wind turbines manufactured by Gamesa. These turbines, which have a tower height of 397 feet and a rotor diameter of 285 feet, are much larger than the proposed 250 kilowatt (kW) turbines for the Lorton Energy Park, which will have a tower height of 120 feet and a rotor diameter of 100 feet.

Geosyntec contacted three manufacturers of wind turbines of suitable size and power rating for the Lorton Energy Park to ascertain whether similar sized wind turbines have been installed on the east coast of the United States. Two of the manufacturers, Aeronautica and PowerWorks, have not installed turbine models of interest on the east coast of the United States. The third manufacturer, Wind Energy Systems, has installed a model of interest at the following site in Massachusetts:

Bartlett's Farm
33 Bartlett Farm Road
Nantucket, MA 02554
508-228-9403

Please do not hesitate to contact either of the undersigned at (410) 381-4333 with any questions concerning the contents of this letter.

Sincerely,

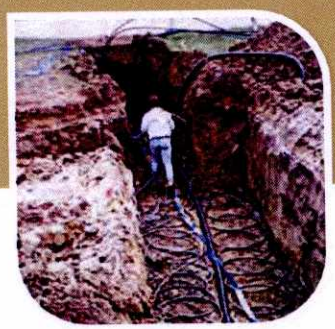
Jeremy W.F. Morris, Ph.D., P.E.
Senior Engineer

Thomas B Ramsey, P.E.
Associate

EXHIBIT 1

Final Report

Feasibility Study for Renewable Energy Technologies Lorton Energy Park, Lorton Landfill, Virginia



Prepared for:

LCL Lorton Construction Landfill

10001 Furnace Road
Lorton, VA 22079-2604

Prepared by:

Geosyntec consultants
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TABLE OF CONTENTS

1. Introduction 1

1.1 Purpose and Terms of Reference 1

1.2 Layout and Size of the Landfill 1

1.3 Potential Environmental Benefits of the MSE Berm 4

1.3.1 Renewable Energy Park 4

1.3.2 Fairfax County Environmental Improvement Program 4

1.4 Outline of Opportunities and Constraints for Development 5

1.4.1 Potential End Users for Supplied Energy 5

1.4.2 Supply Side Dynamics 6

1.4.3 Demand Side Dynamics 7

1.5 Permitting and Regulatory Considerations 7

2. Review of Selected Renewable Energy Technologies (RETs) 9

2.1 Solar Power 9

2.1.1 Overview of Solar Technology 9

2.1.2 Outlook for Supply and Cost Dynamics 11

2.1.3 Environmental Benefits 12

2.1.4 Power Generation Potential and Capacity Factor 12

2.1.5 Opportunities and Constraints on Development 13

2.2 Wind Power 14

2.2.1 Overview of Wind Technology 14

2.2.2 Outlook for Supply and Cost Dynamics 16

2.2.3 Environmental Benefits 16

2.2.4 Environmental and Other Concerns 16

2.2.5 Power Generation Potential and Capacity Factor 17

2.2.6 Opportunities and Constraints on Development 18

2.3 Methane Utilization 19

2.3.1 Overview of Methane Utilization Technology 19

2.3.2 Methane Generation Potential and Optimal Project Development. 21

2.3.3 Environmental Benefits 23

2.3.4 Opportunities and Constraints for Development 23

TABLE OF CONTENTS
(CONTINUED)

2.4 Geothermal Energy 24
2.4.1 Overview of Geothermal Technology 24
2.4.2 Potential Heat Capacity and Optimal Project Development 26
2.4.3 Environmental Benefits 27
2.4.4 Opportunities and Constraints for Development 28
2.5 Projected Growth and Learning Curves for Selected RETs 29
3. Phased Development Plan for Lorton Energy Park 30
3.1 Integrated Strategy for RET Deployment 30
3.2 Anticipated Timeframes for RET Deployment 32
3.3 Outlook and Recommendations for Deployment of Selected RETs 32
3.3.1 Solar Energy 32
3.3.2 Wind Energy 33
3.3.3 Methane Utilization 34
3.3.4 Geothermal Energy 35
4. Recommendation for Lorton Energy Park Development 36
5. Scale of Lorton Energy Park Relative to Other RET Projects 38
5.1 Individual RETs 38
5.2 Mixed-Use Energy Park 39
6. Summary of Principal Findings from the Study 40
6.1 Environmental Benefits in Support of the Landfill Capacity Increase 40
6.2 Integrated Strategy for Phased RET Deployment 42
6.3 Recommended Approach for Developing Lorton Energy Park 43
6.4 Scale of Lorton Energy Park Relative to Other RET Projects 43
References 45

1. Introduction

1.1 Purpose and Terms of Reference

Geosyntec Consultants of Columbia, Maryland prepared this final report for Furnace Associates, Inc. (FAI) of Lorton, Virginia to report on findings from a feasibility study conducted to evaluate phased implementation of various renewable energy technologies (RETs) at FAI's Lorton Landfill located at 10001 Furnace Road, Lorton, Virginia. The purpose of the feasibility study was to evaluate the technical and financial feasibility, aesthetic qualities, and regulatory and public acceptability of four RETs at the landfill. The RETs investigated were solar, wind, methane, and geothermal (GT) technologies. This feasibility study helps provide the basis for planning for a renewable energy park, particularly with regard to the optimal timing for deployment of RETs at the landfill. FAI's vision is for the landfill property to serve as a pilot project for renewable energy in an urban environment over the remainder of its operational life, with a possible option during the post-closure period (and potentially as an end-use should local authorities so approve) of a state-of-the-art renewable energy park.

FAI's vision for the landfill property is that it serves as a pilot project for renewable energy while addressing a critical waste disposal need

1.2 Layout and Size of the Landfill

The landfill property is located between Furnace Road and Interstate I-95 in Lorton, Virginia. The Fairfax County landfill facility is located to the northwest on the opposite side of Furnace Road (Figure 1.1). The landfill property comprises the active landfill area and two small discrete property parcels located west of Furnace Road. The original ground surface elevation varies from 230 ft-msl (feet above mean sea level) on the Furnace Road side to 100 ft-msl on the I-95 side. Currently, the maximum permitted elevation of the landfill is 412 ft-msl with a top deck area of approximately four acres.

FAI also owns two small property parcels adjacent to the landfill on the opposite side of Furnace Road. The smaller parcel, termed the "FAI Recycling Facility," is 9.7 acres in area and is sparsely vegetated with gravel surface and stormwater ponds. Recycling operations are carried out on this parcel and a building is being developed to handle CDD volumes that are currently disposed of in the landfill. The larger unnamed parcel is 17 acres in area and is thickly vegetated with mature tree stands. Both parcels are accessible from Furnace Road and are potentially available for the energy park.

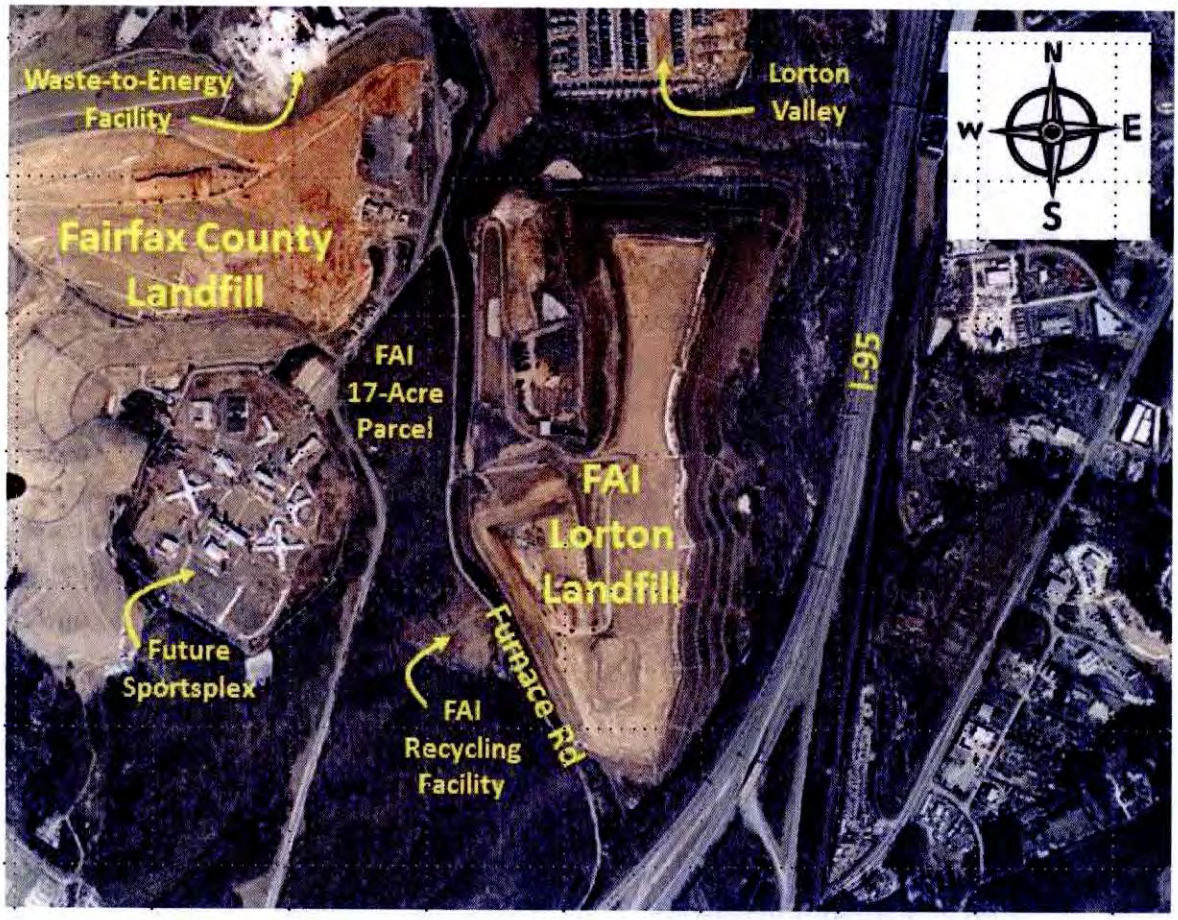
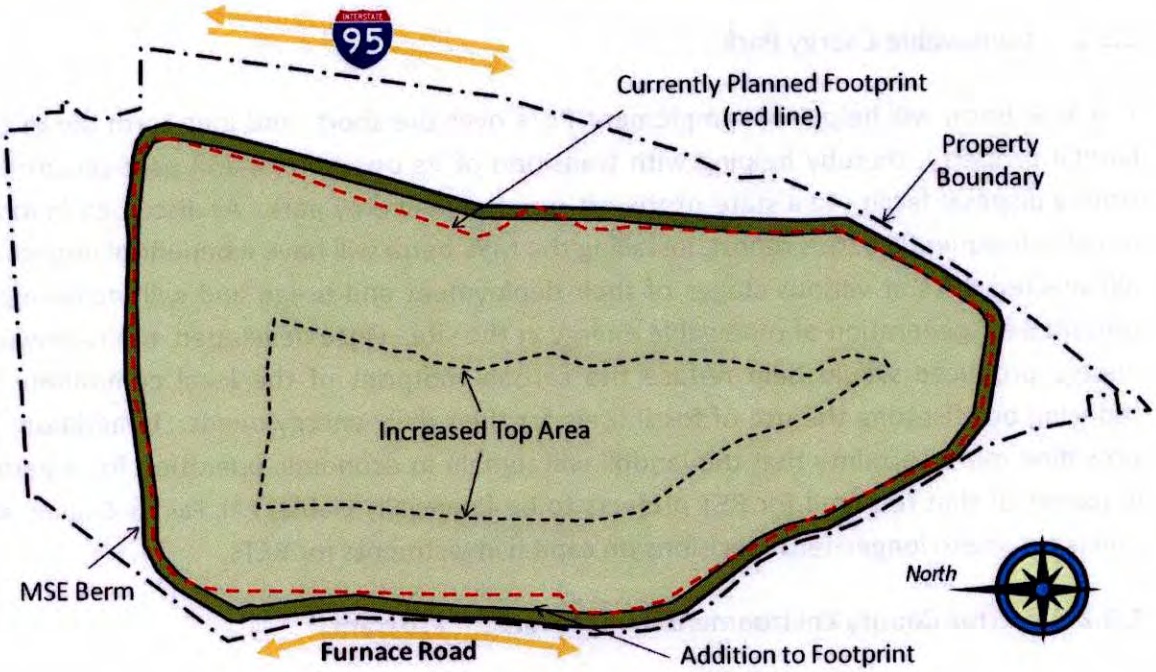
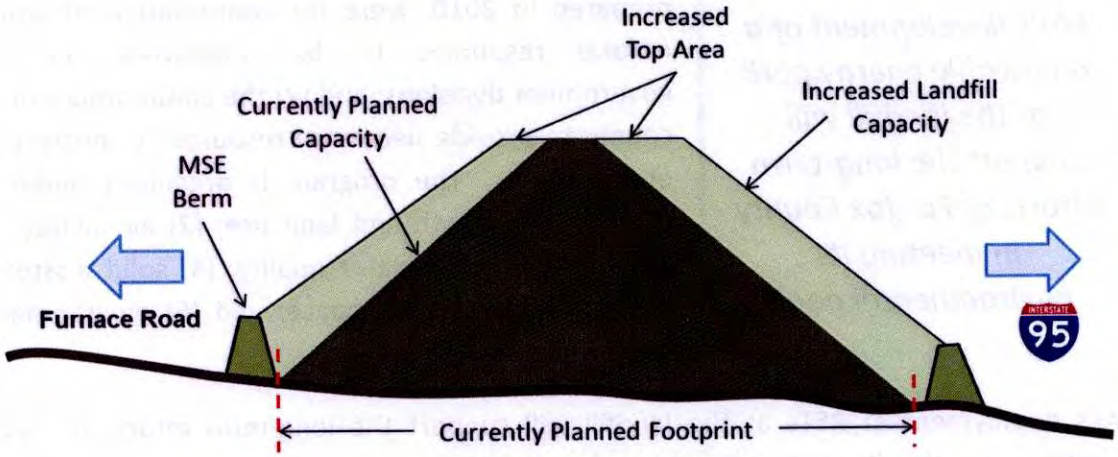


Figure 1.1: Aerial view of the landfill (photo taken in January 2005)

FAI plans to increase the landfill capacity by constructing a mechanically stabilized earth (MSE) berm around the perimeter of the landfill footprint. Once permitted, the final elevation of the landfill would remain at 412 ft-msl (that is, the landfill will not be any taller than currently permitted). Increasing the capacity of the landfill by constructing a perimeter MSE berm would also result in only a small increase in the total waste footprint area (Figure 1.2a). However, by filling in the area between the current side slopes and the top of the MSE berm (Figure 1.2b), this would provide additional disposal capacity. At average rates of disposal of preferred waste types, with existing and added capacity the landfill would be expected to reach its final permitted capacity by 2040. The top deck (flat) area at the top of the landfill will increase from four acres to approximately 40 acres, yielding considerably more space for beneficial reuse as a renewable energy park with multiple RETs.



(a) Plan view (not to scale)



(b) Cross section view looking north from south (not to scale)

Figure 1.2: Conceptual views of the landfill under existing (pre-berm installation) and future (post-berm installation) conditions

1.3 Potential Environmental Benefits of the MSE Berm

1.3.1 Renewable Energy Park

The MSE berm will help FAI to implement RETs over the short- and long-term life of the landfill property, thereby helping with transition of its operational and post-closure life from a disposal facility to a state-of-the-art renewable energy park. As discussed in more detail subsequently in this report, installing the MSE berm will have a beneficial impact on all selected RETs at various stages of their deployment and usage and will increase the potential for generation of renewable energy at the site. Once developed, the renewable energy produced would help reduce the carbon footprint of the local community by reducing or offsetting the use of fossil fuels for their daily energy needs. In addition, by providing more certainty that the landfill will remain in economic operation for a period in excess of that required for RET projects to be financially viable, FAI, Fairfax County, and others can make longer-term decisions on capital investments for RETs.

1.3.2 Fairfax County Environmental Improvement Program

In June 2004, Fairfax County adopted an environmental program entitled "*Environmental Excellence for Fairfax County: A 20-Year Vision*." The County's main principles, as stated in their Environmental Improvement Program (EIP) prepared in 2010, were for conservation of limited natural resources to be interwoven into all government decisions; and (2) the commitment of the county to provide necessary resources to protect the environment. The program is organized under six themes: (1) growth and land use; (2) air quality and transportation; (3) water quality; (4) solid waste; (5) parks, trails and open space; and (6) environmental stewardship.

FAI's development of a renewable energy park at the landfill will support the long-term efforts of Fairfax County in meeting its environmental goals

FAI's deployment of RETs at the landfill will support the long-term efforts of Fairfax County in meeting its environmental goals in multiple ways. For example, by utilizing the existing landfill for a longer duration, FAI can provide for more efficient management of solid waste in the County and prevent use of alternative land areas for CDD disposal. Further, FAI's vision for transitioning use of the property from a CDD disposal facility to a state-of-the-art renewable energy park provides for sustainable and beneficial reuse of the property, a clear demonstration of environmental stewardship. Voluntarily managing

methane from naturally generated biogas at the landfill will improve air quality and reduce greenhouse gas (GHG) emissions. Generation of renewable energy via solar, wind, methane, and geothermal technologies will offset dependence on fossil fuel based energy, and will offset GHG emissions associated with use of fossil fuels. The energy park could also serve to help the County demonstrate environmental stewardship concepts by providing community outreach and educational opportunities to students to understand the interaction, implementation, technologies, and benefits of renewable energy at a local facility.

1.4 Outline of Opportunities and Constraints for Development

1.4.1 Potential End Users for Supplied Energy

Several existing and planned facilities adjacent to or near to the landfill site could benefit and serve as end users of the renewable energy produced at the renewable energy park, either directly or indirectly (see Figure 1.3).

Michigan Cogeneration (MC) Facility: For the purposes of the feasibility study, the MC Facility (about 500 feet distant of the landfill at Point A on Figure 1.3) was considered to act as a central "hook up" point (i.e., an interconnection for all solar and wind power generated and the delivery point for methane) and thus a potential end user for these three renewable RETs.

Wastewater Treatment Plant (WWTP): The WWTP is about 2.5 miles distant from the landfill at Point B on Figure 1.3, with an existing gas pipeline from the MC Facility (shown blue running from Point A to Point B), and is thus considered a potential end user for methane.

Lorton Valley Development: This residential development, which is adjacent to the northern property boundary, houses a community center (with swimming pool) and is considered a potential end user for GT energy for residential heating and cooling, acknowledging potential access restrictions and connection constraints.

Sportsplex: This planned facility, to be located next to FAI's recycling facility and directly south of the MC facility, is considered a potential end user for electricity produced by the renewable energy park and for GT energy, again acknowledging potential access restrictions and connection constraints.

Lorton Arts Center: This facility, located approximately 1.5 miles from the landfill, could utilize methane for both heating and artisan kilns and furnaces.

Horticultural Applications: Construction of greenhouse structures for community and commercial horticultural uses in the vicinity of the landfill is under discussion. Greenhouses would be potential users of GT energy for heating and cooling. In addition, the renewable energy park could supply electrical power to these greenhouses.

Figure 1.3: Potential end users for energy in the landfill vicinity

1.4.2 Supply Side Dynamics

The various RETs considered for installation at the landfill will offer two major forms of energy: (1) electricity generation from methane gas, solar, and wind sources; and/or (2)

heat or thermal energy from methane gas and the geothermal source. These forms of energy will become available to differing degrees at different phases during the life of the landfill.

1.4.3 Demand Side Dynamics

Onsite Energy Utilization: Onsite energy needs would be minimal and remain constant during the course of landfill operation. This would include 20,000 kWh for operation of the site administration building and weighing station. Additional electrical energy is required for the leachate pumps, which would remain as the only significant energy need after closure. For the purposes of the feasibility study, it was assumed that onsite energy needs are insignificant in the context of economic self-supply. Therefore, it was assumed that all renewable energies would be utilized offsite.

Offsite Energy Utilization: As the renewable energies are developed, the energy available for offsite use will increase with time. It is anticipated that demand for electricity and methane will always exceed the supply potential and, therefore, that all electricity generated and methane captured will be welcome at the MC Facility hook up. Due to population increases in the Lorton area, this will help the community by supplying more renewable energy to meet daily needs, albeit indirectly. The potential for GT energy to meet local demand will be constrained by distances to end users and their willingness to convert to GT heat pump systems. Due to the size of the landfill heat source, it is considered that potential GT energy supply will exceed demand.

1.5 Permitting and Regulatory Considerations

The Virginia regulations regarding closure and post-closure care of CCD landfills require a final Closure/Post-Closure (C/PC) Plan to be submitted and approved to describe all systems and activities that will be installed and performed at the landfill after closure. Therefore, to allow for installation of RETs at the landfill, a C/PC Plan will need to be prepared/amended to address all issues associated with the installation of the solar panels. These include: (1) maintaining the integrity of the final cover; (2) drainage and erosion control; (3) installation of associated utilities; and (4) impacts on the existing landfill gas control system (if any). Post-closure maintenance costs and financial assurance should also be reviewed and revised if significant additional maintenance will be required. If RETs are to be installed during the operational life of the landfill, the site Operations Plan will likewise need amending accordingly.

In addition, state- or county-level land use permits for the site may be needed due to modifying the land use to include energy park elements. Aesthetics/visual quality may be the most significant impact consideration, particularly with regard to solar panels and wind turbines. Methane and GT energy systems do not present significant environmental impact concerns (in fact, gas collection and control would be considered to mitigate potential environmental impacts arising from odors, subsurface migration, and GHG emissions).

2. Review of Selected Renewable Energy Technologies (RETs)

2.1 Solar Power

2.1.1 Overview of Solar Technology

Solar power is created by conversion of sunlight energy into electricity. This occurs directly using photovoltaic (PV) cells or indirectly using concentrated solar power (CSP) systems. Both PV and CSP systems can be mounted as fixed systems with rigid foundations or have tracking mechanisms to follow the movement of sunlight throughout the day (Figure 2.1).

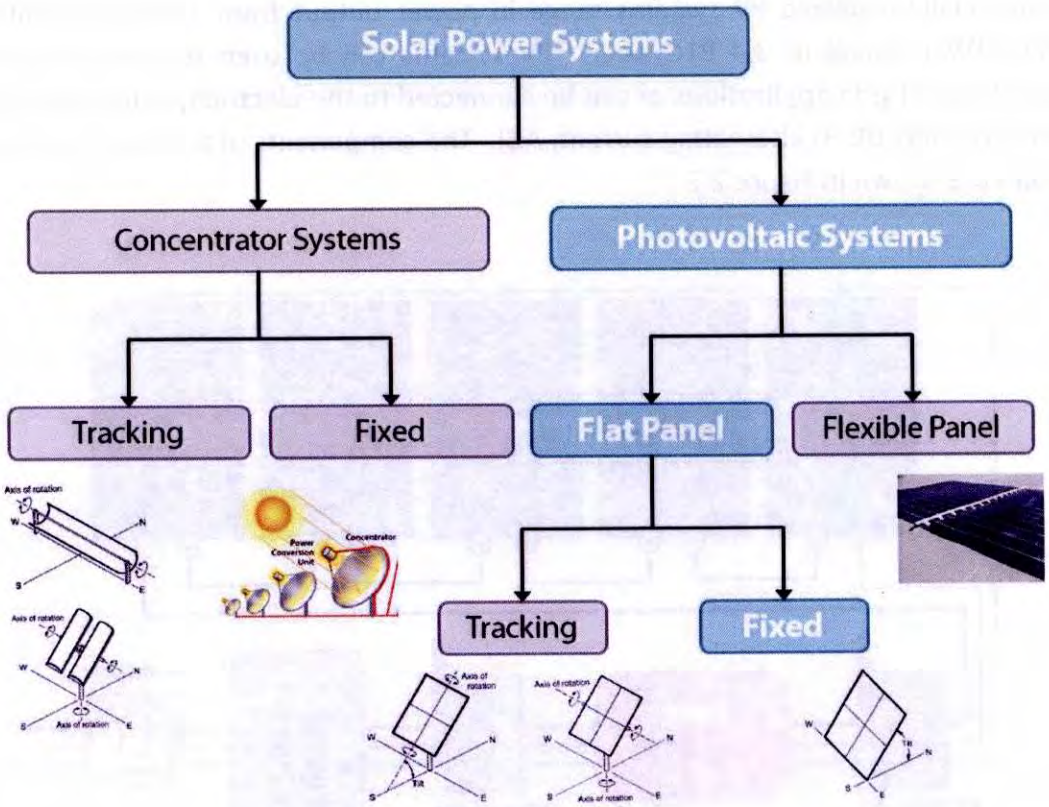


Figure 2.1: Typical solar power systems (fixed flat panel PV systems are the recommended technology at Lorton Landfill)

CSP systems involve use of lenses or mirrors to focus a large area of sunlight into a small beam, which is typically used to heat water for steam-powered turbines. Commercial CSP

systems require abundant cheap water, cheap land, and plenty of sun to produce thermal energy before it can be used to produce electrical energy. Generally, CSP plants are large in size (typically hundreds of megawatts, MW) and have to be linked to transmission networks.

PV cells are semiconductors made of wafer-based crystalline silicon or thin film amorphous silicon coating on plastic, glass or stainless steel. PV systems consist of multiple cells which convert sunlight directly into electric energy (direct current, DC) using the photoelectric effect, which in simple terms is the movement (excitement) of electrons caused by interaction between sunlight energy and the semiconductor materials. The electrons are collected to form a direct current of electricity.

Commercially available PV systems range in power output from 10 to 300 watts (W), where 1W is equal to 3.4 BTU/hour. PV systems can be used to power small-scale, standalone off-grid applications or can be connected to the electricity grid using inverters (which convert DC to alternating current, AC). The components of a simple household PV system are shown in Figure 2.2.

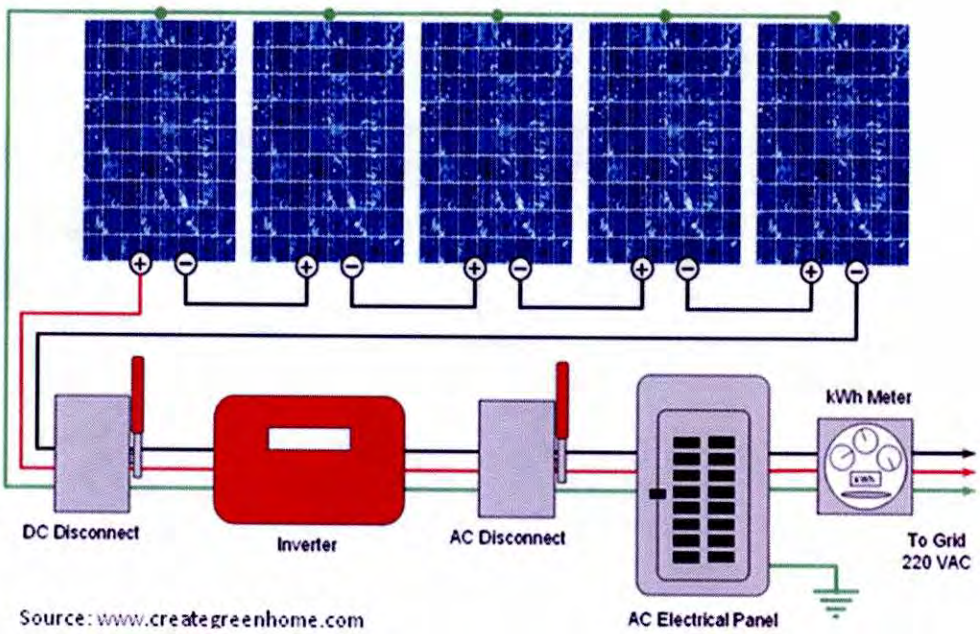


Figure 2.2: Components of a simple PV system

Market conditions for the solar power industry have become increasingly favorable in recent years for a number of reasons, including: (1) declining manufacturing costs; (2) market growth worldwide and in the United States; (3) increasing efficiency of solar panels; and (4) increasing reliability and longer life service of solar panels. The solar energy market in the U.S. has seen tremendous growth in the last few years. The annual rate of growth of the market for solar panels has been about 43 percent between 1998 and 2008. Despite this growth rate, the contribution of solar energy to the entire U.S. energy market is still less than 0.1%.

Fixed tilt flat panel systems are the most common type of PV system. These systems operate in a fixed position where the tilt remains constant or is manually adjusted seasonally. In applications where the position of the panel can be freely chosen, certain orientations must be selected to optimize energy output. In the northern hemisphere, panels should face south and be tilted approximately equal to site latitude. A tracking flat panel system (tracker) includes a tracking mechanism to allow the panel to rotate around one or two axes, and follow sunlight throughout the day and/or seasonally. Single-axis trackers rotate around the north-south position and track daily sun movement. Dual-axis tracking systems face the sun's position at all times by rotating simultaneously around the north-south and east-west positions. Although more expensive than fixed tilt systems, trackers can increase the power output over that of fixed systems by approximately 30 percent at low latitudes. However, if fixed-tilt panels are used, more panels can be constructed per unit area of land.

2.1.2 Outlook for Supply and Cost Dynamics

Solar PV systems have various components which need to be considered in developing supply cost estimates, including the PV modules, mounting infrastructure (i.e., foundation, mounting hardware, electrical connectors, and cables), DC-AC inverter, labor and handling costs, and miscellaneous costs (e.g., warranty reserves and costs tied to securing permits and managing rebates). The major cost component for PV system implementation is the material and installation cost which represents 50-60% of the total cost for the system. The mounting structure, cabling, and inverters account for most of the remaining 40% of the cost. Operation and maintenance costs for PV systems are minimal due to the absence of moving parts and are estimated to be around 0.5% of the capital investment annually.

A benchmark unit cost of solar energy that is commonly used by the solar energy industry is the price per watt-peak (Wp), which is defined as the output of a standard solar panel

(or photovoltaic element) when it is exposed to standard conditions. Watt-peak does not take into account solar conditions at a site; therefore, the solar radiation at the site must be considered separately. The cost of generating electricity is the most important metric in assessing the cost competitiveness of a solar PV technology. PV costs are characterized by a high learning rate of 15-20%. (The term "learning rate" refers to the reduction in cost achieved per each doubling of the total cumulative installed capacity.) The total installed cost of a PV system was over $80/Wp thirty years ago but only $6.25/Wp in 2006. At a sustained high learning rate above 15%, the costs are expected to be down to $2.20/Wp in 2030 and $1.25/Wp by 2050.

2.1.3 Environmental Benefits

PV systems provide one of the most sustainable methods of electricity generation without producing GHG emissions. Using the "Clean Energy Calculator" on the California Energy Commission "Go Solar California" website, a modest 2MWp solar system that generates about 2 million kWh per year prevents the emission of approximately 2.3 million lbs of carbon dioxide, 2,500 lbs of sulfur dioxide, and 3,500 lbs of nitrous oxide every year. This is equivalent to a reduction in automobile driving of nearly 3 million miles or planting over 180 acres of trees.

2.1.4 Power Generation Potential and Capacity Factor

As introduced above, the solar power industry rates a solar system in terms of its peak power generation potential, or capacity factor, which assumes that the system's PV cells are under direct sunlight for 24 hours a day, 365 days per year. Somewhat misleadingly, informal reference to a 1MW solar power system is in reality reference to a 1MW peak (1MWp) system. The difference is significant: a true 1MW system could theoretically generate 8.76 million kWh of energy annually (i.e., 1000 kW × 365 × 24). However, in reality this system can only generate a fraction of its rated capacity because of limited daily exposure of PV cells to direct sunlight, non-optimal placement and alignment of PV cells with respect to the path of the sun, loss of generation capacity with time, and losses due to conversion from DC to AC for distribution and use.

Actual power generation depends on several factors, including: (1) solar radiation at the site (which depends on latitude and longitude, as indicated in Figure 2.3); (2) tilt and type of sun-tracking PV device (i.e., fixed, single-axis tracking, or dual-axis tracking); (3) panel orientation; (4) solar array DC power rating; and (5) overall DC-AC inverter efficiency. Considered together, a 1MWp unit installed in northern Virginia is expected to produce,

on average, about 1.2 million kWh annually. This is less than 14% of its theoretical peak rating. Based on average rates of incident solar energy in Virginia (Figure 2.3), the area required to install a 1MWp solar system is about 7 acres.

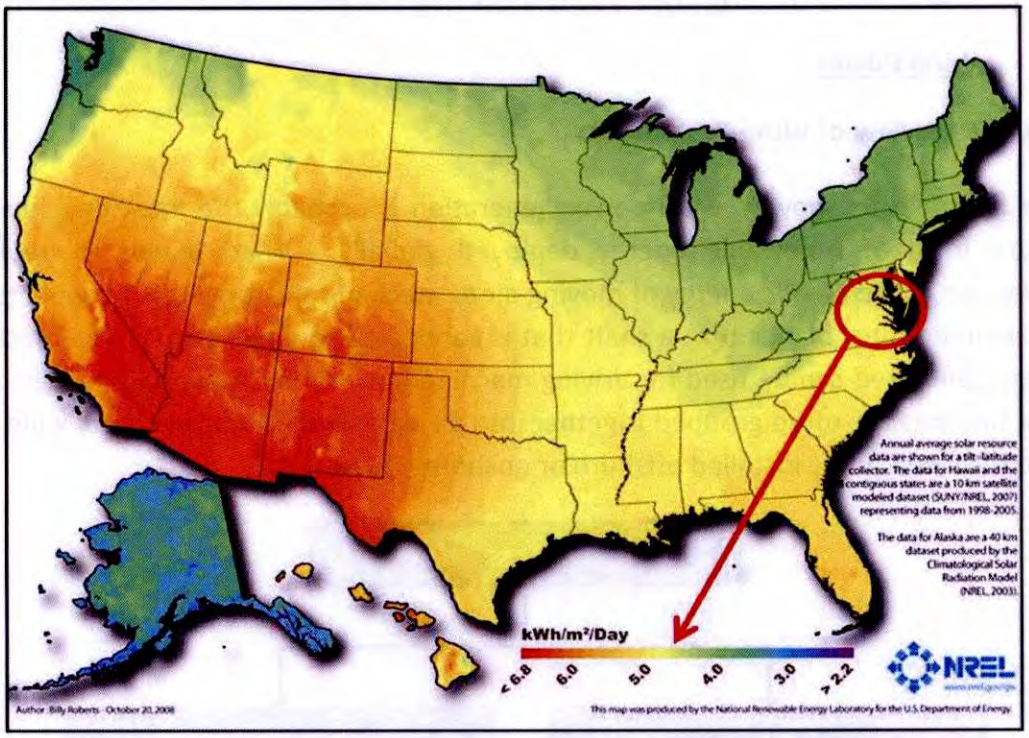


Figure 2.3: Photovoltaic resources of northeastern Virginia in relation to the continental United States

2.1.5 Opportunities and Constraints on Development

Offsite Interconnectivity: The electricity generated by solar panels would be connected to the power grid. The nearest grid connection available is at the MC Facility, which is about 500 feet away from the landfill.

MSE Berm: The planned construction of the MSE berm at the landfill would benefit implementation of solar technology at the landfill. After MSE berm construction, the southward-facing side slope area exposed to optimal solar incident energy would be significantly increased, leading to increased power generation potential. Following closure capping of the landfill, the entire southern side slope area and 40-acre top deck area created by the berm would potentially be available for solar panel installation.

Complimentary Attributes with Other RETs: Solar technology shares complimentary attributes with wind energy, as both require similar DC-AC inverters and cabling. If deployed at the energy park together, solar and wind projects could potentially share these components and the proposed electricity hook up point at the MC Facility.

2.2 Wind Power

2.2.1 Overview of Wind Technology

After hydroelectric power, wind power generation is probably the most developed and mature form of renewable energy deployed globally. Wind power is created by conversion of the kinetic energy of moving air to mechanical energy using a wind turbine. The spinning rotor blades turn a shaft that is connected to a generator. The mechanical energy generated can be used for driving machinery or can be converted into electricity. Wind turbines are often grouped together into a single wind power plant or "wind farm." Wind turbines can be installed offshore or onshore (Figure 2.4).

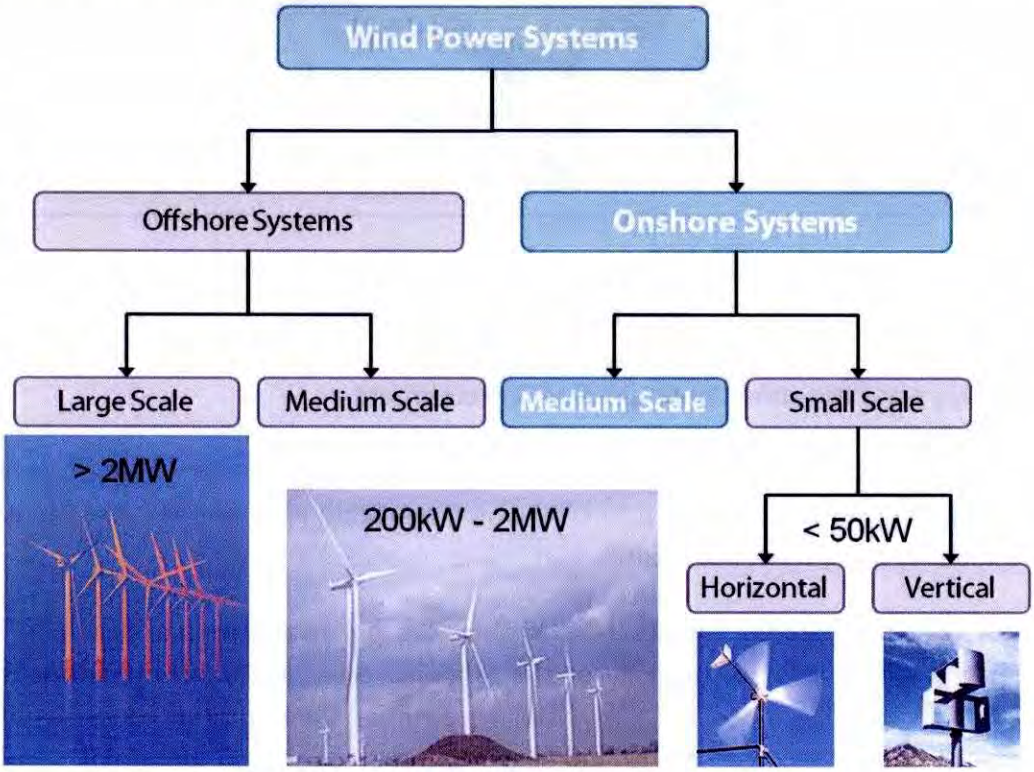


Figure 2.4: Typical wind turbine systems (medium scale onshore turbines are the recommended technology at Lorton Landfill)

Modern day wind turbines can be divided into two major categories: horizontal axis wind turbines (HAWT) and vertical axis wind turbines (VAWT). HAWT have the main shaft and generator at the top of a tower and pointing into the direction of the wind. The towers produce turbulence behind the turbine leading to positioning of these turbines in an upwind direction. VAWT have the main rotor shaft in the vertical direction. VAWT can be placed independent of the direction of wind. They can also be placed closer to the ground and thus are relatively easy to maintain. However, they are less efficient, reduce wind speeds significantly, and have to be spaced at wider distances than HAWT. The basic components of a HAWT system are shown in Figure 2.5. The wind turbine along with the generator produces DC output, which is converted to AC and then connected to the power grid.

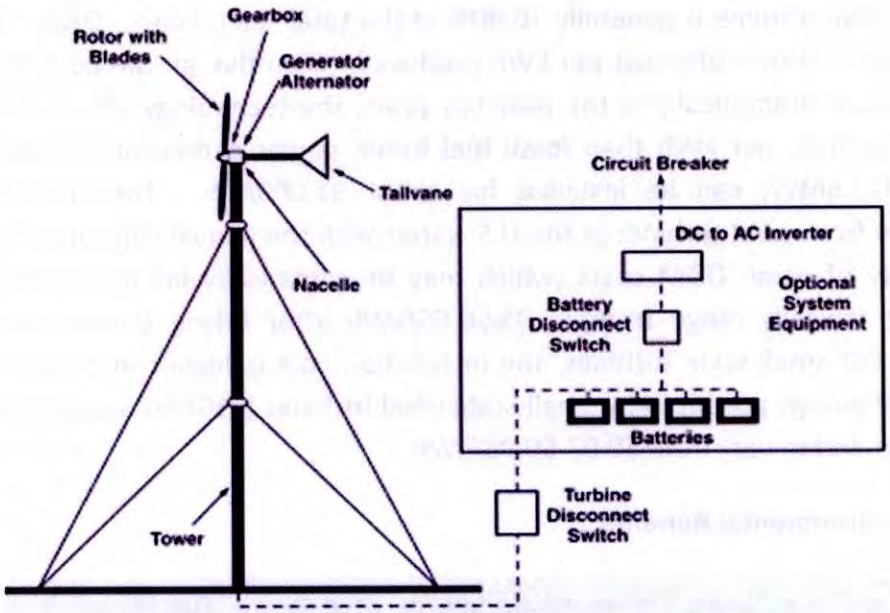


Figure 2.5: Basic components of a wind turbine system

Wind turbines need moderate but steady winds for producing energy. They start producing energy as wind speeds reach 5-7 m/s (11-16 mph). The efficiency of wind turbines depends on the amount of energy extracted by the blades (swept area of the rotor) and installation height of rotor. Greater height provides better access steadier, higher-speed winds.

Wind turbines are available in a range of sizes. Very small (i.e., household scale) devices are capable of producing only a few watts. On the upper end of the scale, large commercial onshore turbines with a rated output of over 1.5MW are available, while offshore turbines with capacities in excess of 3MW are not uncommon. Most medium- to large-scale turbines are installed in commercial wind power stations consisting of groups of turbines each rated at about 400kW or above. Wind energy is a mature technology, with most new development focused at the very large (>1.5MW) and very small (<5kW) ends of the scale. Small-scale wind turbines are relative expensive on a per kilowatt basis which can make them a costly option to install.

2.2.2 Outlook for Supply and Cost Dynamics

The life cycle cost of wind systems consists of infrastructure costs for the turbine, power plant with tower, foundation system, wires, generator, and invertors, and O&M costs. The cost of the turbine is generally 70-80% of the total capital cost. O&M costs average about 20-25% of the total cost per kWh produced. Even though the cost of wind power has decreased dramatically in the past ten years, the technology still requires a higher initial investment per kWh than fossil fuel based power generators. Large-scale wind turbines (>1.5MW) can be installed for about $1,000/kW. The cost of electricity production from wind turbines in the U.S. varies with the annual capacity factor, location and quality of wind, O&M costs (which may be climatically induced), and installation costs, but typically range from $0.03-$0.06/kWh after taking federal incentives into account. For small-scale turbines, the installation cost is higher at $2,000-$8,000/kW. The cost of energy produced by small-scale wind turbines (<10kW) over their lifetime has been estimated to vary from $0.07-$0.96/kWh.

2.2.3 Environmental Benefits

Wind energy is a clean, non-polluting source of energy. Unlike conventional power plants, wind power plants emit no air pollutants or GHGs. It is estimated that a 1MW wind system would prevent the release of nearly 2 million pounds of carbon dioxide every year for the life of the system (California Energy Commission).

2.2.4 Environmental and Other Concerns

Although wind power plants have little impact on the environment as compared to fossil fuel plants, there are some concerns that need to be addressed when designing a wind facility.

Environmental Concerns: Wind power has three main environmental impacts: visual impact, noise, and risk of bird collisions. Two kinds of noises are associated with wind turbines: (1) aerodynamic noise from the spinning blades, and (2) mechanical noise from the rotating machinery. Although design improvements are bringing about sharp reduction in noise factors, this remains of particular concern to host communities. Most problems can be resolved or greatly reduced through proper siting and technology.

Aviation Concerns: The installation of wind towers would require identification of known airports and landing strips in vicinity of the landfill. The final tower height would be decided in accordance with Federal Aviation Administration (FAA) regulations. Concerns regarding interference of tower height and wind turbine blades with anticipated airplane pathways would be addressed by installing an aviation warning light on the towers.

Visual and Aesthetic Concerns: Wind turbines are the focal point of visual and aesthetic concerns based on the visual patterns created by their size, spacing and uniformity of appearance. Visual and aesthetic concerns are most commonly expressed concerns for the development of wind energy projects. Determination of adverse visual impact is highly subjective as it depends on the values, beliefs and experiences of individual views.

2.2.5 Power Generation Potential and Capacity Factor

The wind power industry rates a wind system in terms of its "nameplate" power generation capacity, which assumes that the wind conditions prevailing at a site are available at speeds required to achieve maximum efficiency from a wind turbine for 24 hours a day, 365 days per year. As with solar systems, and again somewhat misleadingly, informal reference to a 1MW wind power system is in reality reference to a 1MW name plate (1MWp) system. By way of illustration, under favorable conditions a 1MWp wind unit installed in Virginia would be expected to produce, on average, about 3.0 million kWh annually. In reality, of course, this system would only generate a fraction of its rated capacity because of the variation in wind resources (Figure 2.6), non-optimal placement and alignment of wind turbines, obstructions from site features, and turbulence effects from the ground and adjacent wind turbines. The capacity factor of turbines developed optimally at the site is expected to be about 20% of the maximum rating. The direct impact area needed for developing wind energy projects ranges from 3-7 acres per MWp in the U.S., depending on site-specific conditions and the size of individual turbines.

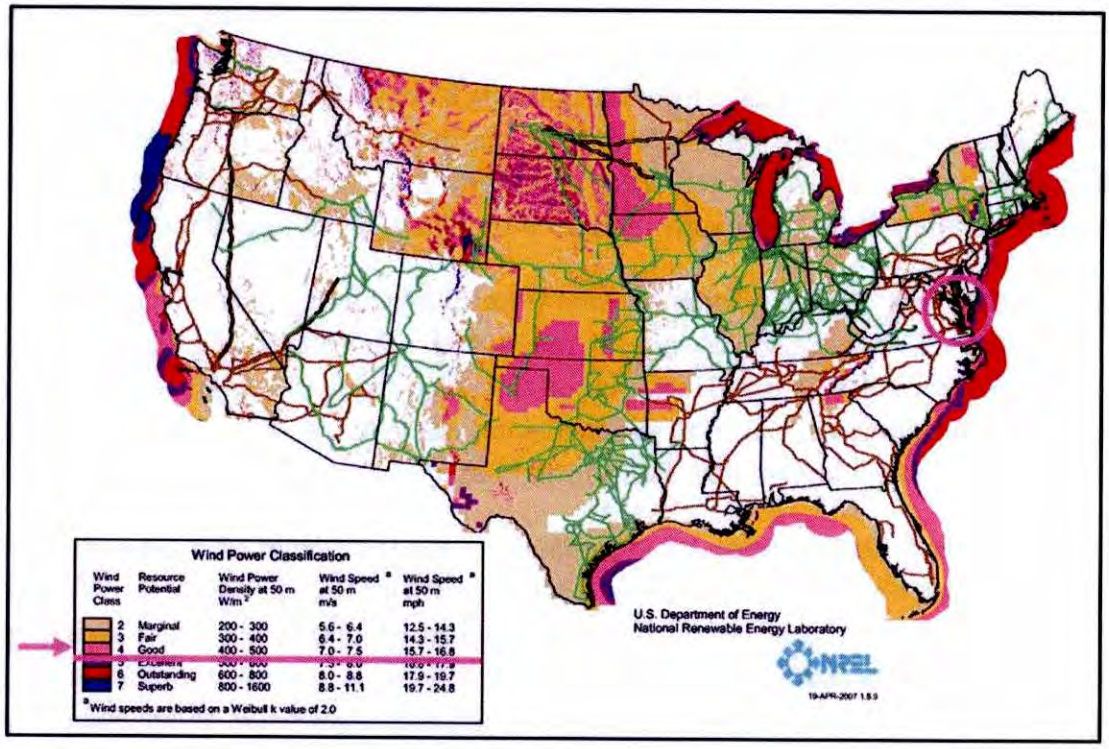


Figure 2.6: Wind resource potential for Chesapeake Bay influenced portions of Northeastern Virginia in relation to the continental United States

2.2.6 Opportunities and Constraints on Development

Offsite Interconnectivity: The electricity generated by wind turbines would be distributed to the power grid. The nearest grid connection available is at the MC Facility, which is 500 feet away from the landfill. A separate connection directly to the grid is also feasible but would duplicate the grid connection at the MC Facility.

MSE Berm: Constructing the MSE berm and increasing the top deck area at the maximum elevation of the landfill will facilitate installation of larger wind turbines at heights above the surrounding land surface where wind speeds are higher, more constant, and reliable throughout the year, ensuring a more efficient and steady rate of power generation throughout the year. The planned landfill capacity increase would therefore significantly benefit implementation of wind technology at the landfill. After MSE berm construction and subsequent waste filling, the maximum contour grades of the landfill at closure (as per the current design) would provide up to 40 acres of top flat area at an elevation of 412 feet-msl. At the landfill location, consistent wind speeds for optimal wind power

exploitation occur above elevation 475 f-msl, about 250 ft above the average surrounding ground surface. Placing a turbine on top of this landfill with the rotor above this height would provide access to steady winds.

Complimentary Attributes with Other RETs: Wind technology shares complimentary attributes with solar technology, as both require similar DC-AC inverters and cabling. If deployed at the energy park together, solar and wind projects could potentially share these components and the proposed electricity hook up point at the MC Facility. It is not uncommon for these technologies to be combined to form a hybrid system (Figure 2.7).

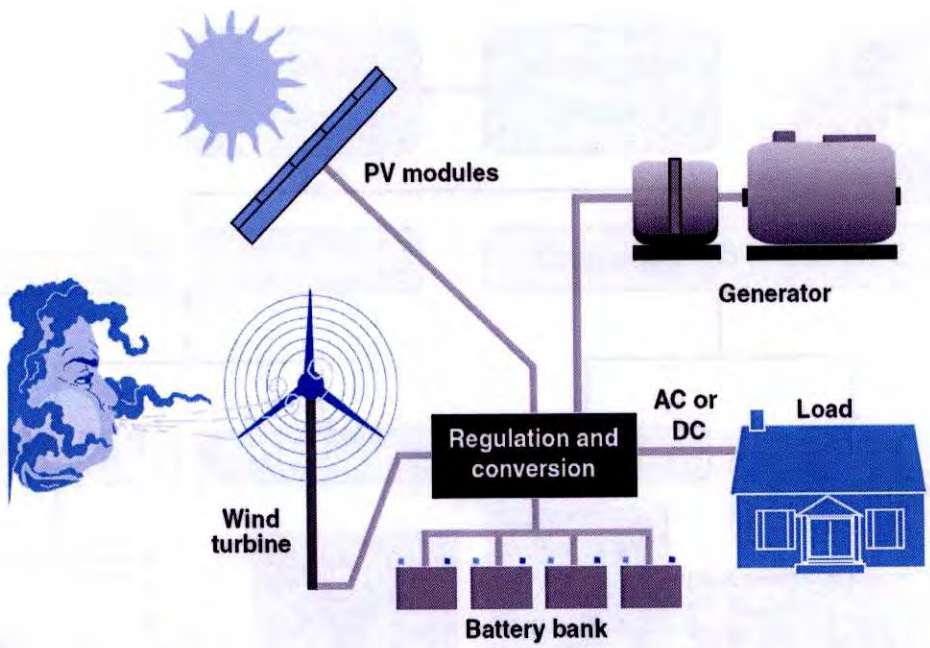


Figure 2.7: Wind and Solar Hybrid Systems (US Department of Energy, 2005)

2.3 Methane Utilization

2.3.1 Overview of Methane Utilization Technology

Landfill gas (LFG) is a natural byproduct of the decomposition of organic waste material under anaerobic conditions (oxygen is absent). The pathways for biochemical degradation of organic material yield LFG containing roughly 50% methane and 50% carbon dioxide by volume, with trace concentrations (less than 1%) of volatile organic

compounds and inorganic compounds. Methane in LFG has the same chemical characteristics as fossil natural gas, and can be collected and converted into useful energy forms such as electricity, steam, heat, or vehicle fuel. Medium BTU applications, such as the MC Facility at the Fairfax County Landfill, can directly utilize the methane for electricity generation and/or heat energy. Alternatively, medium BTU gas can be used to displace natural gas usage onsite or at a nearby industrial facility. LFG can also be purified to increase its BTU value and the clean methane injected into the natural gas grid or used to produce compressed natural gas (CNG), an alternative vehicle fuel (Figure 2.8).

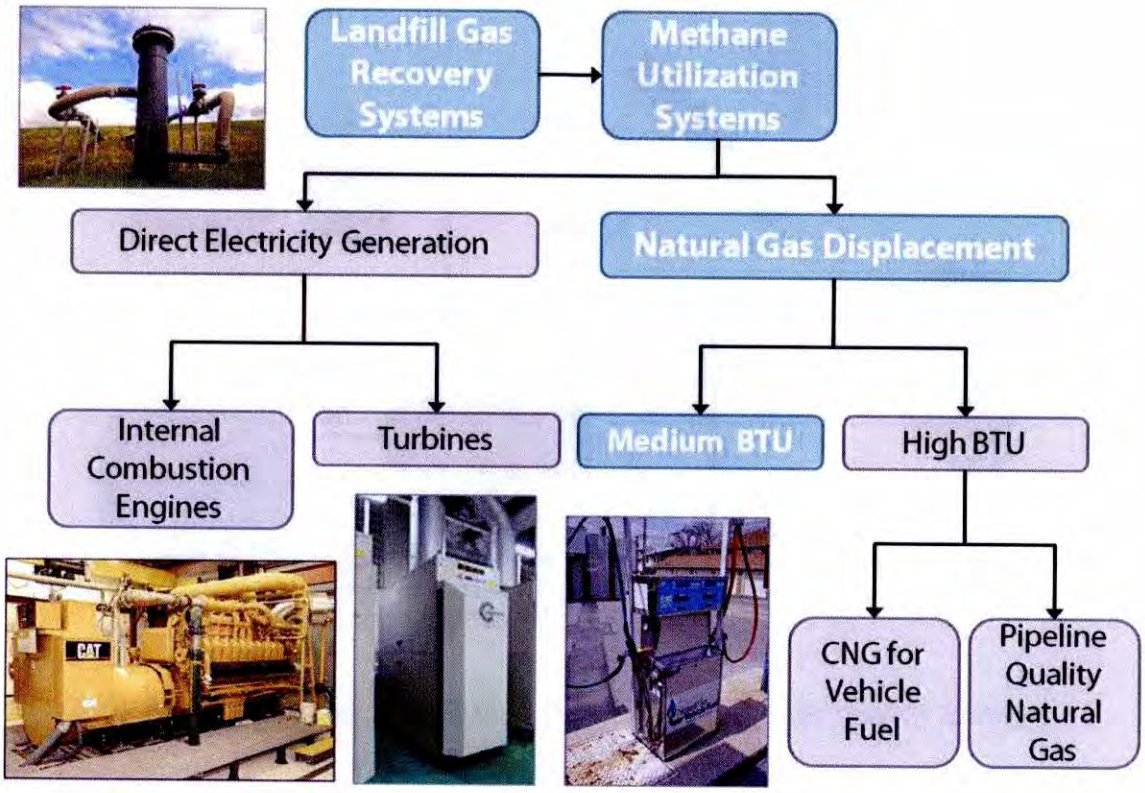


Figure 2.8: Typical methane utilization systems (direct use of medium BTU methane is the recommended technology at Lorton Landfill)

Generally, LFG is collected by installing horizontal collector trenches (concurrent with waste placement) or by drilling vertical wells into the landfill (at the end of waste placement). Trenches and wells are connected to control wellheads to transport collected

gas via lateral piping to a main collection header. Mechanical blowers are used to induce a vacuum on the collection system. The goal of a methane utilization project is to convert methane collected in LFG into useful energy by either direct use or electricity generation. Both of these options have three basic components: (1) a gas collection system and backup flare; (2) a gas compression and treatment system; and (3) an energy recovery system (Figure 2.9).

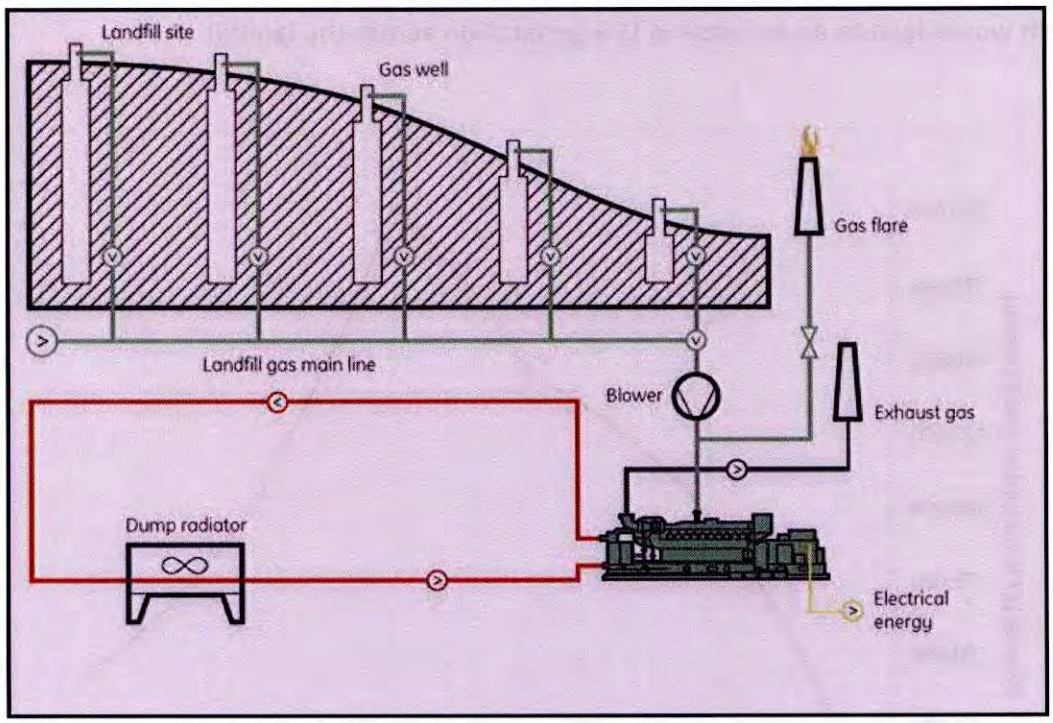


Figure 2.9: Schematic of main components involved in a LFGTE system (GE Energy)

2.3.2 Methane Generation Potential and Optimal Project Development

The methane generation rate at a landfill can be estimated based on the U.S. EPA's Landfill Gas Emissions Model (LandGEM), the industry standard model for regulatory applications concerning LFG collection in the U.S. LandGEM is a first order decay model in which it is assumed that methane generation peaks shortly after waste placement and then decays exponentially with time. Methane generation depends on three main factors: (1) the average annual waste disposal rate, which defines the total quantity of organic material available; (2) the methane generation potential of the waste in place

(this is typically low for CDD landfills); and (3) the methane generation rate constant (this is dependent on climate conditions, mainly temperature and rainfall).

Based on LandGEM output in accordance with the input parameters and conditions described above, and assuming a collection efficiency of 75%, the potential LFG collection rate (mmBTU/year) was estimated as shown in Figure 2.10. The initial curve represents historic and ongoing landfilling prior to MSE berm construction, the second curve "bump" represents the additional waste placement that will occur after MSE berm construction, which would lead to an increase in LFG generation across the landfill.

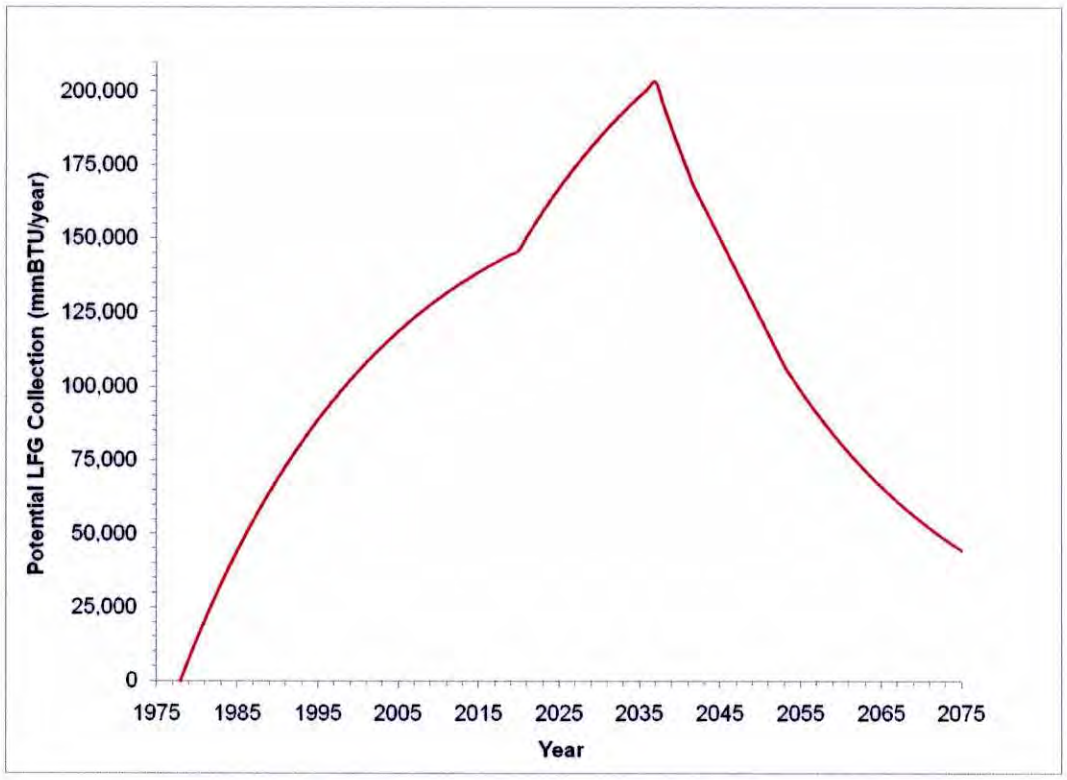


Figure 2.10: Potential landfill gas collection at Lorton Landfill

Beyond the energy value of methane generated, a number of factors are involved in determining the optimal project for a particular landfill. These include: (1) availability of end users (for direct use) or grid interconnection (for electricity production); (2) development costs; (3) potential revenues; (4) infrastructure requirements; and (5) technical considerations. Gas collection infrastructure also requires periodic inspection

and maintenance, generally in accordance with the operating permit or post-closure plan. O&M costs tend to be low (1-5% of installation costs) during the life of the system. Site-specific and equipment-specific O&M requirements and procedure would need to be drafted based on final design of the gas collection system installed.

Due to the existence of the MC Facility and municipal WWTP in the local vicinity of Lorton Landfill (Figure 1.9), a medium BTU application for direct use of collected methane at one or both of these facilities is considered the most feasible methane utilization project at the landfill. As previously discussed, an existing gas delivery hookup (point A on Figure 1.9) is available at the MC Facility, only 500 feet northwest of the landfill. It is assumed this hookup can serve to deliver methane directly into an existing gas treatment system and subsequently into an existing pipeline connection to either facility.

2.3.3 Environmental Benefits

Methane is a potent GHG considered to have 20 times more heat-trapping potential than carbon dioxide in the atmosphere. Although CDD landfills generate less methane more slowly than municipal waste landfills, active methane collection and control at the landfill will nonetheless be beneficial in reducing GHG emissions and improving local air quality (when captured methane is burned in an engine or flare, it is converted to water and carbon dioxide). In addition, LFG emissions can be odorous due to the presence of trace amounts of aromatic and volatile organic compounds; active LFG control thus helps prevent odors. Indirectly, the electrical and/or heat energy produced from a methane utilization project displaces energy demand from coal, oil, or natural gas, thereby avoiding GHG gas emissions from fossil fuel combustion.

2.3.4 Opportunities and Constraints for Development

MSE Berm: The planned landfill capacity increase would benefit economical recovery of methane at the landfill. Methane is produced from biological degradation of organic waste in landfills; rates of methane production are highest in freshly disposed waste and decrease exponentially with time thereafter. Because the organic content of CDD is relatively low, CDD landfills produce less methane more slowly than other municipal waste landfills. Extending the total quantity of waste in place and period of waste placement in the landfill would therefore not only increase the total methane yield, but also overcome limits on the scale and duration for which methane recovery is practical from a technical perspective.

Complimentary and Antagonistic Attributes with other RETs: During installation, the gas collection system at the landfill could have complimentary attributes with a geothermal energy application (see Section 2.4), and could share some trenching and pipe laying activities and costs if the two technologies are installed simultaneously during the active filling stage. LFG technology has some antagonistic attributes with geothermal technology, as drawing heat out of landfill could reduce the rate biological activity and hence gas production in the waste body. Also, care would need to be taken to ensure that gas wellheads and pipes do not interfere with wind and/or solar foundation systems. Solar panel arrays and wind turbines towers may compete for space with vertical gas well appurtenances. Given that solar or wind deployment within the limits of waste would be expected to occur only after closure, it would be beneficial for horizontal gas collection trenches to be installed during waste placement rather than waiting to sink vertical wells at the end of operations. Horizontal trenches are also beneficial in that they do not impact waste placement activities and other landfill operations after installation (allowing an "install it and forget it" approach).

2.4 Geothermal Energy

2.4.1 Overview of Geothermal Technology

Geothermal (GT) energy projects are developed to take advantage of the thermal energy from the earth or large structures with earth-like properties (such as landfills). Geothermal energy projects rely on recovery of heat from within the earth, which can be used in a heat exchanger system. There are three main categories of GT energy projects (Figure 2.11), which depend on the temperature of the ground or groundwater in their application. These are: (1) direct use heating systems, which require small quantities of hot water from springs relatively near the ground surface; (2) electricity generation power plants, which require large quantities of hot water at very high temperatures to drive steam turbines; and (3) geothermal heat pumps (GHP) with heat exchanger loops, which use stable ground or water temperature within 10-30 feet of the ground surface to control the temperature of aboveground buildings or in ground structures such as swimming pools. Only the third category of GT systems is of interest to this study.

A GHP system uses a central heating and air-conditioning system that actively pumps heat to and from the shallow ground (Figure 2.12). In this way, GHP systems use the earth as a source of heat in the winter or as a sink of excess heat in the summer. These systems thus take advantage of stable, moderate temperature in the shallow ground to boost efficiency and reduce operation costs. GHP systems can exchange heat through one of

the three methods: (1) direct exchange system; (2) open-loop systems; or (3) closed-loop system. The direct exchange system circulates the refrigerant underground, open-loop system uses natural groundwater to exchange heat with the ground and closed loop system uses a mixture of anti-freeze and water. For shallow ground applications, closed-loop systems typically consist of two loops (i.e., a primary refrigerant loop and secondary water loop).

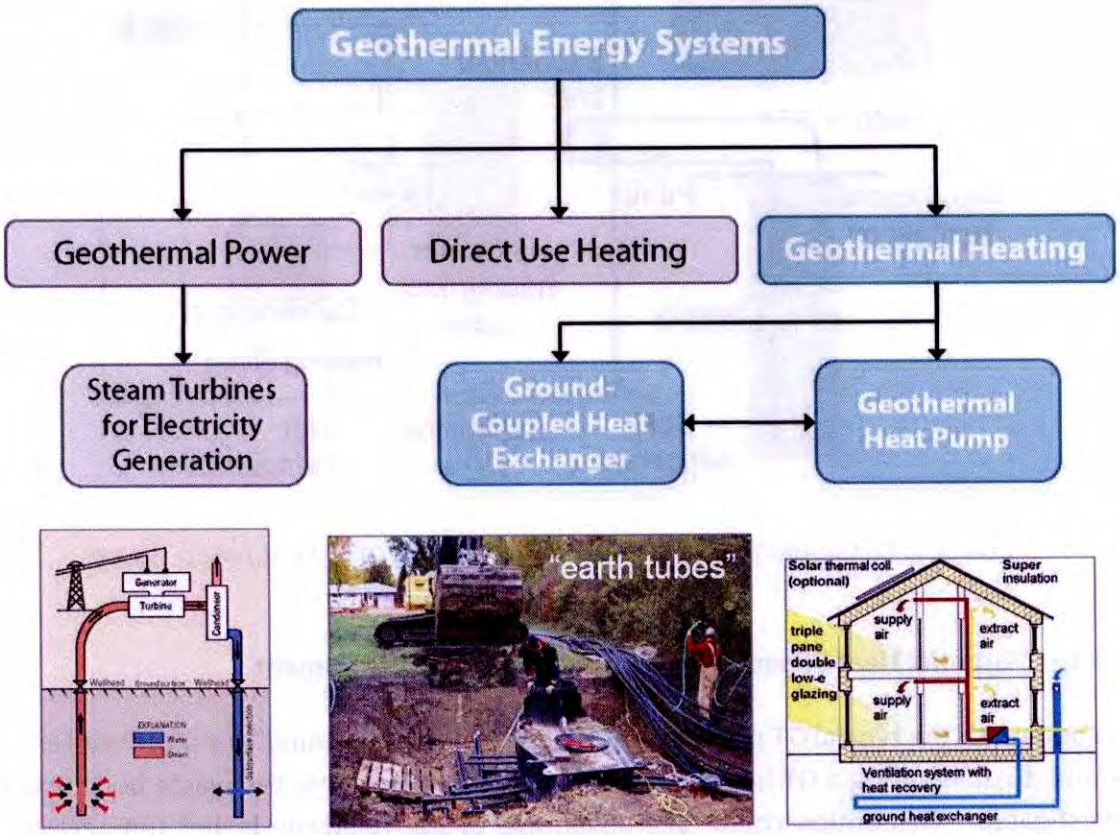


Figure 2.11: Typical geothermal energy systems (use of a ground-coupled heat exchanger and heat pump system is the recommended technology at Lorton Landfill)

A GT heat exchanger unit requires an electrically driven compressor and heat exchanger to concentrate heat obtained from the ground/waste and release it inside the building or other structure that is being heated (and, conversely, to absorb excess heat generated in the structure and return it to the ground). The heat exchanger unit collects heat by means of wire loops, which are generally made of durable, flexible high-density

polyethylene (HDPE) and carry the heat exchange fluid in the loop. The length of pipes or ground loop is dependent on the heat and air conditioning load, soil conditions, local climate, and available land area.

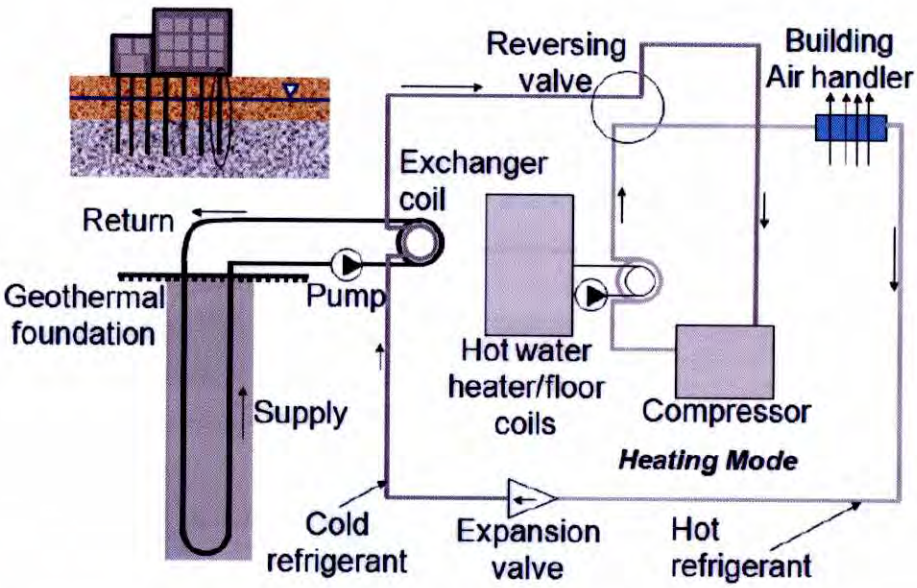


Figure 2.12 Components of a closed-loop geothermal heat pump system

2.4.2 Potential Heat Capacity and Optimal Project Development

In addition to the typical GT project option of using "native ground" for a GHP system, the feasibility of installing a GT heat exchanger piping system within the waste body was also investigated. This option could take advantage of the relatively higher temperature of the waste mass relative to the surrounding native ground (internal landfill temperatures are typically elevated due to exothermic biological activity). A GHP system developed in this way could act as a dual system (i.e., a ground-coupled heat exchanger within the waste mass of the landfill and native ground) with enhanced heating and cooling capabilities, which would be available throughout the year.

The native soils in the landfill vicinity are classified as a sandy loam to gravelly loam. The thermal conductivity of these soils is generally assumed to be about one watt per kelvin-meter. Based on these soil properties and review of geothermal project development resources for Virginia, the potential heat capacity of an acre of native land area at the

landfill was estimated at about 1.0 mmBTU/hr. The body of knowledge related to use and performance of GT systems in landfills is not well developed; indeed, development of a GT system at Lorton Landfill would represent the first such project in the U.S. However, if a geothermal system were installed within the landfill waste, the heat capacity would be expected to be reduced to about 0.8 mmBTU/hr (due to larger pore spaces between waste particles relative to soil particles). Based on this, it is estimated that a 1MWp in-waste GT system with an effective capacity factor[1] of 30% would require approximately 6,000 feet of HDPE heat exchanger piping to be installed in the waste at the base of the internal side slope of the MSE berm.

The piping system installed as part of the GT system at the landfill should not require maintenance. The O&M costs of a GT system thus tend to be low at 1-5% of the initial installation costs over the life of the system. Site-specific and equipment-specific operation and maintenance procedures would need to be drafted based on the design and accessibility of the pipeline and heat pump system recommended for the site.

2.4.3 Environmental Benefits

GT energy has several environmental advantages. It is non-polluting and has only a small carbon footprint after installation (although energy is required to run heat exchanger pumps. It is also of very large magnitude, essentially inexhaustible (i.e., heat stored in the earth is estimated to be about five billion times the annual domestic energy demand in the U.S.). Finally, it is available year-round and not subject to intermitted generation in the same way solar, wind, tidal, and other renewables are.

[1] As previously discussed in relation to solar and wind power, the capacity factor of a power generation unit is a measure of the amount of real time during which the unit is used. Simply stated, it is the ratio of the actual output of the unit over a period of time and its potential output if it had operated at full "nameplate" (i.e., rated) capacity the entire time. Therefore, to calculate the capacity factor, the total amount of energy the unit produces during a set period of time is divided by the amount of energy the unit could have produced at full capacity during the same period. Capacity factors vary greatly depending the type and design of the power generating unit, and are affected by type and energy content of fuel used or other energy source, the availability of the energy source, and the reliability of the unit. Geothermal has a higher capacity factor than many other power sources, and geothermal resources are available 24 hours a day, seven days a week. However, given the unknown performance of GT systems in landfills, a conservative "effective" capacity factor of 30% was assumed for this feasibility study.

2.4.4 Opportunities and Constraints for Development

MSE Berm: The planned MSE berm would benefit implementing GT energy technology at the landfill. After to MSE berm construction, the amount of waste in place in the landfill would increase. Expanding the total quantity of waste in place and the period of waste placement in the landfill would, therefore, not only increase the total heat capacity of the landfill, but also help overcome limits on the scale and duration for which geothermal energy is practical from a technical and financial perspective. In addition, because of concerns with excessive waste settlement leading to damage to heat exchange loops if they were to be buried deep in the landfill, it is assumed that the components of the GT system that are internal to the landfill (i.e., the heat exchange loops and fittings) would be installed as part of MSE berm construction, such that the MSE berm is an essential component of the GT system.

Proximity of End Users: In the short term, supplying heat energy generated from the GT system to homes in the Lorton Valley Development, which is directly adjacent to the landfill property, seems to be the most promising prospect as transmission infrastructure requirements would be minimal (although these existing homes would have to be retrofitted with GT heat pump systems). Any future facilities located in close proximity to the landfill, such as the Sportsplex shown on Figure 1.3, would be promising prospects for preplanned use of GT energy. Supplying GT energy to more distant end users such as the Lorton Art Center and/or Community Center (approximately 1 to 1.5 miles away) would likely not be practical due to the high development costs and losses associated with heat transmission via long transmission loops.

Potential Antagonistic Attributes with other RET's: A geothermal heat system installed at the landfill has potential antagonistic attributes with the performance of the landfill gas system because heat is needed to drive methane generation within the landfill (i.e., underestimating the energy demands on a GT system could lead excessive heat being drawn out of landfill and cooling of the waste, which would negatively affect methane production rates). In addition, care would be taken to ensure that GT system components do not interfere with the future foundations for the wind and solar systems that would only be installed after the pipelines for the GT system have been installed in a given landfill area. However, the plan to collocate the majority of GT system components with the MSE berm should significantly reduce the potential impact of the GT system on other RETs.

2.5 Projected Growth and Learning Curves for Selected RETs

It is anticipated that with advances in RETs in the future, the cost for developing RET projects at the landfill would decrease significantly (this trend is termed the "learning" or "experience" curve). For example, Figure 2.13 presents results from a study conducted by International Energy Agency shows the experience curves for three power generation technologies in the European Union between 1980 and 1995.

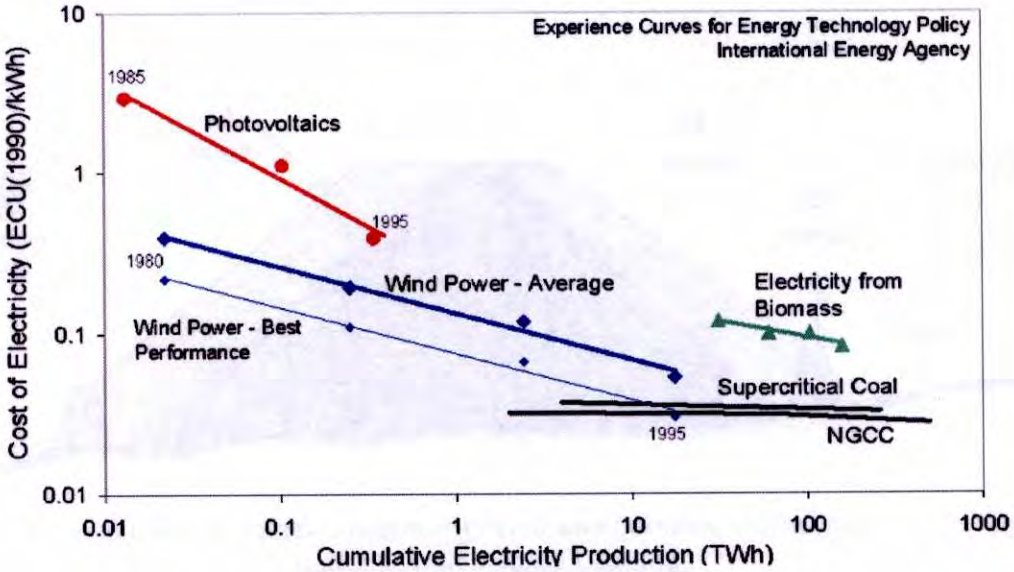


Figure 2.13: Learning curves for renewable energy technologies, 1980-1995

Overall, the PV industry achieved cost reductions in power generation by about 65% between 1980 and 1995. Another study reported that PV technology is expected to have a learning rate of 18% and a growth rate of 19% between 2005 and 2030. The same study reported that wind technology has performed even better over the last decade, achieving overall cost reductions for power generation of about 80%. Onshore wind technology is projected to have a learning rate of 7% and a growth rate of 10% between 2005 and 2030. The implications of these projections are important since FAI intends to implement portions of the solar and wind systems at the renewable energy park after cessation of landfill operations. At that time, both technologies should be considerably more efficient and cost effective than currently.

3. Phased Development Plan for Lorton Energy Park

3.1 Integrated Strategy for RET Deployment

To develop an integrated strategy for RET deployment at the landfill, FAI's property was divided into three broad categories according to areas A1, A2, or A3. A conceptual model depicting a cross section of landfill property indicating all three areas is provided below (Figure 3.1).

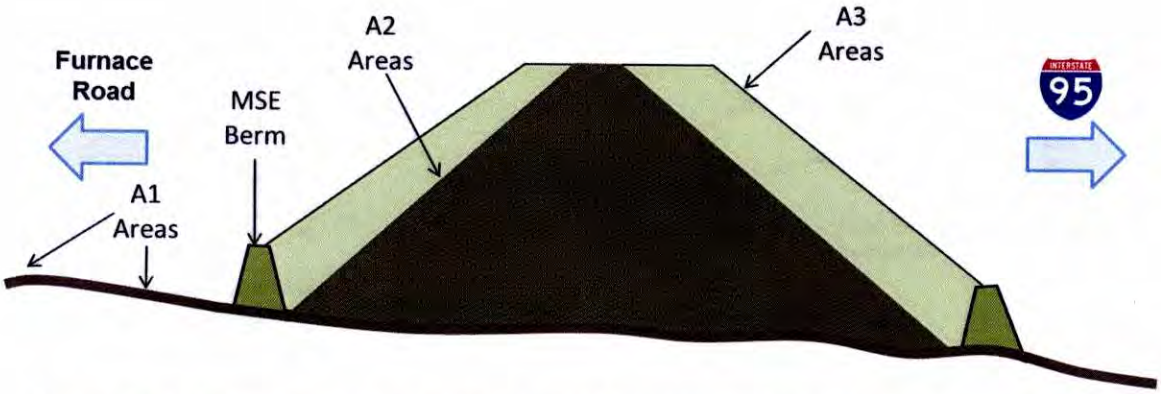


Figure 3.1: Cross section view looking north from south depicting various areas of the landfill property (not to scale)

A1 areas indicate portions of the landfill property and the two offsite parcels that are outside the current and proposed limits of waste disposal. A2 areas indicate the current active landfill areas (i.e., before MSE berm construction). A3 areas indicate future development of A2 areas (i.e., after MSE Berm construction). From Figure 3.1, it is clear that different areas will be relevant at different times during the phased construction of the MSE berm and developed of the landfill.

A1 Areas: These comprise three sectors: (1) the small offsite "FAI Recycling Facility" (9.7 acres); (2) another offsite parcel between Furnace Road and the Fairfax County Landfill (17 acres); and (3) areas within the landfill property boundary but outside of the landfill footprint.

A1 areas cannot be developed for methane and do not fit with Furnace Associates Inc's plans for developing a pioneering landfill-based GT system. It is also assumed that their low-lying nature eliminates these areas from consideration for wind RETs, as the height of

the towers needed for turbines would be excessive. Therefore, A1 areas are assumed to be useful for solar RETs only. Currently, the FAI Recycling Facility property is partially developed with gravel layer on the ground surface. The other offsite parcel is undeveloped and has thick vegetation and tree cover. Onsite A1 areas are generally utilized for landfill operations (traffic handling, leachate management, site buildings, etc.) or are covered with wetlands or trees, all of which would constrain their use for RET deployment. Overall, it is therefore assumed that only the FAI Recycling Facility property offers immediate opportunity for RET development. The other offsite property could potentially be developed at a later date. All onsite areas are assumed to be unavailable for development until completion of landfilling activities.

A2 Areas: These areas represent the landfill before construction of the MSE berm. Based on site development plans, construction of the berm will be completed in four stages, each comprising between 2,250 and 3,700 linear feet. A2 areas thus comprise four sequential sectors reflecting the current best estimate of the sequence of MSE berm construction around the perimeter of the landfill footprint. It is assumed that construction of the MSE berm would tentatively start anytime after 2015 and would be completed by 2025. However, the final MSE berm phasing and construction schedule will be decided based on site conditions and annual waste receipts.

A2 areas have temporal constraints on development for RETs because they will disappear and be replaced with A3 areas. Therefore, these areas are not suitable for long-term installation of solar or wind RETs. A2 areas hold considerable promise for methane collection and utilization, and this is the primary use recommended for these areas. Due to the intent to coincide GT system installation with construction of the MSE berm, it is not practical that GT piping be installed in A2 areas.

A3 Areas: These areas represent the landfill after construction of the MSE berm is completed. Therefore, A3 areas correspond directly with A2 areas and again comprise four sequential sectors.

A3 areas also have temporal constraints on development for solar and wind RETs because they will not exist until after construction of the MSE berm. Therefore, these areas are most suitable for long-term installation of solar or wind RETs after landfill closure. As discussed in Section 2.4, it is recommended that GT infrastructure be installed in conjunction with MSE berm construction. In addition, as waste filling occurs to bring the landfill up to final grades, it is recommended that methane collection infrastructure continue to be installed at the landfill.

3.2 Anticipated Timeframes for RET Deployment

In analyzing scenarios for phased deployment of RETs in different areas of the energy park, it was assumed that the MSE berm construction activities for the landfill will begin in 2015 and the landfill will be operational through 2040. Based on this schedule, the total timeframe for phased deployment of RETs is 25 years. For planning purposes, the timeline for deployment of RETs has been divided into four main periods as shown in the table below.

Table 3.1: Timeline of opportunities for RET deployment

Period	Term	Conditions
2015-2020	Immediate Term (Phase 1)	Before MSE berm construction
2020-2030	Short Term (Phase 2)	Ending with or after completion of MSE berm construction
2030-2040	Medium Term (Phase 3)	Through cessation of landfill operations
2040 onward	Long Term (Phase 4)	Landfill closure and post-closure

3.3 Outlook and Recommendations for Deployment of Selected RETs

The primary opportunities for deployment of RETs in each of the three area categories (Figure 3.1) within the four main opportunity periods for deployment (Table 3.1) are identified in this section. The outlook for deployment of individual RETs is discussed in the context of Geosyntec's recommended approach for integrated development of a renewable energy park featuring four different RETs.

3.3.1 Solar Energy

Hosting a solar energy project in the short to medium term is likely to be popular and would have significant public relations and educational value for the local community. However, at current electricity and PV panel prices the direct financial viability of a solar project is very limited, particularly in the immediate to short term. In other words, while technically feasible and offering some cost offset incentives and sources of revenue,

installing a solar project would be a net cash sink for FAI and not a revenue generation opportunity.

In the immediate term (Phase 1), FAI's primary opportunity for solar technology is to install a small-scale (1MWp) solar park on about seven acres of the FAI Recycling Facility property in conjunction with developing an Energy Education Trail as a renewable energy educational resource for the community. This would serve the important and highly visible goal of demonstrating commitment to the energy park concept and provide site-specific data regarding the unit amount of solar energy (per acre utilized) that can be generated at the site. The Energy Education Trail would be beneficial in providing an opportunity for local citizens and schools to get a first-hand view of a productive solar park. With anticipated reductions in solar PV module costs and improvements in efficiencies over time, it may become more financially attractive to install solar panels in other offsite areas during Phases 2 or 3, although this represents a secondary opportunity for solar technology. In the long term (Phase 4), a 2MWp solar array could be installed in A3 Areas on the upper south-facing side slopes. A much larger array could also be installed on the 40-acre final top deck area after the landfill is completed.

In the immediate term, installing a 1MWp solar park on the FAI Recycling Facility property would serve the important and highly visible goal of demonstrating commitment to the energy park concept

3.3.2 Wind Energy

The potential visual, noise, and environmental impacts of wind turbines means that the true value of hosting a wind energy project at the landfill is more difficult to ascertain than for other RETs. In Geosyntec's opinion, FAI should not be surprised if wind proves not to be as popular with county residents as other RETs. Moreover, the direct financial viability of a wind project is limited, particularly in the immediate to short term, and would (like solar) represent a cost of doing business as opposed to a true revenue generation opportunity.

Overall, therefore, Geosyntec has the following broad conclusions regarding primary opportunities to install wind technology at Lorton Energy Park. First, wind turbines are not technically feasible on offsite properties (A1 areas) because it will not be practical to install turbines with the rotor at sufficient height for good performance. Second, small-

scale wind turbines (<50kWp per unit) are not economically feasible but may be technically feasible for applications on top of the landfill (A3 areas), depending on the average wind speed at their rotor height. Finally, medium- to large-scale wind turbines (200kWp – 2MWp per unit), while economically challenged and potentially subject to public opposition, would be technically feasible if installed on the landfill top deck (A3 areas) such that their rotor height is at least 250 feet above the surrounding terrain (or about 70 feet above the surface of the landfill top deck). Assuming continued reductions in wind turbine prices and improved turbine performance over time, it will become increasingly cost-effective to install these systems at the landfill. Based on the availability of land on the top flat surface of the landfill, the opportunity to install about 3MWp of wind energy exists at the landfill in Phase 4.

It is recommended that site-specific data be collected to firm up conclusions presented here. The site is located outside of mapped areas of high wind power potential in Virginia but potentially within the zone of "good" wind availability associated with the Chesapeake Bay (Figure 2.6). Therefore, FAI would be best advised to consider conducting a multi-year pilot study to obtain site-specific data regarding the reliability of wind speed and power at various heights above the ground surface at the landfill. In this regard, there is a possibility of working directly or indirectly on this under an ongoing statewide wind calibration program at James Madison University in Harrisonburg, Virginia. It is recommended that the wind pilot study be incorporated into the planned Energy Education Trail on the FAI Recycling Facility property.

3.3.3 Methane Utilization

Because the infrastructure associated with methane utilization is mostly subterranean, the public relations value of a methane utilization project at the landfill is difficult to ascertain, but is considered unlikely to attract as much attention from county residents as other RETs. However, given the pernicious nature of methane as a GHG in the atmosphere, active methane collection and control at the landfill will offer significant environmental benefits in additional to renewable energy generation, such as reducing GHG emissions, improving local air quality, and helping prevent odors.

A medium-BTU methane utilization project of up to 4MW capacity appears to be financially viable at the landfill, despite the relatively low methane generation potential from CDD degradation. Negotiating and obtaining a pre-sales agreement for methane supply with at least one of the two identified end-users is recommended to reduce financial risks before moving forward with a large-scale project. In general, however,

given the scalability of the more expensive system components (blower, condensate knockout, backup flare, and main distribution header) and expected low methane yield per unit area, Geosyntec's recommendation would be for FAI to install as much gas collection infrastructure as practical assuming a decision to move forward with methane utilization is taken. Thereafter, every effort should be taken to continually extend the system into newer areas as fresh waste is being placed. This approach will not significantly increase capital and operating costs for the project but should maximize both the total quantity of methane recovered and the recovery rate per unit volume of waste in place. It will also maximize the positive non-energy attributes of proactive gas management (improved air quality and odor management) at the landfill, and emphasize FAI's standing as a good neighbor.

3.3.4 Geothermal Energy

Given the proximity of the landfill to the future planned facilities as well as the Lorton Valley Development, supplying heat energy generated from a GT system to these facilities seems to be a promising prospect. Supplying energy to more distal end users such as the Lorton Art Center and/or Community Center (approximately 1 to 1.5 miles away) may be impractical due to the high development costs and losses associated with heat transmission via long transmission loops. Overall, hosting a GT energy project is likely to be popular with the community and could have a significant public relations value.

It is important to note that GT energy systems are significantly different to other RETs in that excess heat energy cannot be stored in a grid, used to generate electricity, or directly offset natural gas or other fuel usage. The certainty of securing end uses for the heat energy supplied by the GT system is low, time-dependent (in terms of when potential end users are looking to convert to GT heat supply), and thus subject to many social, economic, and political factors. Therefore, although it is assumed that development of GT will be a core component of the renewable energy park as it represents an important differentiating factor for the project, the extent of the GT system developed will be limited by the potential direct heat energy demand of proximal end-users. To put this in perspective, it is estimated that a 1MW GT system with an effective capacity factor of 30% should be sufficient to offset the heat energy required for heating and cooling all 500 or so homes in the Lorton Valley Development. A 1MW in-waste GT system would require approximately 6,000 feet of HDPE heat exchanger piping pipe to be installed along the base of the internal side slope of the MSE berm.

4. Recommendation for Lorton Energy Park Development

As discussed in Section 3.2, in analyzing scenarios for phased deployment of RETs to develop the energy park over time, it was assumed that MSE berm construction activities would begin in 2015 and landfill operations will cease in 2040. The date for completion of capping activities represents the time when the final cover will be fully available for installation of solar panels and wind turbines; this also defines the final transition of the property from a landfill facility to an energy park. Based on this schedule, the total timeframe for phased deployment of RETs is 25 years. It is assumed that FAI would seek to phase-in additional RETs to increase energy output in a step-up manner, such that about 20% of total output capacity is installed in 2015 and an additional 20% of total output capacity is added every five years or so thereafter.

The primary opportunities for RET deployment in each of the three area categories within the four main project periods were identified in Section 3.3. Geosyntec's recommended approach for integrated development of Lorton Energy Park as a 10MWp renewable energy facility featuring four different RETs is summarized in the table below.

Table 4.1: Summary of potential phased installation of 10MWp renewable energy facility

Area	Phase 1 (2015-2020)	Phase 2 (2020-2030)	Phase 3 (2030-2040)	Phase 4 (2040 onward)
A1	Solar (1MWp)			
A2		Methane (2MWp)		
A3		Geothermal (1MWp)	Methane (2MWp)	Solar (1MWp) Wind (3MWp)

This approach was developed in accordance with following main assumptions:

1. Although not financially viable at present, a 1MWp solar park will be established on the FAI Recycling Facility property immediately upon approval of the MSE berm project (Phase 1). Establishing this solar park will be done in conjunction with the Energy Education Trail. Together, these would be highly visible and meaningful steps by FAI toward their commitment to the energy park and would be seen by the

community as FAI's confirmed abandonment of plans to operate a waste sorting and recycling facility on that property.

2. Methane represents the most cost-effective RET at the landfill, and collection of landfill gas offers benefits to FAI beyond its energy value (e.g., odor control). Therefore, the maximum potential for methane collection is assumed to be utilized during the working stage of the landfill. It is assumed that gas collection infrastructure will be installed in four steps during Phases 2 and 3 (half in A2 areas, and half in A3 areas) with development of 1MW capacity utilizing at least 50 acres of the wellfield at each step in order to maximize economies of scale.

3. The extent of the GT system developed will be limited by the potential direct heat energy demand of proximal end-users. Although the landfill has significantly more heat capacity, it is assumed that only a 1MW GT system will be installed early in Phase 2 (during MSE berm construction). This GT system should be sufficient to offset the heat energy required for heating and cooling the equivalent of all 500 or so homes in the Lorton Valley Development or to service the planned Sportsplex.

4. Wind and solar systems will be developed immediately after closure capping is completed to take advantage of the benefits of the elevated side slope areas and increased top deck area that will have been made available as a result of the MSE berm.

The MWp rating for each RET listed in the above table is technology-specific as it depends on the RET's capacity factor (15% for solar, 20% for wind, 30% for GT, and 85% for methane). An explanation of the capacity factor for solar and wind is provided in Sections 2.1.4 and 2.1.5, respectively. The capacity factor listed for methane in the above table represents direct use of medium-BTU gas rather than electricity generation at the Michigan Cogeneration facility. (The capacity factor for electricity generation from landfill gas methane is much lower at about 30% due to inefficiencies of the engines.) Given that the municipal WWTP has need for methane close to the expected limit of what can be supplied by the landfill, it is reasonable to assume that the total MWp rating for the project be claimed at the higher capacity factor representing the direct heat value of methane. Note also that GT systems generally have a much higher capacity factor than other renewable energy sources as geothermal resources are available 24 hours a day, seven days a week. However, given the unknown performance of GT systems in landfills, a conservative "effective" capacity factor of 30% was assumed for this feasibility study.

5. Scale of Lorton Energy Park Relative to Other RET Projects

Geosyntec researched how FAI's vision for utilizing four RETs to develop a 10MWp renewable energy park at the Lorton Landfill compares on a national scale to other energy park projects. Geosyntec reviewed databases of published information from: (1) closed academic resources made available via the "Web of Science" portal; (2) closed engineering industry resources made available via membership of technical institutions such as the American Society of Civil Engineers (ASCE), Solid Waste Association of North America (SWANA), the U.S. EPA's Landfill Methane Outreach Program (LMOP), and the International Solid Waste Association (ISWA); (3) review of information from U.S. renewable energy sources such as the National Renewable Energy Laboratory (NREL), Solar Energy Industries Association (SEIA), and American Wind Energy Association (AWEA); and (4) open popular sources of information and news media accessible via Google and other search engines.

5.1 Individual RETs

Solar Power: The total installed capacity of solar power in the U.S. is difficult to ascertain because of the profusion of small-scale private systems in recent years. However, according to a study by SEIA, about 900MWp of PV solar capacity and 80MWp of concentrating solar power (CSP) capacity was installed in the U.S. in 2010. Several very large solar projects exist in the southeastern states. The DeSoto Next Generation Solar Energy Center in Florida is the largest PV solar facility in the eastern U.S., constructed over 180 acres with 90,500 solar panels and annual capacity of 25MWp. There are currently no active commercial-scale PV solar facilities in Virginia, although Dominion Power is reportedly in the process of setting up a 40-50 acre 4MWp solar farm in Halifax County. That project is planned to be completed by the end of 2012.

Wind Power: According to AWEA, the total installed capacity of wind power in the U.S. is significant and was estimated at around 35GWp at the end of 2009. Texas has the most installed wind power capacity and is home to the largest single site wind farm in the national with a capacity of 780MWp. However, there are currently no commercial-scale wind farms currently operational in Virginia.

Methane Utilization: Hundreds of landfills across the U.S. have installed LFGTE or other high- or medium-BTU gas utilization schemes. According to a database maintained by LMOP, several methane utilization projects have rated capacities in the tens of megawatts.

Geothermal Energy: Geosyntec cannot find evidence of any landfills in the U.S. that are utilizing the heat capacity of waste for geothermal energy supply to offsite end users.

Lorton would be the first landfill in the U.S. to utilize the heat capacity of waste for geothermal energy supply to offsite end users

In conclusion, Lorton would be the first landfill in the U.S. to utilize the heat capacity of waste for geothermal energy supply to offsite end users. Beyond this, however, the planned total output of individual RETs at Lorton Energy Park cannot compete in scale with several very large MSW landfill methane projects in place around the county, large wind farms in places like Texas, or solar parks in places like Arizona, California, or Florida.

5.2 Mixed-Use Energy Park

With regard to the question of the scale and ambition of Lorton Energy Park relative to other mixed-use renewable energy parks, Geosyntec reviewed existing or planned developments of mixed-use energy parks in the U.S. In this regard, a "mixed-use energy park" was considered a single site offering at least two of the six commonly identified major categories of RETs (i.e., solar, wind, biomass, hydropower, geothermal, and tidal).

Most reported mixed-use energy parks are pilot-scale or research-based operations where each installed RET is used to generate a few hundred kilowatts of energy only. Several landfills across the U.S. have installed large (>10MW) LFGTE or other methane utilization schemes; however, deployment of multiple RETs at a single site is rare. A few landfills, including Republic Services' Tessman Road in San Antonio, Texas (135kWp) and Hickory Ridge in Conley, Georgia (1MWp), have installed flexible PV solar systems as part of their closure capping systems. In 2009, two 1.6MWp wind turbines were installed at Frey Farm Landfill in Lancaster County, Pennsylvania.

In summary, the concept of developing renewable energy parks to utilize methane and at least one other RET (generally, solar) has been reported as under consideration, or even under development, at a handful of landfill sites. However, Geosyntec can find no evidence of plans on the scale of Lorton Energy Park to utilize four RETs.

6. Summary of Principal Findings from the Study

This final report summarizes a detailed internal report on findings from a technical and financial feasibility study conducted to evaluate phased implementation of various RETs in accordance with FAI's plans to develop Lorton Landfill as a renewable energy park. The RETs included in the FS were solar, wind, methane, and geothermal technologies. The long-term vision behind this plan is to develop RETs as part of the landfill development plan, such that the landfill property will transition over the remainder of its operational and post-closure life from a disposal facility to a state-of-the-art renewable energy park.

6.1 Environmental Benefits in Support of the Landfill Capacity Increase

A key purpose of the study was to investigate and highlight the beneficial effects that the landfill capacity increase would have with regard to the technical and financial viability of developing the energy park. As discussed throughout this report, the increased capacity of the landfill will have a beneficial impact on all selected RETs at various stages of their deployment and usage. It would also benefit FAI's ability to invest in RETs. In summary, the increased capacity of the landfill will be integral to ensuring the technical and economic feasibility of the energy park for a number of reasons:

The increased capacity of the landfill will have a beneficial impact on all selected RETs at various stages of their deployment and usage

1. ***Increased Solar Power Generation Potential***: Construction of the MSE berm and resulting increase of the landfill surface area would provide significantly increased area of southward-facing side slopes, which will provide a larger area for deployment of solar arrays with higher incident solar radiation exposure. Larger solar arrays allow for increased total power generation and greater efficiency in the use of interconnection infrastructure.

2. ***Increased Wind Power Generation Potential***: Increasing the top deck area available at the highest elevation of the landfill (412 ft-msl) will facilitate installation of wind turbines with rotor heights above the surrounding land surface where wind speeds are higher, more constant, and reliable throughout the year, without the need to construct excessively tall turbine towers. Tall tower structures are subject to higher public opposition (due to aerodynamic noise and increased visual impact), more challenging and costly design and construction (due to the level of geotechnical

analysis and strengthening required for the foundation system), and more complex, multi-layered regulatory approval due to their potential to impact air traffic and bird migrations. A larger top deck area will allow installation of a larger number of medium-scale turbines, increasing the total power generation capacity and enabling greater efficiency in the use of interconnection infrastructure.

3. ***Higher Methane Utilization Potential***: Methane gas is produced from biological degradation of organic waste in landfills; rates of methane production are highest in freshly disposed waste and decrease exponentially with time thereafter. Because the organic content of CDD is relatively low, CDD landfills produce less methane more slowly than other municipal waste landfills. Extending the total quantity of waste in place and the period of waste placement in the landfill would therefore not only increase the total methane yield, but also overcome limits on the scale and duration for which methane recovery is practical from a technical perspective. For example, if the methane yield per acre falls below an economic threshold, it would not be practical to install gas recovery system in which only very low per-well or per-trench rates of gas recovery are achievable.

4. ***Increased Geothermal Capacity***: The planned MSE berm would benefit implementing GT energy technology at the landfill. After to MSE berm construction, the amount of waste in place in the landfill would increase. Expanding the total quantity of waste in place and the period of waste placement in the landfill would, therefore, not only increase the total heat capacity of the landfill, but also help overcome limits on the scale and duration for which geothermal energy is practical from a technical and financial perspective. In addition, because of concerns with excessive waste settlement leading to damage to heat exchange loops if they were to be buried deep in the landfill, it is assumed that the components of the GT system that are internal to the landfill (i.e., the heat exchange loops and fittings) would be installed as part of MSE berm construction, such that the MSE berm is an essential component of the GT system.

5. ***Improved Cash Flow:*** All RET deployment is capital intensive and requires a long payback period to break even. This is often the key limiting factor to development of RET projects. By providing more certainty that the landfill will remain in economic operation for a period in excess of that required for RET projects to be financially viable (generally, at least 15 years), FAI can make longer-term decisions on capital investments for RETs. In addition, an active landfill operation will provide a diversified

income stream and reduce the financial risk associated with developing the energy park.

6. ***Reduced Greenhouse Gas Emissions:*** From the above discussion, it is clear that increasing the capacity of the landfill would lead to increases in the methane generation, geothermal heat capacity, and land area available for siting solar and wind system. This would increase the renewable energy potential in the local area and facilitate FAI's commitment of financial provisions for cost-effective development of an energy park, thereby allowing the landfill's transition from an untapped renewable energy resource to a fully developed energy park. This would reduce the carbon footprint of the local community by directly reducing or indirectly offsetting their use of fossil fuels to meet daily energy needs.

Finally, FAI's deployment of RETs at the landfill will also support the long-term efforts of Fairfax County in meeting the goals set out in their 2010 Environmental Improvement Program (EIP). For example, by utilizing the existing landfill footprint for a longer duration, FAI can provide for more efficient management of solid waste in the County and prevent use of alternative land areas for CDD disposal. Further, FAI's vision for transitioning use of the property from a CDD disposal facility to a state-of-the-art renewable energy park provides for sustainable and beneficial reuse of the property, a clear demonstration of environmental stewardship.

6.2 Integrated Strategy for Phased RET Deployment

To develop an integrated strategy for RET deployment at the landfill, FAI's property was divided into three broad categories according to area: A1, A2, and A3. A1 areas indicate portions of the landfill property and the two-offsite parcels that are outside the current and proposed limits of waste disposal. A2 areas indicate the current active landfill areas (i.e., before MSE berm construction). A3 areas indicate future development of A2 areas (i.e., after MSE Berm construction).

Different areas will be relevant at different times during the phased construction of the MSE berm and development of the landfill. Each area was assessed for its suitability for deployment of RETs assuming that MSE berm construction activities at the landfill would begin in 2015 and landfill operations would be completed in 2040. Based on this schedule, the total timeframe for phased deployment of RETs is 25 years.

For planning purposes, the timeline for deployment of RETs was divided into four main periods:

- Phase 1 (2015-2020): Immediate term before MSE berm construction;
- Phase 2 (2020-2030): Short term, ending midway through MSE berm construction;
- Phase 3 (2030-2040): Medium term, ending at cessation of landfill operations; and
- Phase 4 (2040 onward): Long term, closure/post-closure period.

The primary opportunities for deployment of RETs in each of the three area categories within the four main periods were identified, and the outlook for deployment of individual RETs discussed in the context of Geosyntec's recommended approach for integrated development of a renewable energy facility featuring four different RETs.

6.3 Recommended Approach for Developing Lorton Energy Park

The energy generated by the various RETs at the landfill will be available either as DC electrical energy from solar and wind sources or heat energy from methane gas and the geothermal source. Both these forms of energy will become available for exploitation in different phases during the life of the landfill.

Based on the primary opportunities for RET deployment identified, Geosyntec's recommended approach was for integrated development of Lorton Energy Park as a 10MWp renewable energy facility featuring four different RETs. When fully developed, the energy park will comprise 2MWp of solar power, 3MWp of wind power, 4MWp of equivalent methane utilization, and 1MWp of GT heat energy potential. The peak rating for each RET is technology-specific as it depends on the capacity factor (15% for solar, 20% for wind, 30% for GT, and 85% for methane).

6.4 Scale of Lorton Energy Park Relative to Other RET Projects

With regard to the scale and ambition of Lorton Energy Park relative to other mixed-use renewable energy parks, Geosyntec reviewed existing or planned developments of mixed-use energy parks in the U.S.

Overall, if approved for development, Lorton Energy Park would represent a number of significant firsts:

1. If operational at an output level above 1MW (actual), Lorton would be the largest 100% renewable energy park (i.e., single source renewable energy rather than a blend of renewables and fossil-fuel based energy) in Virginia;
2. Lorton would be the first landfill in Virginia at which a mix of two or more RETs is developed; and
3. Lorton would be the first landfill in the nation at which more than three RETs are developed.

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EXHIBIT 2

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Memorandum

Date: 15 December 2011

To: Paul Farrell and Conrad Mehan – Furnace Associates, Inc.

From: Ranjiv Gupta and Jeremy Morris – Geosyntec

Copies: Gary Hewes – Furnace Associates, Inc.
David Espinoza and Scott Sheridan – Geosyntec

Subject: Questions Related to Wind Energy Development
Feasibility Study for Renewable Energy Technologies (RETs)
Lorton Landfill, Virginia

As requested via email on 22 November 2011, Geosyntec has prepared this brief memorandum to address central questions posed by Furnace Associates, Inc. with regard to moving forward with discussions with the public and county staff regarding the proposal to install wind turbines at Lorton as part of the renewable energy park development and how it fits into the Green Energy Corridor concept. In anticipation of questions that might be raised, Furnace Associates, Inc. posed a number of questions to Geosyntec:

1. What height are the wind turbines from bottom to top?
2. What elevation are the turbines above mean sea level? Do the turbines need to be at this elevation? What are the advantages?
3. What will the turbines look like?
4. What is the composition of a turbine? What materials are used to construct the turbine? What is the width of the turbine blades?
5. Will the turbines be made in the USA?
6. Will the turbines make noise? If so, how loud will the noise be and what is the nature of the sounds? Will the noise of the turbines drop as you get further away from them? If so what are the decibel levels when you are 100ft, 500ft, etc. from the turbine?
7. How long will it take to install a turbine to the point it is operational?

8. Is there any alternative design that would produce the same amount of power?
9. Are turbines dangerous for birds? Is there a specific species of bird that is more susceptible to death by turbines?
10. How many lights will be on each turbine? What color are the lights? What is the frequency of the light blinking?
11. Can the turbines be blown over by high winds? How will they be anchored on top of a landfill?

In addressing these questions, and in fulfillment of another scope item requested by Furnace Associates, Inc., Geosyntec has prepared a factsheet brochure describing the plan for installing turbines at Lorton. The factsheet addresses questions (1) through (7) above, which are directly rated to the attributes and expected performance of the planned installation. However, Geosyntec considers that questions (8) through (11) are better answered separately as they do not easily fit the purpose of a factsheet brochure. These questions are addressed in the remainder of this memorandum.

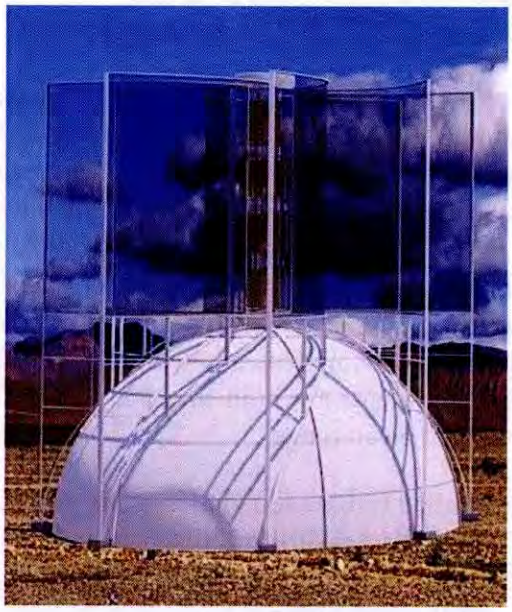
Geosyntec appreciates the opportunity to continue providing consulting services to Furnace Associates, Inc. If you have any questions regarding the information presented in this memorandum please contact Jeremy Morris at (410) 381-4333.

* * * * *

Question 8 – Alternate design of wind turbines that would provide same amount of power: There are two components to answering this question. The first is that the total energy output from a wind farm is dependent on the individual number of turbines installed and the size of each turbine. So a 3MW wind farm could have one 3MW turbine, three 1MW turbines, six 500kW turbines, or 12 250kW turbines (as is proposed at Lorton). The reason smaller turbines are proposed is that they are less visually intrusive and require smaller foundations, which is more appropriate for a landfill setting. The usual height disadvantage of smaller turbines is overcome by placing them on top of the completed landfill.

The second component to the answer is that there are two different types of turbines: (1) the traditional Horizontal Axis Wind Turbine (HAWT), such as those proposed at Lorton; and (2) the relatively new Vertical Axis Wind Turbine (VAWT). VAWTs have the main rotor shaft in the vertical direction and can be placed independent of the direction of wind. They are also closer to the ground making them easier to maintain. However, VAWTs are considerably less efficient than HAWTs, due to the nature of their blades relative to the aircraft wing inspired blades of a HAWT. VAWT blades are also more fragile and prone to fatigue and, being closer to the ground, VAWT are more prone to damage. Currently, VAWT technology is not considered mature, which is why traditional HAWT were proposed for Lorton. However, prototype

commercial-scale 250kW VAWTs are being marketed by Directional Energy of Las Vegas, Nevada (see photo below).



250kW Vertical Axis Wind Turbine (Directional Energy)

Question 9 – Effect on birds: Birds can fly into wind turbines, as they do with other tall structures. Assuming that care is taken to site turbines outside of the main cross-continental migration corridors, the collision rate of birds with turbines is reportedly very low, similar to that for electricity transmission lines. In fact, wind energy's overall impact on birds is extremely low compared too other human-related causes of death. Buildings (particularly with glass facades), communications towers, traffic, and house cats are responsible for far great numbers of bird deaths per year than wind turbines. The majority of bird fatalities recorded at wind turbines are passerines (songbirds). In addition, bats (mostly migratory, solitary tree bats such as the hoary silver haired and red bat during fall migration) are susceptible to collision in low numbers (averaging 0-6 deaths per megawatt installed per year). Potential effects on birds would need to be established as part of a detailed ASTM Site Assessment conducted during the project development process.

Question 10 – Lights on wind turbines: Lights are required for aviation safety on any structure which is higher than 200 feet above the surrounding terrain, and have to follow recommendations from the Federal Aviation Administration (FAA) Advisory Circular AC 70/7460 (2007) for Obstruction Marking and Lighting. The number of lights required depends on the number and layout of the wind turbines installed. However, not all the wind turbines need to be lighted, if the periphery of the installation is lighted properly and the lights are not spaced more than a half mile apart. A dual lighting system which consists of red lights for nighttime

and high or medium intensity flashing white lights for daytime and twilight is generally required. The red colored flashing lights need to comply with FAA L-864 requirements and have 20-40 flashes per minute (FPM) and white lights need to comply with FAA L-864/L-865 requirements with 40 FPM.

Question 11 – Stability of Turbines of Landfills: Due to potential issues with differential settlement, proper foundation design is critical for any large structure installed on a landfill. The foundation design for wind turbines on top of a landfill will require either deep foundations (drilled shaft or piles, which penetrate the final cover) or shallow foundations (concrete rafts, which do not penetrate the cover). Design selection is based on the settlement characteristics and bearing capacity of underlying cover, waste, and soil/rock properties at a site, and regulatory conditions governing cover penetrations. Note that to avoid excessive movement of the wind turbines and transmission of high dynamic forces to the tower and foundation during high winds, automatic breaking and cut-off systems are built into the turbines' control systems which stop operating if wind speeds exceed a given range.

Geosyntec has conducted a detailed turbine foundation study and design for installation of large-scale (2MW) turbines at Fresh Kills Landfill on Staten Island, New York. This study showed that a shallow foundation could be satisfactorily constructed, even for turbines with tower heights up to 400 feet. Landfill-based turbines have been installed and are operational at Frey Farm Landfill in Pennsylvania (two 1.6MW turbines with tower heights of 260 feet) and Hull, Massachusetts (one 1.8MW turbine with tower height of 190 feet). These projects both feature turbines that are taller than those proposed at Lorton. Geosyntec has prepared a one-page factsheet brochure which provides more information on these two existing projects.

EXHIBIT 3

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Memorandum

Date: 13 January 2012

To: Paul Farrell and Conrad Mehan – Furnace Associates, Inc.

From: Ranjiv Gupta and Jeremy Morris – Geosyntec

Copies: Gary Hewes – Furnace Associates, Inc.
David Espinoza and Scott Sheridan – Geosyntec

Subject: Questions Related to Solar Energy Development
Feasibility Study for Renewable Energy Technologies (RETs)
Lorton Landfill, Virginia

As requested via email on 19 December 2011, Geosyntec has prepared this brief memorandum to address central questions posed by Furnace Associates, Inc. with regard to moving forward with discussions with the public and county staff regarding the proposal to install solar panels at Lorton as part of the renewable energy park development and how it fits into the Green Energy Corridor concept. In anticipation of questions that might be raised, Furnace Associates, Inc. posed a number of questions to Geosyntec:

1. How will be solar power produced at Lorton Energy Park?
2. What is the height/size of solar panels?
3. Will the solar panels create heat in surrounding areas? Will there be issues with glare form the solar panels?
4. Are solar panels dangerous for birds and airplanes?
5. Can the solar panels be blown over by high winds? How will they be anchored on top of a landfill?

In addressing these questions, and in fulfillment of another scope item requested by Furnace Associates, Inc., Geosyntec has prepared this memorandum and a separate factsheet brochure describing the plan for installing solar panels at Lorton. The factsheet is related to attributes and expected performance of the solar panels and is based on answers to questions addressed here.

Geosyntec appreciates the opportunity to continue providing consulting services to Furnace Associates, Inc. If you have any questions regarding the information presented in this memorandum please contact Jeremy Morris at (410) 381-4333.

* * * * *

Question 1 – Energy production by Solar panels: Energy will be produced in form of electricity from solar power using photovoltaic (PV) cells at Lorton renewable energy park. The PV cells are made of silicon, a semi-conductor material, when exposed to the direct sunlight lead to the movement of electrons thereby generating electricity. The electric current produced will be connected to power grid connection available at the Michigan Cogeneration facility which is 500 feet away from the landfill.

Question 2 – Height and Size of Solar panels: A PV system is made up of several cells where each cell produces 1 or 2 watts of power. To boost the power output of PV cells, they are connected together to form larger unit called modules, which can then be connected to form arrays. A typical solar panel manufactured by Hyundai is 40 inches (width), 65 inches (length) and 1.4 inches (thick), and has 60 cells weighing 42 lbs.

Question 3 – Heat and glare produced by solar panels in surrounding area: The PV cells are designed to absorb sunlight to produce energy. The more sunlight they absorb the more energy they produce. The current PV cells absorb about 2/3rd of the total incident sunlight and reflect 1/3rd of the sunlight reaching their surface. Most solar panels are now designed with at least one anti-reflective layer and may have multiple layers thereby further reducing reflectivity. The second component is the issue related to glare produced by the solar panels in the surrounding area. According to a study conducted by Oregon DOT, the reflectivity of solar panels is around 30%-similar to reflectivity of surface materials such as dry sand at 45%, needle-leaf coniferous tress at 20%, grass-type vegetation at 25% and broad leaf deciduous trees at 10%. Based on Florida Light and Power company (www.fpl.com), which operates the world's largest solar thermal facility in California's Mojave Desert, the reflection or glare from solar panels is similar to that of a field of planted crops, such as corn.

Based on resources available at US Department of Energy website, calculation was done for fixed PV panels at Lorton park which indicated that the optimum installation would correspond to an azimuth of 180 degrees (south direction) with a tilt angle of 39 degrees for the arrays. The glare from summertime sun at high noon would have the highest potential for impact to the surrounding area. However based on the sun path diagram and inclination of the solar arrays, the potential for glare on the residents was found to be minimum.

Question 4 – Effect of solar panels on birds and airplanes: Solar panels may be a source of polarized light pollution that may cause ecological traps for many insects, which may use the dark surfaces to deposit their eggs and become easy target for predators. To avoid this, the white grids that reduce the attractiveness of such false habitats can be used. However it may reduce the efficiency of solar panels by 2%.

Based on limited research conducted by Geosyntec, no special precautions or requirements for installing solar panels next to airfields were found. In general, the reflection on airplanes from solar panels was considered to be less than large industrial roof-tops, lakes or sea.

Question 5 – Stability of Solar Panels: Several foundation types can be used to support PV solar power systems, including: (1) shallow poured concrete pillars; (2) pre-fabricated concrete footings; (3) concrete slabs; (4) ballast frames; (5) driven piles, and (6) earth screw augers. For landfill covers, shallow or aboveground footings large enough to spread the weight of the solar panel and the foundation itself are preferred so as to: (1) not penetrate the final cover system geosynthetics or impact subdrain pipes; and (2) minimize imposed loads and settlement of final cover soils and underlying wastes. The foundation system for solar panels is designed to allow easy access for post-closure landscaping (e.g., moving) and cover maintenance.

The stability of solar panel foundations will need to be analysed to verify an adequate factor of safety for wind loading against overturning and sliding. Solar panels are typically certified to withstand a maximum mechanical loading of 50 pounds per square foot, which converts to a wind speed of approximately 105 miles per hour. Based on historical weather information reviewed by Geosyntec for the site area, withstanding maximum wind speeds on this order is considered a reasonable design criterion. Overturning failures can be prevented by adding more weight to the bottom of precast/ballasted foundations and changing their orientation to minimize wind exposure. Sliding failures can be prevented by providing adequate ballast and proper drainage of the subgrade material.

EXHIBIT 4

Geosyntec consultants

COMPUTATION COVER SHEET

Client: Furnace Associates Inc. **Project:** Lorton Landfill **Project #:** MV0829 **Task #:**

TITLE OF COMPUTATIONS PRELIMINARY EVALUATION OF USING DEEP FOUNDATION FOR WIND TURBINE GENERATOR

COMPUTATIONS BY:

Signature _____ 11/1/12 DATE

Printed Name and Title: Davis Garrett, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY: (Peer Reviewer)

Signature _____ DATE

Printed Name and Title: Chunling Li, Engineer

COMPUTATIONS CHECKED BY:

Signature _____ DATE

Printed Name and Title: Chunling Lo, Engineer

COMPUTATIONS BACKCHECKED BY: (Originator)

Signature _____ DATE

Printed Name and Title: Davis Garrett, Staff Engineer

APPROVED BY: (PM or Designate)

Signature _____ DATE

Printed Name and Title _____

APPROVAL NOTES: _____

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

PRELIMINARY EVALUATION OF USING DEEP FOUNDATION FOR WIND TURBINE GENERATOR

1. INTRODUCTION

The purpose of this calculation is to conduct a preliminary foundation design analysis to demonstrate the feasibility of installing a wind turbine on top of the Lorton Landfill. Several foundation options have been evaluated. Design calculation for a deep foundation is presented in this calculation package. Wind turbine loading used for the design calculation is taken from a similar project in this preliminary analysis. The final foundation design should be re-evaluated using the wind turbine loading specific to this project.

2. VERTICAL LOADING

1.1 Design Loading

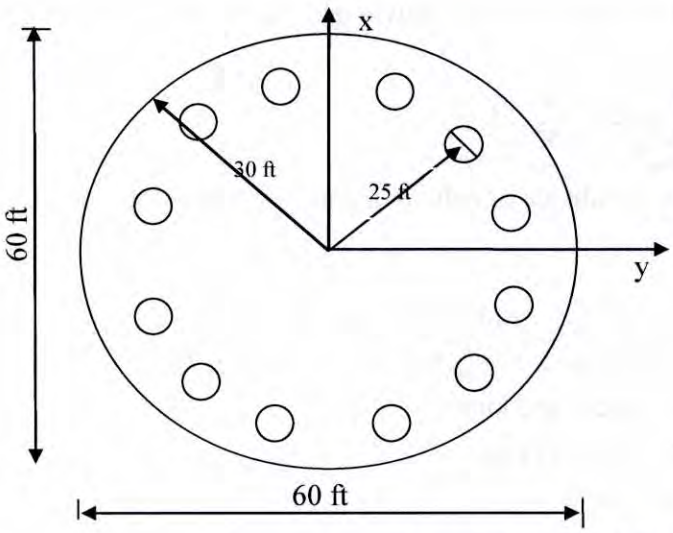
The foundation design is based on the *Tower Foundation Design Basis* provided by Vestas for the V100 1.8MW turbine with hub height of 95m. The characteristic extreme load under abnormal condition is selected for foundation size selection. The horizontal load (F_{res}), vertical load (F_z), torsion (M_z) and overturning moment (M_{res}) are shown in the table below:

F_{res}	F_z	M_z	M_{res}
866kN/194.6 kips	3292 kN/739.8 kips	1,524kN·m/1,123 kips·ft	81,200kN·m/59853 kips·ft

The unit weight used in this foundation evaluation is a conservative 45 pcf. This value was correlated from waste composition and daily waste acceptance weights developed by Kavazanjian et al. [1995].

1.2 Foundation Layout

The selected drilled shaft foundation layout is shown below:



Drilled Shaft,
Shaft length = 120 ft
Shaft diameter = 4 ft
Pile cap thickness = 7 ft

Figure 1. Layout of Shafts

1.3 Bearing Capacity Evaluation

Weight of individual shaft in excess of weight of waste with the same volume:

$$\frac{\pi}{4}(4\,ft)^2(120\,ft)(150\,pcf - 45\,pcf) = 158 \times 10^3 \text{ lbs or } 158 \text{ kips}$$

Weight of pile cap:

$$\frac{\pi}{4}(60\,ft)^2(7\,ft)(150\,pcf) = 2969 \times 10^3 \text{ lbs} = 2{,}969 \text{ kips}$$

Combined weight of pile cap and net weight of shafts:

$$W = 158 \times 12 + 2969 = 4865 \text{ kips}$$

The rocking moment M_y provided by Vestas is for the location at 0.2 m (0.6 ft) above the pile cap. The rocking moment M_y at the bottom of pile cap is calculated as (pile cap thickness is assumed to be 7 ft):

$$59{,}853 \text{ kips·ft} + (194.6 \text{ kips})\,(7.6 \text{ ft}) = 61{,}332 \text{ kips} \cdot \text{ft}$$

The maximum and minimum axial forces for an individual pile in the pile group are calculated as follows:

$$N_i = \frac{Q}{n} \pm \left[\frac{M_x \cdot r_{y_i}}{\sum r_{yi}^2} + \frac{M_y \cdot r_{x_i}}{\sum r_{xi}^2} \right]$$

where: Q = total vertical load; r_{xi} = x coordinate of column i; and r_{yi} = y coordinate of column i.

$$(N_i)_{\max} = \frac{4865 + 739.8}{12} + \frac{61332 \cdot 25 \cdot \cos(15^\circ)}{4[(25\cos 15^\circ)^2 + (25\cos 45^\circ)^2 + (25\cos 75^\circ)^2]} + 0$$

$$(N_i)_{\max} = 467 + 395 = 862\,\text{kips}$$

$$(N_i)_{\min} = 467 - 395 = 72\,\text{kips}$$

Accordingly, the pile need to resist a maximum compressive loading of 862 kips.

An Excel spreadsheet was used to calculate the ultimate bearing capacity of a single shaft. The interface friction angle between the concrete shaft and waste is assumed to be 30°, which is approximately 90% of the internal friction angle of decomposed waste. The recommended lateral earth pressure coefficient (k) by Kulhawy [1984] is (2/3 ~ 1) times of the at-rest earth pressure coefficient k_0 for drilled shaft because the end resistance requires more deformation than the shaft resistance to fully mobilize. In this calculation k is assumed to be equal to k_0. 50% of the ultimate bearing capacity at the tip of the drilled shaft is assumed to contribute to the vertical resistance of the drilled shaft. The ultimate bearing capacity of a single shaft subjected to compressive loading is calculated to be 1,331 kips. The factor of safety for the shaft to resist vertical loading is calculated as:

$$FS = \frac{1331}{862} = 1.55 > 1.5, \text{ O.K.}$$

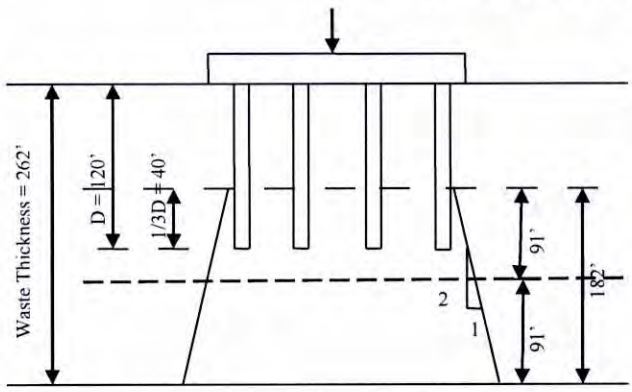
The calculated factor of safety is 1.55, which is greater than minimum recommended value of 1.5 for extreme condition (e.g., API RP2A, 2007).

1.4 Foundation Settlement Calculation

The service load used for settlement calculation was selected from the permanent self weight loading from *Tower Foundation Design Basis* provided by Vestas, which are summarized below:

F_z	M_{res}
3378kN/759 kips	1,469 kN·m/1,082 kips·ft

$$P = W + F_z = 759\text{kips} + 4{,}361\text{kips} = 5{,}120 \text{ kips}$$



Modified Compression Index of waste for primary compression $C_c' = 0.19$

Modified Compression Index of waste for secondary compression $C_\alpha' = 0.02$

Figure 2. Equivalent Footing Concept used for Settlement Calculation

Terzaghi and Peck [1967] proposed that the settlement of pile group could be calculated using the concept of equivalent footing, which is illustrated above. The equivalent footing is located at a depth of 1/3D above the pile tip (D = embedded length of shaft). The load is assumed to spread at an 1H:2V side slope.

Stress at equivalent footing

Area of equivalent footing

$$A = \pi(50+4)^2/4 = 2289 \text{ ft}^2$$

Stress at equivalent footing

$$p_1' = \frac{5120 kips}{2289 ft^2} = 2.237 ksf = 2237 psf$$

The waste below the equivalent footing is divided into two lifts, as shown in Figure 2 above. The settlement of each lift is calculated below.

Settlement of lift 1:

Stress at bottom of lift 1

$$p_2' = \frac{5120 kips}{\pi(54 ft + 91 ft)^2 / 4} = 0.31 ksf = 310 psf$$

Average vertical pressure for layer 1:

$$\overline{p}_1 = \frac{p_1' + p_2'}{2} = \frac{2237 psf + 310 psf}{2} = 1274 psf$$

Average initial pressure for layer 1:

$$\overline{p}_{1,0} = 126 ft \times 45 pcf = 5670 psf$$

Primary compression for layer 1:

$$S_{p_1} = H_0 \cdot C_c' \cdot \log\left(\frac{\overline{p}_{1,0} + \overline{p}_1}{\overline{p}_{1,0}}\right) = (91 ft)(0.19)\log\left(\frac{5670 psf + 1274 psf}{5670 psf}\right) = 1.52 ft$$

Secondary compression for layer 1:

Assume waste age = 19 yrs.; Consider 100 yrs. from now.

$$S_{s_1} = H_0 \cdot C_\alpha' \cdot \log\left(\frac{t_2}{t_1}\right) = (91 ft)(0.02)\log\left(\frac{100 yrs + 19 yrs}{19 yrs}\right) = 1.5 ft$$

Settlement of lift 2:

Stress at bottom of lift 2:

$$P_3' = \frac{5120 kips}{\pi(54 ft + 182 ft)^2 / 4} = 0.117 ksf = 117 psf$$

Average vertical pressure for layer 2:

$$\overline{p}_2 = \frac{p_2' + p_3'}{2} = \frac{310 psf + 117 psf}{2} = 214 psf$$

Average initial pressure for layer 2:

$$\overline{p}_{2,0} = 217 ft \times 45 pcf = 9{,}765 psf$$

Primary compression for layer 2:

$$S_{p_2} = (91ft)(0.19)\log\left(\frac{9{,}765psf + 214psf}{9{,}765psf}\right) = 0.16ft$$

Secondary compression for layer 2:

Assume waste age = 32 yrs.; Consider 100 yrs. From now

$$S_{s_2} = (91ft)(0.02)\log\left(\frac{100yrs + 32yrs}{32yrs}\right) = 1.1ft$$

Total estimated settlement of the pile foundation:

$$S = S_{p_1} + S_{s_1} + S_{p_2} + S_{s_2} = 1.52ft + 1.5ft + 0.16ft + 1.1ft = 4.28ft$$

3. LATERAL LOADING

3.1 Horizontal Force at Pile Head

The maximum horizontal load acting on the pile head is calculated in this section. The horizontal force acting on the pile head is induced by the horizontal loading F_y and F_z, as well as the rotational moment M_z.

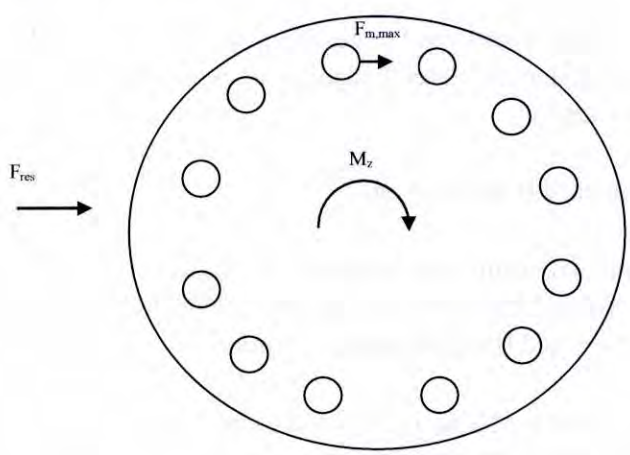


Figure 4 Illustration of Pile Head Lateral Load Calculation

The following loading case was considered as the most critical case. F_{res}, and M_z were picked from the extreme condition:

F_{res}	M_z
866kN/195 kips	1,524kN·m/1,123 kips·ft

Maximum shear forces induced by M_z:

$$F_{m,\max} = \frac{M_z r_{\max}}{\Sigma r_i^2} = \frac{(1123 kips \cdot ft)25}{(12)(25 ft)^2} = 3.74 kips$$

The pile head load induced by F_{res} is assumed to be the same for the individual piles. Therefore, the maximum pile head loading (F_{max}) can be calculated as follows:

$$F_{\max} = 3.74 kips + \frac{195 kips}{12} = 20.0 kips$$

Use $1.15F_{max}$ for design, as recommended by Brown [1996].

$$1.15F_{\max} = (1.15)20.0 = 23.0 kips$$

3.2 LPILE Analysis

As calculated in Section 2.1, the pile will need to resist a maximum pile head lateral loading of 23 kips. The pile response under this lateral loading is evaluated using the LPILE Plus software [Ensoft, 2009] in this section.

The following assumptions are used in the analysis:

- The pile head is simulated using two boundary conditions: a) free rotation; and b) fixed pile head. In reality, the piles are rigidly connected to the pile cap. This condition is closer to the fixed head boundary condition.

- The response of waste to lateral load is assumed to be represented by the Reese sand model because of the frictional characteristics of the waste. The p-y modulus is assumed to be 4 lbs/in^3, which is approximately 1/5 of the p-y modulus recommended for loose sand [Reese, 1971] and is in the range of modulus recommend for soft material as recommended by NAVFAC [1986].

- The axial load acting on the pile head is assumed to be 820 kips, which is the maximum axial load calculated in Section 1.3.

The results of analyses are summarized below:

Case	Axial Load at Pile Head	Lateral Load at Pile Head	Pile head deflection	Maximum Bending Moment	Maximum Shear Force
	kips	kips	in.	kips·ft	kips
Case 1: Fixed head boundary	820	23	0.13	315.5	23
Case 2: Free rotation boundary	820	23	0.35	272.2	23

A detailed output from the program, including p-y curves, deflection, moment and shear force distribution curves is shown in Attachment II to this calculation package.

4. FOUNDATION STIFFNESS

The required foundation stiffness to avoid resonant response is checked using the Novak method [Bowles, 1988]. The rocking stiffness of individual pile can be calculated as follows:

$$k_{\theta i} = \frac{EI}{r_o} f_{7,1}$$

where: E = Modulus of elasticity of pile;

I = moment of inertia of pile about axis to resist displacement;

r_o = Radius of pile cross section;

$f_{7,1}$ = Novak's constant for rocking stiffness.

The factor, $f_{7,1}$, is dependent on several parameters, including ratio of shear wave velocity of pile and soil, Poisson's ratio of soil, length to radius ratio of pile and a dimensionless frequency factor.

The shear wave velocity V is calculated as:

$$V = \sqrt{G'/\rho}$$

where G' is the maximum shear modulus, and ρ is the unit mass.

Consistent with the calculation package entitled "*Preliminary Evaluation of Footing as Foundation of Wind Turbine Generator*", the maximum shear modulus of waste is selected to be 15,000 kPa (313,282psf). Thus, the shear wave velocity of waste, V_s, is calculated as:

$$V_s = \sqrt{313282(32.2)/73} = 371\text{ft/sec}$$

The elastic modulus of concrete is approximately 4,350,000 psi. The compressive wave (p-wave) velocity of a concrete shaft, V_p, is calculated as:

$$V_p = \sqrt{E_p/\rho_p} = \sqrt{4350000 \times 144 \times 32.2/150} = 11{,}596 \text{ ft/sec}$$

$$V_s/V_p = 371/11596 = 0.032$$

The length to radius ratio of shaft is calculated as:

$$L/r_o = 120 \text{ ft} / 2 \text{ ft} = 60$$

The dimensionless frequency factor is defined as:

$$a_0 = \omega r_o \sqrt{q}/V_s$$

Where ω is the angular frequency, and q is defined as:

$$q = \frac{1-2\mu}{2-2\mu}$$

Assume Poisson's ratio of waste to be 0.2. Then, q is calculated to be 0.375. The angular frequency of the wind turbine is in the order of 1 sec^{-1}. Accordingly, the dimensionless frequency factor is 0.003 and close to zero. Novak's constant, $f_{7,1}$, is affected by a_0 significantly when a_0 is above 0.5. Also, Novak's constant, $f_{7,1}$, is insensitive to the length to radius ratio when L/r_o is above 30. Therefore, Novak's constant, $f_{7,1}$, may be selected from Figure 5 to be 0.356 by linearly interpolating between the tabulated values.

TABLE 20-6

Novak's $f_{i,1}$ values for an intermediate value of $\mu = 0.33$ for a concrete pile with $\rho_s/\rho_p = 0.7$

Values from author's computer program based on Novak (1974) and Novak and Howell (1977) Value $f_{12,1}$ are for torsion and using author's identification

Fixed parameters: $L/r_o = 30$, $a_o = 0.3$ and for torsion $\beta = 0.10$, $\mu = 0.33$.

	Stiffness					Damping				
V_s/V_c	$f_{18,1}$	$f_{7,1}$	$f_{9,1}$	$f_{11,1}$	$f_{12,1}$	$f_{18,2}$	$f_{7,2}$	$f_{9,2}$	$f_{11,2}$	$f_{12,2}$
0.01	0.034	0.199	−0.019	0.004	0.045	0.002	0.136	−0.028	0.008	0.002
0.02	0.035	0.282	−0.038	0.010	0.072	0.007	0.198	−0.056	0.023	0.007
0.03	0.037	0.345	−0.057	0.018	0.105	0.016	0.245	−0.084	0.043	0.011
0.04	0.040	0.398	−0.076	0.027	0.139	0.027	0.283	−0.112	0.066	0.015
0.05	0.044	0.445	−0.095	0.038	0.174	0.041	0.314	−0.141	0.092	0.019
0.06	0.049	0.448	−0.114	0.050	0.208	0.055	0.346	−0.169	0.122	0.022

Source: Bowles [1988]

Figure 5 Novak's Constants

The moment of inertia about the center of each circular shaft is:

$$I = \frac{\pi {r_o}^4}{4} = \frac{\pi (2)^4}{4} = 12.57 \text{ ft}^4$$

The moment of inertia about the axis of rotation is calculated as:

$$12.57 + \pi(2)^2 d^2$$

where d is the distance to the axis of rotation (d = 6.47, 17.68 or 24.15 ft for the pile layout in Figure 1).

The rocking stiffness of an individual pile is calculated as follows:

$$k_{\theta i} = \frac{4350000 \times 144 \times I}{2} 0.356 = (0.111 \times 10^9) I$$

Neglecting the group effect, the global stiffness is the sum of stiffness of individual piles. That is:

$$k_\theta = 0.111 \times 10^9 [12 \times 12.57 + 4 \times \pi(2)^2 (6.47^2 + 17.68^2 + 24.15^2)] = 5248 \times 10^9 \text{ lbs·ft/rad} \quad \text{or} \quad 5248 \text{ GNm/rad}$$

This is greater than the minimum required foundation stiffness (i.e., 60 GNm/rad)

5. SUMMARY AND RECOMMENDATION

A group of 12 reinforced concrete piles equally distributed along the perimeter of a 50-ft diameter circumference within a 60-ft diameter and 7-ft thick reinforced concrete cap was preliminary selected as a foundation option for the proposed wind tower. The selected pile is a drilled shaft with outside diameter of 48 in. The pile length is 120 ft.

The capability of the selected pile foundation to resist vertical and lateral loading is evaluated in this calculation. The maximum axial loading on the pile is 862 kips when considering the extreme environmental loads. A factor of safety greater than 1.5 can be achieved for the axial loading with the selected pile dimensions. The pile foundation is expected to settle approximately 4 ft under the operating loads. The pile head lateral deflection is estimated to be approximately 0.13 in. under the design lateral load without consideration of group effects. The foundation stiffness is greater than the required minimum stiffness.

For future detailed design, the following issues may need to be considered: 1) structural resistance of the pile; 2) optimization of the pile cap height and diameter; 3) characterization of the stiffness and strength of the waste as well as its short and long term compressional characteristics.

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ATTACHMENT I

PILE CAPACITY SPREADSHEET

Table 1

PILE CAPACITY FOR VERTICAL LOADING CALCULATION
Wind Turbine Foundation Evaluation
Lorton Landfill, Lorton, Virginia

Side Friction Calculation

Soil Layer No.	Soil Type	Unit Weight (pcf)	Thickness (ft)	k_0	k/k_0	δ (deg)	Vertical Stress (psf)	Side Friction (psf)	Perimeter of Pile Cross-section (ft)	Surface Area (sq. ft.)	Negative Friction	Side Friction Force (lbs)
1	Cover soil	120	2	0.46	1	30	120	31.87	12.56	25.12	N	800.6
2	CDD waste	45	28	0.46	1	30	870	231.06	12.56	351.68	N	81257.6
3	CDD waste	45	30	0.46	1	30	2175	577.64	12.56	376.8	N	217654.4
4	CDD waste	45	60	0.46	1	30	4200	1115.44	12.56	753.6	N	840596.1

Side friction **1,140,309**

Tip Resistance Calculation

Unit Weight	45	Depth to pile tip,D (ft)	120	ζ_{qr}	0.14
Friction Angle (deg)	33	Length of Pile, L (ft)	120	ζ_{qs}	1.02
Cohesion (psf)	0	Width of Pile ,B (ft)	4	ζ_{qd}	1.41
Young's Modulus (psf)	30000	Area of tip (sq. ft)	12.56	ζ_{cr}	0.11
Poisson Ratio	0.25	q (psf)	5640	ζ_{cs}	1.02
Shear Modulus (psf)	12000	Nq	26.09	ζ_{cd}	1.43
I_r	3.28	Nc	38.64	$\zeta_{\gamma r}$	0.14
Δ	0	N_γ	35.19	$\zeta_{\gamma s}$	0.99
I_{rr}	3.28			$\zeta_{\gamma d}$	1.00

Ultimate Bearing Capacity (psf)	**30,366**
Contribution of UBC to tip resistance (%)	50
Tip Resistance (lbs)	**190,701**

Ultimate Pile Capacity for Vertical Load (lbs) **1,331,009**

Reference: Kulhamy, F.H. [1984], "Limiting Tip and Side Resistance: Fact or Fallacy?",*Analysis and Design of Pile Foudation*, Edited by Meyer, J.R., pp 80-98, ASCE, 1984

ATTACHMENT II

LPILE OUTPUT

CASE 1 FIXED HEAD BOUNDARY

==========

LPILE Plus for Windows, Version 5.0 (5.0.46)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2010 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Chunling Li
Geosyntec Consultants

Files Used for Analysis

Path to file locations:	P:\PRJ1\MDENG\PROJECT\ME0736 - Fresh Kill Wind Energy Tower\analysis\
Name of input data file:	fresh kill_drilled shaft_free rotation.lpd
Name of output file:	fresh kill_drilled shaft_free rotation.lpo
Name of plot output file:	fresh kill_drilled shaft_free rotation.lpp
Name of runtime file:	fresh kill_drilled shaft_free rotation.lpr

---

Time and Date of Analysis

Date: October 15, 2010 Time: 17:11:02

Problem Title

New Pile

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 4:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment
  Capacity with Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis includes automatic computation of pile-top deflection vs. pile embedment length
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- Additional p-y curves computed at specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

Pile Structural Properties and Geometry

Pile Length = 1440.00 in

Depth of ground surface below top of pile = 0.00 in

Slope angle of ground surface = 3.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	48.00000000	260576.0000	1809.0000	4350000.
2	1560.0000	48.00000000	260576.0000	1809.0000	4350000.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 0.000 in
Distance from top of pile to bottom of layer = 2160.000 in
p-y subgrade modulus k for top of soil layer = 4.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 4.000 lbs/in**3

(Depth of lowest layer extends 720.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 2 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	0.00	0.03760
2	2160.00	0.04330

Shear Strength of Soils

Shear strength parameters with depth defined using 2 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	0.000	0.00000	28.00	------	------
2	2160.000	0.00000	28.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

Loading Type

Cyclic loading criteria was used for computation of p-y curves.

Number of cycles of loading = 5000.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)

Shear force at pile head	=	20800.000 lbs
Bending moment at pile head	=	0.000 in-lbs
Axial load at pile head	=	774700.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

Output of p-y Curves at Specified Depths

---

p-y curves are generated and printed for verification at 3 depths.

Depth No.	Depth Below Pile Head in	Depth Below Ground Surface in
1	240.000	240.000
2	600.000	600.000
3	1200.000	1200.000

Depth of ground surface below top of pile = 0.00 in

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Number of sections = 1

Pile Section No. 1

The sectional shape is a circular shaft with steel casing.

Outside Diameter	=	48.0000 in
Wall thickness of steel shell	=	0.2000 in
Cross-sectional area of shell	=	30.03363 in**2
Moment of inertia of steel shell	=	8.57790E+03 in**4

Material Properties:

Compressive Strength of Concrete	=	4.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Steel shell or core yield stress	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Cover Thickness (edge to bar center)	=	2.000 in
Number of Reinforcing Bars	=	10
Area of Single Bar	=	0.50000 in**2
Number of Rows of Reinforcing Bars	=	5
Area of Steel	=	35.034 in**2
Area of Shaft	=	1809.557 in**2
Percentage of Steel Reinforcement	=	1.936 percent
Unfactored Axial Squash Load Capacity	=	8135.40 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.000	20.733
2	1.000	12.814
3	1.000	0.000
4	1.000	-12.814
5	1.000	-20.733

Axial Thrust Force = 774700.00 lbs

Bending Max. Concrete Moment Stress in-lbs psi	Bending Max. Steel Stiffness Stress lb-in2 psi	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches
1370041. 476.06249	1.096033E+12 3864.49973	0.00000125	0.00013709	109.87386
2783747. 572.64727	1.113499E+12 4627.09368	0.00000250	0.00016722	67.08894968
4196952. 667.95354	1.119187E+12 5392.74423	0.00000375	0.00019746	52.85542059
5702511. 771.01538	1.140502E+12 6127.47011	0.00000500	0.00022663	45.52538252
7094327. 865.62792	1.135092E+12 6889.41804	0.00000625	0.00025673	41.27755022
8341609. 943.56094	1.112214E+12 7684.93424	0.00000750	0.00028800	38.59999895
9863441.	1.127250E+12	0.00000875	0.00031717	36.44832659

1050.32461	8419.76976			
11260052.	1.126005E+12	0.00001000	0.00034762	34.96241999
1140.74138	9191.68109			
11260052.	1.000894E+12	0.00001125	0.00036000	32.19999933
1149.99808	9439.40149			
11260052.	9.008042E+11	0.00001250	0.00038207	30.76561117
1240.25123	9968.25817			
11477952.	8.347602E+11	0.00001375	0.00040700	29.79999876
1279.71906	10580.04604			
12051940.	8.034627E+11	0.00001500	0.00043017	28.87812853
1342.20731	11140.85485			
12615126.	7.763154E+11	0.00001625	0.00045249	28.04571676
1401.38894	11676.98538			
13222099.	7.555485E+11	0.00001750	0.00047497	27.34095526
1460.12698	12217.54856			
13748627.	7.332601E+11	0.00001875	0.00049500	26.59999895
1511.37990	12687.33561			
14563587.	7.281794E+11	0.00002000	0.00051578	25.98882437
1606.44302	13178.67673			
15609530.	7.345661E+11	0.00002125	0.00053975	25.59999990
1668.55638	13762.73095			
15609530.	6.937569E+11	0.00002250	0.00055800	25.00000048
1714.95406	14180.80373			
15833127.	6.666580E+11	0.00002375	0.00058425	24.80000067
1732.82743	14830.87629			
16533968.	6.613587E+11	0.00002500	0.00060000	24.20000124
1819.52529	15176.44914			
17877803.	6.810591E+11	0.00002625	0.00062475	23.99999857
1879.68751	15783.02174			
17877803.	6.501019E+11	0.00002750	0.00063998	23.47202826
1915.89936	16955.65053			
17877803.	6.218366E+11	0.00002875	0.00066456	23.31510401
1919.08947	17857.19751			
19592629.	6.530876E+11	0.00003000	0.00069000	23.19999933
2032.49202	18733.73847			
19592629.	6.269641E+11	0.00003125	0.00070004	22.60115576
2054.96905	20057.01289			
19592629.	6.028501E+11	0.00003250	0.00072586	22.53407335
2053.98822	20922.51858			
19692370.	5.834776E+11	0.00003375	0.00074925	22.40000010
2104.17689	21858.45503			
20766184.	5.933195E+11	0.00003500	0.00076406	22.03041315
2195.81233	23043.15819			
20921326.	5.771400E+11	0.00003625	0.00078300	21.80000067
2235.91286	24108.34925			
21069837.	5.618623E+11	0.00003750	0.00080580	21.68810034
2220.01404	25061.36324			
21518958.	5.553279E+11	0.00003875	0.00082925	21.60000086
2267.08783	25995.74381			
22143062.	5.535766E+11	0.00004000	0.00085600	21.60000086
2319.98544	26834.31619			
22865779.	5.543219E+11	0.00004125	0.00086126	21.07904291

2394.51084	28296.08451			
23004668.	5.412863E+11	0.00004250	0.00088400	20.99999857
2371.61823	29250.96377			
23387745.	5.345770E+11	0.00004375	0.00090605	20.90967035
2412.79440	30225.89016			
25697349.	5.710522E+11	0.00004500	0.00092700	20.79999876
2518.92932	31232.60845			
26336352.	5.694346E+11	0.00004625	0.00095275	20.79999876
2565.50373	32100.18091			
26971312.	5.678171E+11	0.00004750	0.00097850	20.79999876
2610.81350	32967.75336			
26971312.	5.532577E+11	0.00004875	0.00098252	20.35429430
2617.40826	34465.44050			
26971312.	5.262695E+11	0.00005125	0.00102500	20.19999933
2619.11388	36462.21988			
29147166.	5.422729E+11	0.00005375	0.00106425	19.99999952
2751.91900	38552.61446			
30341539.	5.394051E+11	0.00005625	0.00111375	19.99999952
2827.38233	40345.75932			
31521574.	5.365374E+11	0.00005875	0.00116325	19.99999952
2898.17606	42138.90418			
31521574.	5.146379E+11	0.00006125	0.00117690	19.41475725
2916.38542	44971.58562			
31521574.	4.944561E+11	0.00006375	0.00122400	19.40000010
2978.18248	46834.44284			
31521574.	4.757973E+11	0.00006625	0.00126326	19.26805544
2959.74330	48924.58632			
31945604.	4.646633E+11	0.00006875	0.00130625	19.20000029
3011.13649	50906.48209			
32934315.	4.622360E+11	0.00007125	0.00135375	19.20000029
3064.51120	52757.62689			
33910888.	4.598087E+11	0.00007375	0.00140125	19.20000029
3113.94758	54608.77170			
34850229.	4.570522E+11	0.00007625	0.00144875	19.20000029
3159.44563	56459.91650			
36249245.	4.603079E+11	0.00007875	0.00146044	18.74523497
3224.20566	59349.63160			
36382348.	4.477827E+11	0.00008125	0.00149500	18.60000086
3251.24443	60000.00000			
37120301.	4.432275E+11	0.00008375	0.00154100	18.60000086
3283.84166	60000.00000			
37120301.	4.303803E+11	0.00008625	0.00156975	18.40000105
3254.83568	60000.00000			
37263427.	4.198696E+11	0.00008875	0.00161525	18.40000105
3285.34915	60000.00000			
37914395.	4.155002E+11	0.00009125	0.00166075	18.40000105
3312.26659	60000.00000			
38544303.	4.111392E+11	0.00009375	0.00170625	18.40000105
3335.58799	60000.00000			
39676802.	4.122265E+11	0.00009625	0.00171123	17.97900438
3369.22801	60000.00000			
39676802.	4.017904E+11	0.00009875	0.00173800	17.79999876

3348.28161	60000.00000			
39676802.	3.918696E+11	0.00010125	0.00178200	17.79999876
3365.22040	60000.00000			
39676802.	3.824270E+11	0.00010375	0.00181311	17.67577600
3374.94802	60000.00000			
42968889.	4.044131E+11	0.00010625	0.00184875	17.59999895
3398.25449	60000.00000			
43471238.	3.997355E+11	0.00010875	0.00189225	17.59999895
3399.83339	60000.00000			
43949623.	3.950528E+11	0.00011125	0.00193575	17.59999895
3397.99853	60000.00000			
44415511.	3.904660E+11	0.00011375	0.00197925	17.59999895
3399.98154	60000.00000			
44415511.	3.820689E+11	0.00011625	0.00197610	17.19866896
3399.90240	60000.00000			
44415511.	3.740254E+11	0.00011875	0.00199500	16.99999952
3398.31404	60000.00000			
44415511.	3.663135E+11	0.00012125	0.00203700	16.99999952
3397.45903	60000.00000			
44415511.	3.589132E+11	0.00012375	0.00207419	16.96115828
3399.66997	60000.00000			
44632558.	3.535252E+11	0.00012625	0.00209575	16.79999971
3399.99827	60000.00000			
44958963.	3.491958E+11	0.00012875	0.00213725	16.79999971
3395.58671	60000.00000			
45278915.	3.449822E+11	0.00013125	0.00217875	16.79999971
3398.98126	60000.00000			
45578433.	3.407733E+11	0.00013375	0.00222025	16.79999971
3399.30491	60000.00000			
45852028.	3.365286E+11	0.00013625	0.00226175	16.79999971
3395.04706	60000.00000			
46120161.	3.323976E+11	0.00013875	0.00230325	16.79999971
3398.56854	60000.00000			
46369972.	3.282830E+11	0.00014125	0.00234475	16.79999971
3399.97207	60000.00000			
46369972.	3.225737E+11	0.00014375	0.00232163	16.35048151
3398.66979	60000.00000			
46369972.	3.170596E+11	0.00014625	0.00234095	16.20648050
3399.33407	60000.00000			
46369972.	3.117309E+11	0.00014875	0.00238000	16.20000029
3398.84248	60000.00000			
46369972.	3.015933E+11	0.00015375	0.00246000	16.20000029
3396.99197	60000.00000			
46369972.	2.920943E+11	0.00015875	0.00251599	16.04878092
3399.58645	60000.00000			
46369972.	2.831754E+11	0.00016375	0.00258725	16.00000048
3392.17065	60000.00000			
46369972.	2.747850E+11	0.00016875	0.00266625	16.00000048
3397.81819	60000.00000			
46369972.	2.668775E+11	0.00017375	0.00274525	16.00000048
3398.24795	60000.00000			
46369972.	2.594124E+11	0.00017875	0.00282425	16.00000048

3393.40260	60000.00000			
46369972.	2.523536E+11	0.00018375	0.00290325	16.00000048
3398.98127	60000.00000			
46369972.	2.456687E+11	0.00018875	0.00298225	16.00000048
3395.34141	60000.00000			
46369972.	2.393289E+11	0.00019375	0.00306125	16.00000048
3392.57732	60000.00000			
46369972.	2.333080E+11	0.00019875	0.00304793	15.53551340
3393.31127	60000.00000			
46369972.	2.275827E+11	0.00020375	0.00309962	15.41286135
3387.31662	60000.00000			
46369972.	2.221316E+11	0.00020875	0.00317300	15.40000105
3394.58572	60000.00000			
46369972.	2.169355E+11	0.00021375	0.00324900	15.40000105
3399.02794	60000.00000			
46369972.	2.119770E+11	0.00021875	0.00332500	15.40000105
3396.99282	60000.00000			
46369972.	2.072401E+11	0.00022375	0.00340100	15.40000105
3385.63089	60000.00000			
46369972.	2.027103E+11	0.00022875	0.00347434	15.38836527
3392.42162	60000.00000			
46369972.	1.983742E+11	0.00023375	0.00353407	15.31903410
3395.82249	60000.00000			
46369972.	1.942198E+11	0.00023875	0.00359412	15.25390291
3398.24371	60000.00000			
46369972.	1.902358E+11	0.00024375	0.00365625	15.20000124
3399.70676	60000.00000			
46369972.	1.864119E+11	0.00024875	0.00373125	15.20000124
3394.54866	60000.00000			
46369972.	1.827388E+11	0.00025375	0.00380625	15.20000124
3384.50789	60000.00000			

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =
46369.97219 in-kip

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	240.000	in
Depth below ground surface	=	240.000	in
Equivalent Depth (see note)	=	240.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03792	pci
k	=	4.000	pci
A (cyclic)	=	0.8800	
B (cyclic)	=	0.5500	
Pst	=	4044.080	lbs/in

Psd	=	9836.996	lbs/in
Ps	=	4044.080	lbs/in
Cbar	=	2475.7068	
n	=	2.0833	
m	=	1334.5463	
yk	=	6.1831	in
pm	=	2224.244	lbs/in
ym	=	0.8000	in
pu	=	3558.790	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	64.0000	*
0.1333333	128.0000	*
0.2000000	192.0000	*
0.2666667	256.0000	*
0.3333333	320.0000	*
0.4000000	384.0000	*
0.4666667	448.0000	*
0.5333333	512.0000	*
0.6000000	576.0000	*
0.6666667	640.0000	*
0.7333333	704.0000	*
0.8000000	768.0000	*
1.3000	1248.0000	*
1.8000	1728.0000	*
49.8000	3558.7902	
97.8000	3558.7902	

* p value(s) computed using p = k * Eff x * y

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	600.000	in
Depth below ground surface	=	600.000	in
Equivalent Depth (see note)	=	600.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03839	pci
k	=	4.000	pci
A (cyclic)	=	0.8800	

B (cyclic)	=	0.5500	
Pst	=	21968.331	lbs/in
Psd	=	24900.572	lbs/in
Ps	=	21968.331	lbs/in
Cbar	=	13448.5843	
n	=	2.0833	
m	=	7249.5494	
yk	=	27.5015	in
pm	=	12082.582	lbs/in
ym	=	0.8000	in
pu	=	19332.132	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	160.0000	*
0.1333333	320.0000	*
0.2000000	480.0000	*
0.2666667	640.0000	*
0.3333333	800.0000	*
0.4000000	960.0000	*
0.4666667	1120.0000	*
0.5333333	1280.0000	*
0.6000000	1440.0000	*
0.6666667	1600.0000	*
0.7333333	1760.0000	*
0.8000000	1920.0000	*
1.3000	3120.0000	*
1.8000	4320.0000	*
49.8000	19332.1317	
97.8000	19332.1317	

* p value(s) computed using p = k * Eff x * y

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	1200.000	in
Depth below ground surface	=	1200.000	in
Equivalent Depth (see note)	=	1200.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03918	pci

k	=	4.000	pci
A (cyclic)	=	0.8800	
B (cyclic)	=	0.5500	
Pst	=	84753.969	lbs/in
Psd	=	50828.083	lbs/in
Ps	=	50828.083	lbs/in
Cbar	=	31115.9618	
n	=	2.0833	
m	=	16773.2675	
yk	=	36.3950	in
pm	=	27955.446	lbs/in
ym	=	0.8000	in
pu	=	44728.713	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	320.0000	*
0.1333333	640.0000	*
0.2000000	960.0000	*
0.2666667	1280.0000	*
0.3333333	1600.0000	*
0.4000000	1920.0000	*
0.4666667	2240.0000	*
0.5333333	2560.0000	*
0.6000000	2880.0000	*
0.6666667	3200.0000	*
0.7333333	3520.0000	*
0.8000000	3840.0000	*
1.3000	6240.0000	*
1.8000	8640.0000	*
49.8000	44728.7134	
97.8000	44728.7134	

* p value(s) computed using p = k * Eff x * y

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 20800.000 lbs
Specified moment at pile head = 0.000 in-lbs
Specified axial load at pile head = 774700.000 lbs

Depth X in	Deflect. Es*h y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in	F/L
0.000	0.345679	-3.81E-06	20800.	-0.001191	428.248	1.10E+12	-18.923	829.440
0.000	0.000							
14.400	0.328524	3.13E+05	20664.	-0.001189	457.059	1.10E+12	-35.876	1658.880
28.800	0.311428	6.22E+05	20269.	-0.001183	485.504	1.10E+12	-50.881	2488.320
43.200	0.294449	9.23E+05	19645.	-0.001173	513.256	1.10E+12	-63.970	3317.760
57.600	0.277645	1.21E+06	18818.	-0.001159	540.023	1.10E+12	-75.188	4147.200
72.000	0.261071	1.49E+06	17816.	-0.001141	565.553	1.10E+12	-84.595	4976.640
86.400	0.244778	1.75E+06	16665.	-0.001120	589.626	1.10E+12	-92.258	5806.080
100.800	0.228815	2.00E+06	15392.	-0.001096	612.060	1.11E+12	-98.254	6635.520
115.200	0.213225	2.22E+06	14020.	-0.001068	632.706	1.11E+12	-102.669	7464.960
129.600	0.198050	2.42E+06	12574.	-0.001038	651.445	1.11E+12	-105.597	8294.400
144.000	0.183328	2.61E+06	11074.	-0.001006	668.191	1.11E+12	-107.136	9123.840
158.400	0.169091	2.76E+06	9542.376	-0.000971	682.886	1.11E+12	-107.391	9953.280
172.800	0.155369	2.90E+06	7997.782	-0.000934	695.498	1.11E+12	-106.470	10783.
187.200	0.142187	3.02E+06	6457.985	-0.000896	706.021	1.11E+12	-104.482	11612.
201.600	0.129566	3.11E+06	4939.132	-0.000856	714.470	1.12E+12	-101.540	12442.
216.000	0.117523	3.18E+06	3455.773	-0.000816	720.882	1.12E+12	-97.755	13271.
230.400	0.106071	3.23E+06	2020.852	-0.000775	725.313	1.12E+12	-93.237	14100.
244.800	0.095217	3.25E+06	645.712	-0.000733	727.834	1.12E+12		

259.200	0.084969	3.26E+06	-659.882	-0.000691	728.531	1.12E+12	-88.096	14930.
273.600	0.075326	3.25E+06	-1887.714	-0.000649	727.503	1.12E+12	-82.437	15759.
288.000	0.066287	3.22E+06	-3031.066	-0.000607	724.857	1.12E+12	-76.362	16589.
302.400	0.057846	3.18E+06	-4084.663	-0.000566	720.710	1.12E+12	-69.971	17418.
316.800	0.049996	3.12E+06	-5044.603	-0.000525	715.185	1.12E+12	-63.354	18248.
331.200	0.042724	3.04E+06	-5908.285	-0.000485	708.408	1.11E+12	-56.601	19077.
345.600	0.036019	2.96E+06	-6674.320	-0.000447	700.510	1.11E+12	-49.793	19907.
360.000	0.029863	2.86E+06	-7342.451	-0.000409	691.621	1.11E+12	-43.003	20736.
374.400	0.024240	2.75E+06	-7913.451	-0.000373	681.874	1.11E+12	-36.302	21565.
388.800	0.019130	2.64E+06	-8389.034	-0.000338	671.396	1.11E+12	-29.751	22395.
403.200	0.014512	2.52E+06	-8771.754	-0.000304	660.315	1.11E+12	-23.405	23224.
417.600	0.010363	2.39E+06	-9064.906	-0.000273	648.754	1.11E+12	-17.311	24054.
432.000	0.006662	2.26E+06	-9272.434	-0.000242	636.830	1.11E+12	-11.512	24883.
446.400	0.003384	2.13E+06	-9398.828	-0.000214	624.656	1.11E+12	-6.043	25713.
460.800	0.000505	2.00E+06	-9449.035	-0.000187	612.338	1.11E+12	-0.930703	26542.
475.200	-0.002000	1.86E+06	-9428.369	-0.000162	599.976	1.11E+12	3.801	27372.
489.600	-0.004154	1.73E+06	-9342.421	-0.000138	587.661	1.10E+12	8.136	28201.
504.000	-0.005984	1.60E+06	-9196.984	-0.000117	575.478	1.10E+12	12.064	29030.
518.400	-0.007512	1.47E+06	-8997.969	-9.65E-05	563.505	1.10E+12	15.577	29860.
532.800	-0.008763	1.34E+06	-8751.342	-7.81E-05	551.809	1.10E+12	18.676	30689.
547.200	-0.009761	1.22E+06	-8463.052	-6.13E-05	540.451	1.10E+12	21.364	31519.
561.600	-0.010527	1.10E+06	-8138.961	-4.60E-05	529.486	1.10E+12	23.649	32348.
576.000	-0.011086	9.85E+05	-7784.783	-3.23E-05	518.957	1.10E+12	25.543	33178.
590.400	-0.011459	8.76E+05	-7406.038	-2.01E-05	508.902	1.10E+12	27.061	34007.
604.800	-0.011666	7.72E+05	-7008.006	-9.29E-06	499.353	1.10E+12	28.221	34836.
619.200	-0.011726	6.74E+05	-6595.697	2.07E-07	490.332	1.10E+12	29.044	35666.

633.600	-0.011660	5.82E+05	-6173.822	8.46E-06	481.857	1.10E+12	29.550	36495.
648.000	-0.011483	4.96E+05	-5746.767	1.55E-05	473.938	1.10E+12	29.763	37325.
662.400	-0.011212	4.16E+05	-5318.579	2.15E-05	466.581	1.10E+12	29.707	38154.
676.800	-0.010863	3.42E+05	-4892.957	2.65E-05	459.786	1.10E+12	29.407	38984.
691.200	-0.010448	2.75E+05	-4473.237	3.06E-05	453.548	1.10E+12	28.887	39813.
705.600	-0.009982	2.13E+05	-4062.400	3.38E-05	447.857	1.10E+12	28.173	40643.
720.000	-0.009476	1.57E+05	-3663.068	3.62E-05	442.702	1.10E+12	27.290	41472.
734.400	-0.008939	1.07E+05	-3277.509	3.79E-05	438.066	1.10E+12	26.260	42301.
748.800	-0.008383	61702.	-2907.652	3.90E-05	433.931	1.10E+12	25.109	43131.
763.200	-0.007815	21995.	-2555.095	3.96E-05	430.273	1.10E+12	23.858	43960.
777.600	-0.007243	-12768.	-2221.120	3.97E-05	429.424	1.10E+12	22.528	44790.
792.000	-0.006673	-42858.	-1906.711	3.93E-05	432.195	1.10E+12	21.140	45619.
806.400	-0.006111	-68558.	-1612.572	3.86E-05	434.562	1.10E+12	19.713	46449.
820.800	-0.005563	-90161.	-1339.146	3.75E-05	436.552	1.10E+12	18.263	47278.
835.200	-0.005031	-1.08E+05	-1086.638	3.62E-05	438.191	1.10E+12	16.807	48108.
849.600	-0.004520	-1.22E+05	-855.032	3.47E-05	439.509	1.10E+12	15.360	48937.
864.000	-0.004032	-1.33E+05	-644.120	3.30E-05	440.531	1.10E+12	13.933	49766.
878.400	-0.003569	-1.42E+05	-453.516	3.12E-05	441.285	1.10E+12	12.539	50596.
892.800	-0.003133	-1.47E+05	-282.681	2.93E-05	441.798	1.10E+12	11.188	51425.
907.200	-0.002724	-1.50E+05	-130.946	2.74E-05	442.095	1.10E+12	9.887	52255.
921.600	-0.002345	-1.52E+05	2.471	2.54E-05	442.201	1.10E+12	8.643	53084.
936.000	-0.001994	-1.51E+05	118.444	2.34E-05	442.141	1.10E+12	7.464	53914.
950.400	-0.001671	-1.49E+05	217.921	2.14E-05	441.935	1.10E+12	6.352	54743.
964.800	-0.001376	-1.45E+05	301.905	1.95E-05	441.607	1.10E+12	5.312	55572.
979.200	-0.001109	-1.40E+05	371.440	1.76E-05	441.175	1.10E+12	4.345	56402.
993.600	-0.000869	-1.35E+05	427.594	1.58E-05	440.658	1.10E+12	3.454	57231.

```
   1008. -0.000654 -1.28E+05   471.445  1.41E-05   440.073  1.10E+12
  2.637    58061.
   1022. -0.000463 -1.21E+05   504.071  1.24E-05   439.436  1.10E+12
  1.895    58890.
   1037. -0.000296 -1.14E+05   526.536  1.09E-05   438.761  1.10E+12
  1.226    59720.
   1051. -0.000149 -1.07E+05   539.885  9.45E-06   438.062  1.10E+12
0.628268    60549.
   1066. -2.35E-05   -98813.   545.128  8.10E-06   437.349  1.10E+12
0.099955    61379.
   1080.  8.38E-05   -91036.   543.240  6.85E-06   436.632  1.10E+12
-0.362109    62208.
   1094.  0.000174   -83320.   535.153  5.71E-06   435.922  1.10E+12
-0.761134    63037.
   1109.  0.000248   -75751.   521.749  4.66E-06   435.225  1.10E+12
 -1.101    63867.
   1123.  0.000308   -68398.   503.857  3.71E-06   434.547  1.10E+12
 -1.384    64696.
   1138.  0.000355   -61322.   482.256  2.86E-06   433.896  1.10E+12
 -1.616    65526.
   1152.  0.000391   -54573.   457.664  2.10E-06   433.274  1.10E+12
 -1.800    66355.
   1166.  0.000416   -48188.   430.745  1.43E-06   432.686  1.10E+12
 -1.939    67185.
   1181.  0.000432   -42199.   402.106  8.32E-07   432.134  1.10E+12
 -2.038    68014.
   1195.  0.000440   -36626.   372.298  3.14E-07   431.621  1.10E+12
 -2.102    68844.
   1210.  0.000441   -31484.   341.816 -1.33E-07   431.147  1.10E+12
 -2.132    69673.
   1224.  0.000436   -26779.   311.106 -5.16E-07   430.714  1.10E+12
 -2.133    70502.
   1238.  0.000426   -22513.   280.560 -8.40E-07   430.321  1.10E+12
 -2.109    71332.
   1253.  0.000412   -18680.   250.526 -1.11E-06   429.968  1.10E+12
 -2.062    72161.
   1267.  0.000394   -15273.   221.305 -1.33E-06   429.654  1.10E+12
 -1.996    72991.
   1282.  0.000373   -12277.   193.161 -1.51E-06   429.378  1.10E+12
 -1.913    73820.
   1296.  0.000350 -9675.841   166.319 -1.66E-06   429.139  1.10E+12
 -1.815    74650.
   1310.  0.000325 -7449.849   140.969 -1.77E-06   428.934  1.10E+12
 -1.705    75479.
   1325.  0.000299 -5576.407   117.276 -1.86E-06   428.761  1.10E+12
 -1.585    76308.
   1339.  0.000272 -4030.874    95.375 -1.92E-06   428.619  1.10E+12
 -1.456    77138.
   1354.  0.000244 -2786.763    75.382 -1.96E-06   428.504  1.10E+12
 -1.320    77967.
   1368.  0.000215 -1816.035    57.393 -1.99E-06   428.415  1.10E+12
 -1.178    78797.
```



```
   1382.  0.000186 -1089.344    41.488 -2.01E-06   428.348  1.10E+12
 -1.031    79626.
   1397.  0.000157  -576.231    27.739 -2.03E-06   428.301  1.10E+12
-0.878876    80456.
   1411.  0.000128  -245.277    16.205 -2.03E-06   428.270  1.10E+12
-0.723027    81285.
   1426.  9.88E-05   -64.215     6.942 -2.03E-06   428.254  1.10E+12
-0.563547    82115.
   1440.  6.96E-05     0.000     0.000 -2.03E-06   428.248  1.10E+12
-0.400627    41472.
```

Please note that because this analysis makes computations of ultimate moment
capacity and pile response using nonlinear bending stiffness that the above
values of total stress due to combined axial stress and bending may not be
representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection              =     0.34567923 in
Computed slope at pile head       =    -0.00119134
Maximum bending moment            =       3260282. lbs-in
Maximum shear force               =    20800.00000 lbs
Depth of maximum bending moment   =      259.20000 in
Depth of maximum shear force      =        0.00000 in
Number of iterations              =              5
Number of zero deflection points  =              2
```

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

```
Type 1 = Shear and Moment,          y = pile-head displacment in
Type 2 = Shear and Slope,           M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness,  V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment,     S = Pile-head Slope, radians
```

fresh kill_drilled shaft_free rotation.lpo
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head
in-lbs/rad

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 20800.	M= 0.000	774700.	0.3456792	3260282.	20800.0000

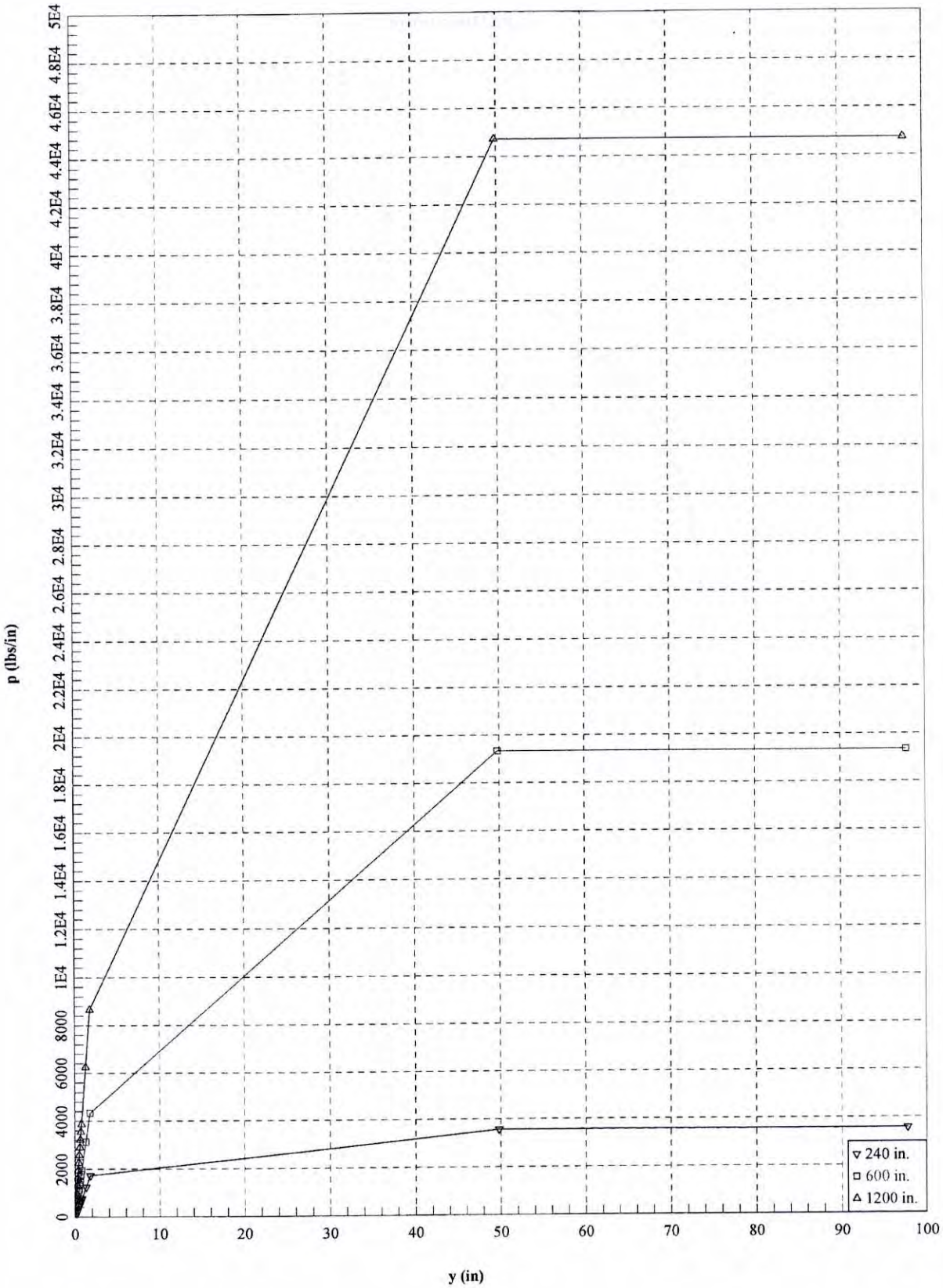
Pile-head Deflection vs. Pile Length

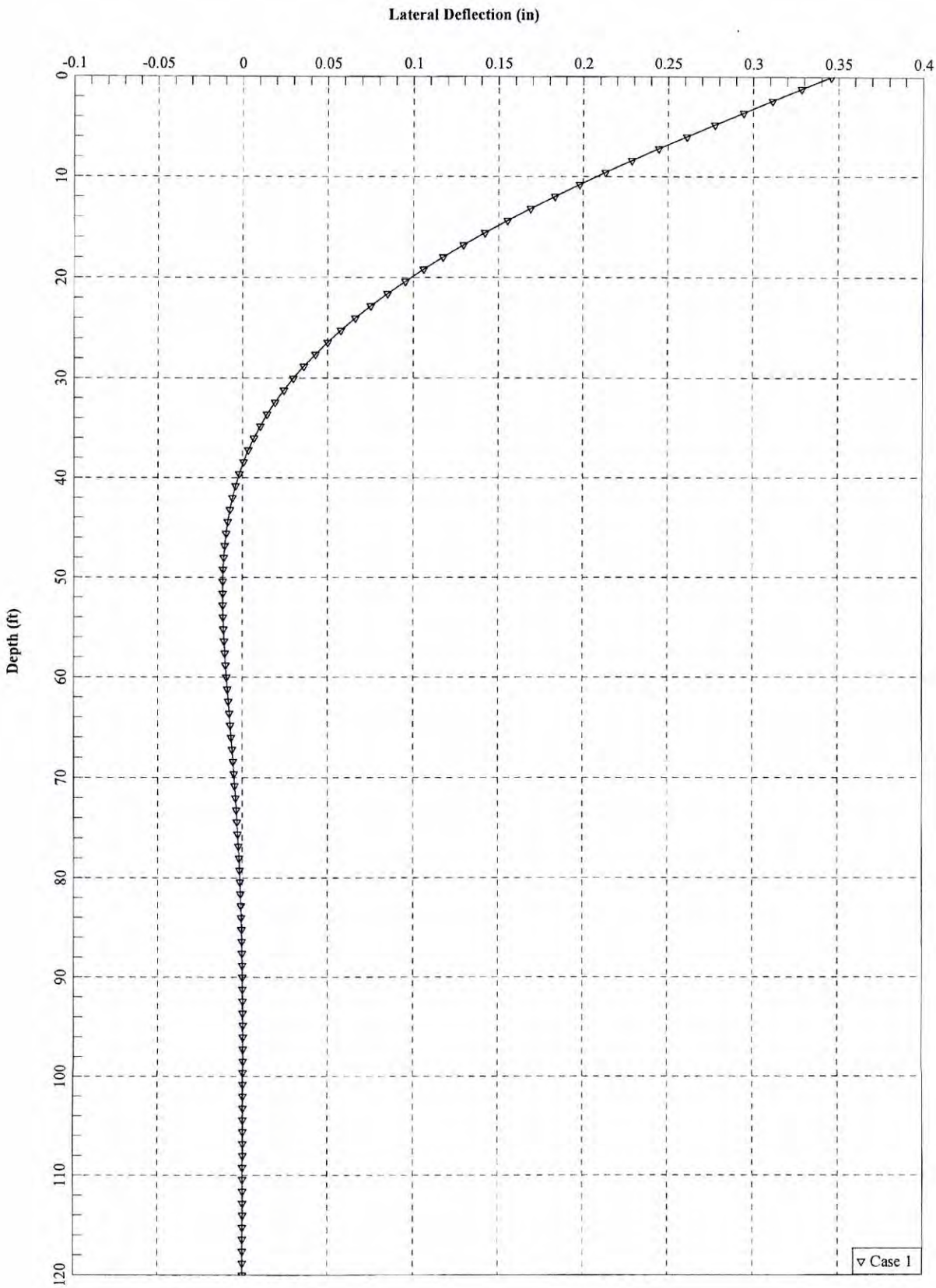
Boundary Condition Type 1, Shear and Moment

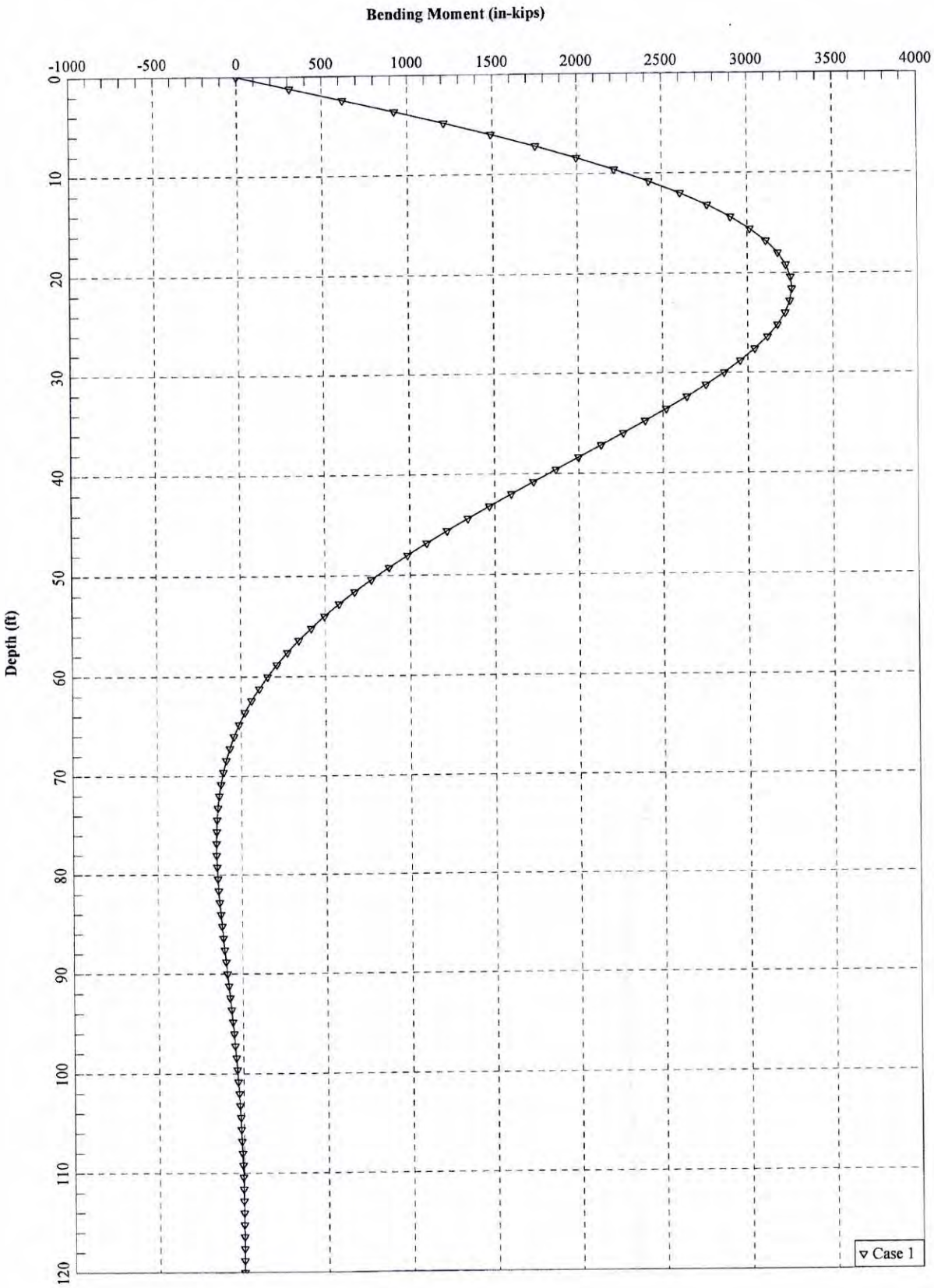
Shear = 20800. lbs
Moment = 0. in-lbs
Axial Load = 774700. lbs

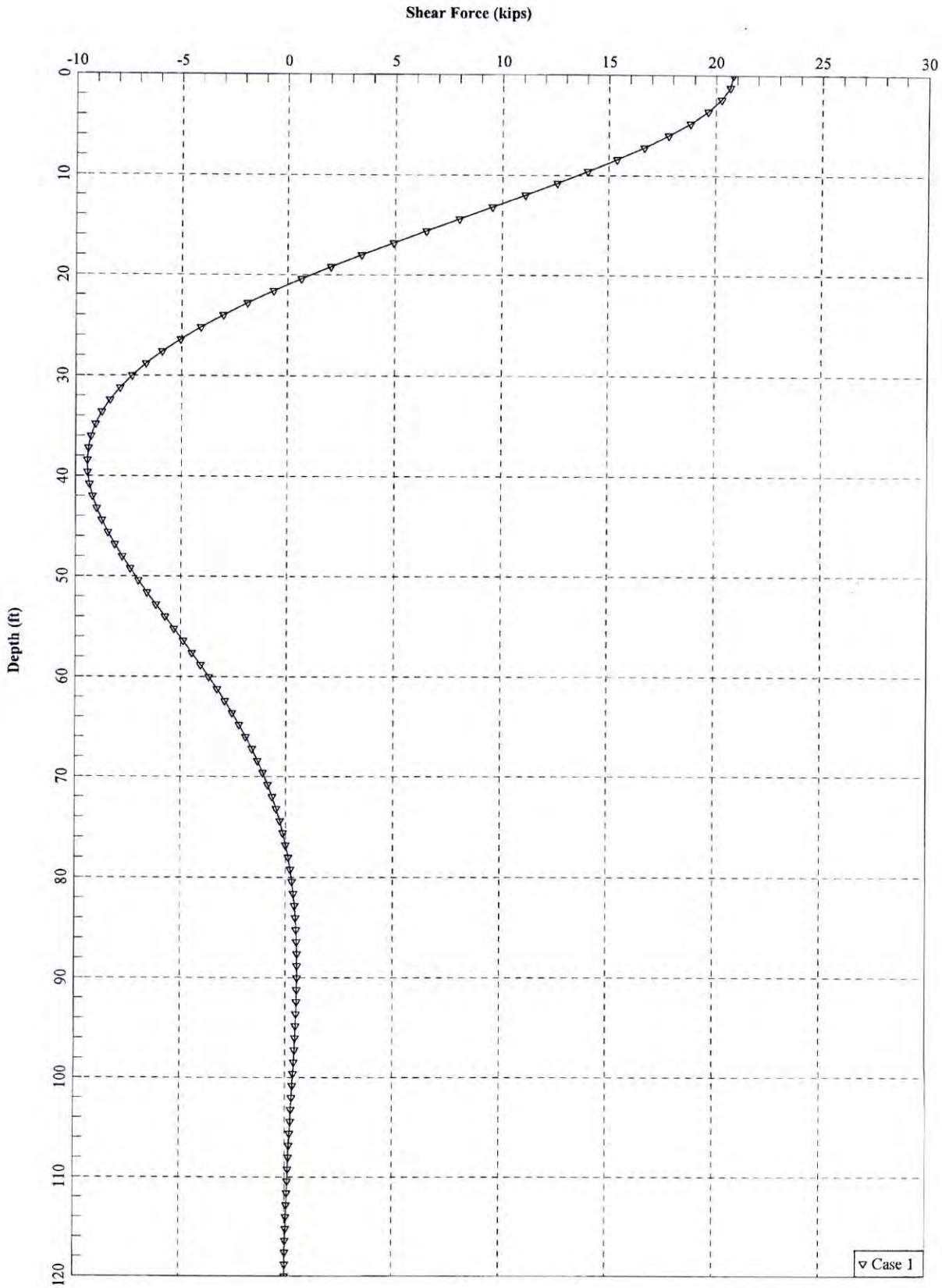
Pile Length in	Pile Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1440.000	0.34291664	3271690.	20800.00000
1368.000	0.34286884	3271136.	20800.00000
1296.000	0.34283050	3270648.	20800.00000
1224.000	0.34281509	3269870.	20800.00000
1152.000	0.34284118	3267903.	20800.00000
1080.000	0.34291386	3268246.	20800.00000
1008.000	0.34299300	3267122.	20800.00000
936.000	0.34300152	3267045.	20800.00000
864.000	0.34301682	3266125.	20800.00000
792.000	0.34384397	3254814.	20800.00000

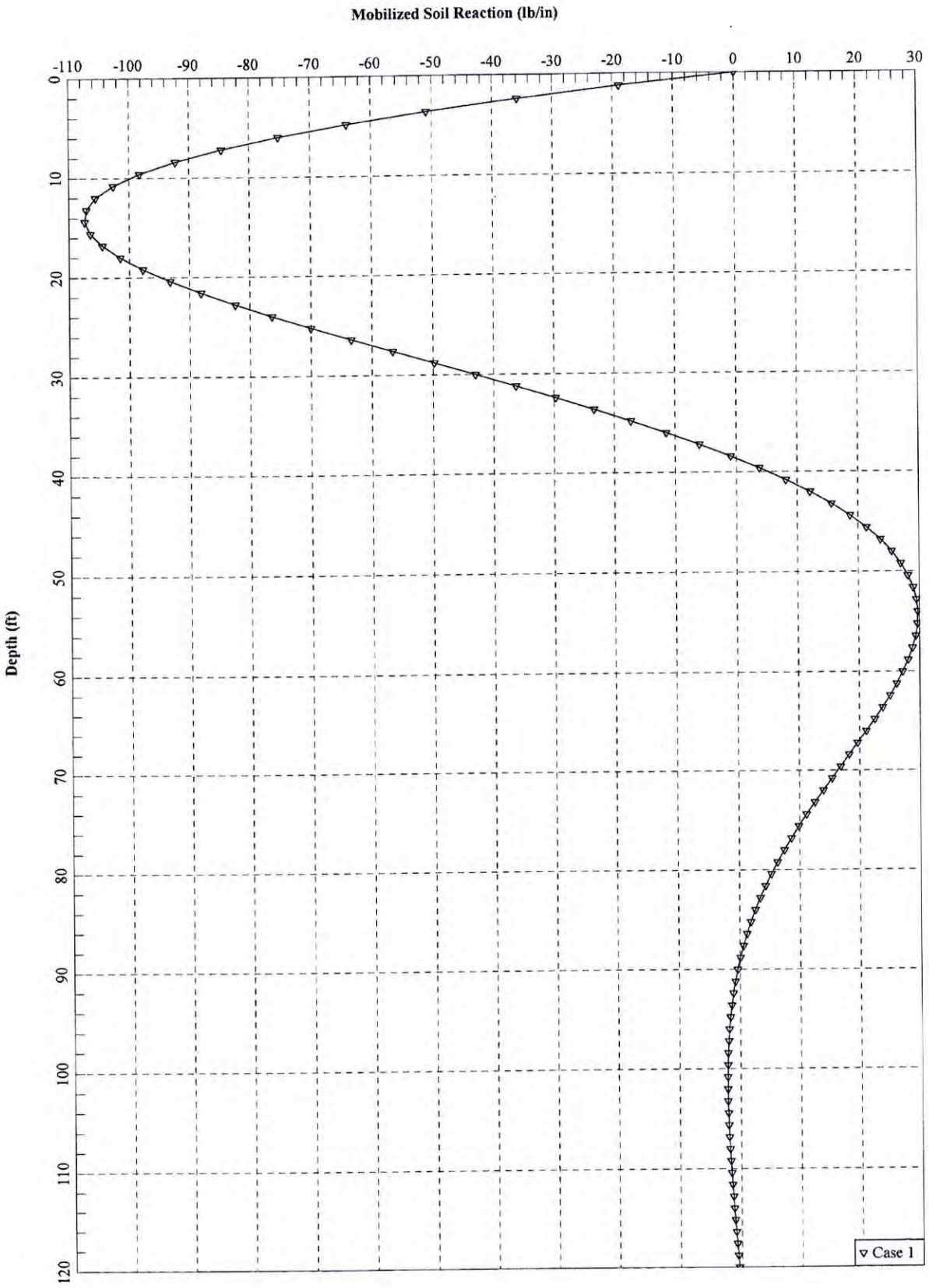
The analysis ended normally.


p (lbs/in)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
2E4
2.2E4
2.4E4
2.6E4
2.8E4
3E4
3.2E4
3.4E4
3.6E4
3.8E4
4E4
4.2E4
4.4E4
4.6E4
4.8E4
5E4
0
10
20
30
40
50
60
70
80
90
100
y (in)
240 in.
600 in.
1200 in.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 1


Bending Moment (in-kips)
-1000
-500
0
500
1000
1500
2000
2500
3000
3500
4000
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 1


Shear Force (kips)
-10
-5
0
5
10
15
20
25
30
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 1


Mobilized Soil Reaction (lb/in)
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 1

CASE 2 FIXED HEAD BOUNDARY

==========

LPILE Plus for Windows, Version 5.0 (5.0.46)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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==========

This program is licensed to:

Chunling Li
Geosyntec Consultants

Files Used for Analysis

Path to file locations: P:\PRJ1\MDENG\PROJECT\ME0736 - Fresh Kill Wind Energy Tower\analysis\
Name of input data file: fresh kill_drilled shaft_fixed head.lpd
Name of output file: fresh kill_drilled shaft_fixed head.lpo
Name of plot output file: fresh kill_drilled shaft_fixed head.lpp
Name of runtime file: fresh kill_drilled shaft_fixed head.lpr

---

Time and Date of Analysis

Date: October 15, 2010 Time: 17:06:07

Problem Title

New Pile

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 4:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment
  Capacity with Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- Additional p-y curves computed at specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

Pile Structural Properties and Geometry

Pile Length = 1440.00 in

Depth of ground surface below top of pile = 0.00 in

Slope angle of ground surface = 3.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	48.00000000	260576.0000	1809.0000	4350000.
2	1440.0000	48.00000000	260576.0000	1809.0000	4350000.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 0.000 in
Distance from top of pile to bottom of layer = 2160.000 in
p-y subgrade modulus k for top of soil layer = 4.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 4.000 lbs/in**3

(Depth of lowest layer extends 720.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 2 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	0.00	0.03760
2	2160.00	0.04330

Shear Strength of Soils

Shear strength parameters with depth defined using 2 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	0.000	0.00000	28.00	------	------
2	2160.000	0.00000	28.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

Loading Type

Cyclic loading criteria was used for computation of p-y curves.

Number of cycles of loading = 5000.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Slope (BC Type 2)
Shear force at pile head = 20800.000 lbs
Slope at pile head = 0.000 in/in
Axial load at pile head = 774700.000 lbs

(Zero slope for this load indicates fixed-head condition)

Output of p-y Curves at Specified Depths

---

p-y curves are generated and printed for verification at 3 depths.

Depth No.	Depth Below Pile Head in	Depth Below Ground Surface in
1	240.000	240.000
2	600.000	600.000
3	1200.000	1200.000

Depth of ground surface below top of pile = 0.00 in

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Number of sections = 1

Pile Section No. 1

The sectional shape is a circular shaft with steel casing.

Outside Diameter	=	48.0000 in
Wall thickness of steel shell	=	0.2000 in
Cross-sectional area of shell	=	30.03363 in**2
Moment of inertia of steel shell	=	8.57790E+03 in**4

Material Properties:

Compressive Strength of Concrete	=	4.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Steel shell or core yield stress	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2

Cover Thickness (edge to bar center)	=	2.000 in
Number of Reinforcing Bars	=	10
Area of Single Bar	=	0.50000 in**2
Number of Rows of Reinforcing Bars	=	5
Area of Steel	=	35.034 in**2
Area of Shaft	=	1809.557 in**2
Percentage of Steel Reinforcement	=	1.936 percent
Unfactored Axial Squash Load Capacity	=	8135.40 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.000	20.733
2	1.000	12.814
3	1.000	0.000
4	1.000	-12.814
5	1.000	-20.733

Axial Thrust Force = 774700.00 lbs

Bending Max. Concrete Moment Stress in-lbs psi	Bending Max. Steel Stress psi	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches
1370041. 476.06249	1.096033E+12 3864.49973		0.00000125	0.00013709	109.87386
2783747. 572.64727	1.113499E+12 4627.09368		0.00000250	0.00016722	67.08894968
4196952. 667.95354	1.119187E+12 5392.74423		0.00000375	0.00019746	52.85542059
5702511. 771.01538	1.140502E+12 6127.47011		0.00000500	0.00022663	45.52538252
7094327. 865.62792	1.135092E+12 6889.41804		0.00000625	0.00025673	41.27755022
8341609. 943.56094	1.112214E+12 7684.93424		0.00000750	0.00028800	38.59999895
9863441. 1050.32461	1.127250E+12 8419.76976		0.00000875	0.00031717	36.44832659
11260052. 1140.74138	1.126005E+12 9191.68109		0.00001000	0.00034762	34.96241999
11260052. 1149.99808	1.000894E+12 9439.40149		0.00001125	0.00036000	32.19999933
11260052.	9.008042E+11		0.00001250	0.00038207	30.76561117

1240.25123	9968.25817			
11477952.	8.347602E+11	0.00001375	0.00040700	29.79999876
1279.71906	10580.04604			
12051940.	8.034627E+11	0.00001500	0.00043017	28.87812853
1342.20731	11140.85485			
12615126.	7.763154E+11	0.00001625	0.00045249	28.04571676
1401.38894	11676.98538			
13222099.	7.555485E+11	0.00001750	0.00047497	27.34095526
1460.12698	12217.54856			
13748627.	7.332601E+11	0.00001875	0.00049500	26.59999895
1511.37990	12687.33561			
14563587.	7.281794E+11	0.00002000	0.00051578	25.98882437
1606.44302	13178.67673			
15609530.	7.345661E+11	0.00002125	0.00053975	25.59999990
1668.55638	13762.73095			
15609530.	6.937569E+11	0.00002250	0.00055800	25.00000048
1714.95406	14180.80373			
15833127.	6.666580E+11	0.00002375	0.00058425	24.80000067
1732.82743	14830.87629			
16533968.	6.613587E+11	0.00002500	0.00060000	24.20000124
1819.52529	15176.44914			
17877803.	6.810591E+11	0.00002625	0.00062475	23.99999857
1879.68751	15783.02174			
17877803.	6.501019E+11	0.00002750	0.00063998	23.47202826
1915.89936	16955.65053			
17877803.	6.218366E+11	0.00002875	0.00066456	23.31510401
1919.08947	17857.19751			
19592629.	6.530876E+11	0.00003000	0.00069000	23.19999933
2032.49202	18733.73847			
19592629.	6.269641E+11	0.00003125	0.00070004	22.60115576
2054.96905	20057.01289			
19592629.	6.028501E+11	0.00003250	0.00072586	22.53407335
2053.98822	20922.51858			
19692370.	5.834776E+11	0.00003375	0.00074925	22.40000010
2104.17689	21858.45503			
20766184.	5.933195E+11	0.00003500	0.00076406	22.03041315
2195.81233	23043.15819			
20921326.	5.771400E+11	0.00003625	0.00078300	21.80000067
2235.91286	24108.34925			
21069837.	5.618623E+11	0.00003750	0.00080580	21.68810034
2220.01404	25061.36324			
21518958.	5.553279E+11	0.00003875	0.00082925	21.60000086
2267.08783	25995.74381			
22143062.	5.535766E+11	0.00004000	0.00085600	21.60000086
2319.98544	26834.31619			
22865779.	5.543219E+11	0.00004125	0.00086126	21.07904291
2394.51084	28296.08451			
23004668.	5.412863E+11	0.00004250	0.00088400	20.99999857
2371.61823	29250.96377			
23387745.	5.345770E+11	0.00004375	0.00090605	20.90967035
2412.79440	30225.89016			
25697349.	5.710522E+11	0.00004500	0.00092700	20.79999876

2518.92932	31232.60845			
26336352.	5.694346E+11	0.00004625	0.00095275	20.79999876
2565.50373	32100.18091			
26971312.	5.678171E+11	0.00004750	0.00097850	20.79999876
2610.81350	32967.75336			
26971312.	5.532577E+11	0.00004875	0.00098252	20.35429430
2617.40826	34465.44050			
26971312.	5.262695E+11	0.00005125	0.00102500	20.19999933
2619.11388	36462.21988			
29147166.	5.422729E+11	0.00005375	0.00106425	19.99999952
2751.91900	38552.61446			
30341539.	5.394051E+11	0.00005625	0.00111375	19.99999952
2827.38233	40345.75932			
31521574.	5.365374E+11	0.00005875	0.00116325	19.99999952
2898.17606	42138.90418			
31521574.	5.146379E+11	0.00006125	0.00117690	19.41475725
2916.38542	44971.58562			
31521574.	4.944561E+11	0.00006375	0.00122400	19.40000010
2978.18248	46834.44284			
31521574.	4.757973E+11	0.00006625	0.00126326	19.26805544
2959.74330	48924.58632			
31945604.	4.646633E+11	0.00006875	0.00130625	19.20000029
3011.13649	50906.48209			
32934315.	4.622360E+11	0.00007125	0.00135375	19.20000029
3064.51120	52757.62689			
33910888.	4.598087E+11	0.00007375	0.00140125	19.20000029
3113.94758	54608.77170			
34850229.	4.570522E+11	0.00007625	0.00144875	19.20000029
3159.44563	56459.91650			
36249245.	4.603079E+11	0.00007875	0.00146044	18.74523497
3224.20566	59349.63160			
36382348.	4.477827E+11	0.00008125	0.00149500	18.60000086
3251.24443	60000.00000			
37120301.	4.432275E+11	0.00008375	0.00154100	18.60000086
3283.84166	60000.00000			
37120301.	4.303803E+11	0.00008625	0.00156975	18.40000105
3254.83568	60000.00000			
37263427.	4.198696E+11	0.00008875	0.00161525	18.40000105
3285.34915	60000.00000			
37914395.	4.155002E+11	0.00009125	0.00166075	18.40000105
3312.26659	60000.00000			
38544303.	4.111392E+11	0.00009375	0.00170625	18.40000105
3335.58799	60000.00000			
39676802.	4.122265E+11	0.00009625	0.00171123	17.97900438
3369.22801	60000.00000			
39676802.	4.017904E+11	0.00009875	0.00173800	17.79999876
3348.28161	60000.00000			
39676802.	3.918696E+11	0.00010125	0.00178200	17.79999876
3365.22040	60000.00000			
39676802.	3.824270E+11	0.00010375	0.00181311	17.67577600
3374.94802	60000.00000			
42968889.	4.044131E+11	0.00010625	0.00184875	17.59999895

3398.25449	60000.00000			
43471238.	3.997355E+11	0.00010875	0.00189225	17.59999895
3399.83339	60000.00000			
43949623.	3.950528E+11	0.00011125	0.00193575	17.59999895
3397.99853	60000.00000			
44415511.	3.904660E+11	0.00011375	0.00197925	17.59999895
3399.98154	60000.00000			
44415511.	3.820689E+11	0.00011625	0.00197610	17.19866896
3399.90240	60000.00000			
44415511.	3.740254E+11	0.00011875	0.00199500	16.99999952
3398.31404	60000.00000			
44415511.	3.663135E+11	0.00012125	0.00203700	16.99999952
3397.45903	60000.00000			
44415511.	3.589132E+11	0.00012375	0.00207419	16.96115828
3399.66997	60000.00000			
44632558.	3.535252E+11	0.00012625	0.00209575	16.79999971
3399.99827	60000.00000			
44958963.	3.491958E+11	0.00012875	0.00213725	16.79999971
3395.58671	60000.00000			
45278915.	3.449822E+11	0.00013125	0.00217875	16.79999971
3398.98126	60000.00000			
45578433.	3.407733E+11	0.00013375	0.00222025	16.79999971
3399.30491	60000.00000			
45852028.	3.365286E+11	0.00013625	0.00226175	16.79999971
3395.04706	60000.00000			
46120161.	3.323976E+11	0.00013875	0.00230325	16.79999971
3398.56854	60000.00000			
46369972.	3.282830E+11	0.00014125	0.00234475	16.79999971
3399.97207	60000.00000			
46369972.	3.225737E+11	0.00014375	0.00232163	16.35048151
3398.66979	60000.00000			
46369972.	3.170596E+11	0.00014625	0.00234095	16.20648050
3399.33407	60000.00000			
46369972.	3.117309E+11	0.00014875	0.00238000	16.20000029
3398.84248	60000.00000			
46369972.	3.015933E+11	0.00015375	0.00246000	16.20000029
3396.99197	60000.00000			
46369972.	2.920943E+11	0.00015875	0.00251599	16.04878092
3399.58645	60000.00000			
46369972.	2.831754E+11	0.00016375	0.00258725	16.00000048
3392.17065	60000.00000			
46369972.	2.747850E+11	0.00016875	0.00266625	16.00000048
3397.81819	60000.00000			
46369972.	2.668775E+11	0.00017375	0.00274525	16.00000048
3398.24795	60000.00000			
46369972.	2.594124E+11	0.00017875	0.00282425	16.00000048
3393.40260	60000.00000			
46369972.	2.523536E+11	0.00018375	0.00290325	16.00000048
3398.98127	60000.00000			
46369972.	2.456687E+11	0.00018875	0.00298225	16.00000048
3395.34141	60000.00000			
46369972.	2.393289E+11	0.00019375	0.00306125	16.00000048

3392.57732	60000.00000			
46369972.	2.333080E+11	0.00019875	0.00304793	15.53551340
3393.31127	60000.00000			
46369972.	2.275827E+11	0.00020375	0.00309962	15.41286135
3387.31662	60000.00000			
46369972.	2.221316E+11	0.00020875	0.00317300	15.40000105
3394.58572	60000.00000			
46369972.	2.169355E+11	0.00021375	0.00324900	15.40000105
3399.02794	60000.00000			
46369972.	2.119770E+11	0.00021875	0.00332500	15.40000105
3396.99282	60000.00000			
46369972.	2.072401E+11	0.00022375	0.00340100	15.40000105
3385.63089	60000.00000			
46369972.	2.027103E+11	0.00022875	0.00347434	15.38836527
3392.42162	60000.00000			
46369972.	1.983742E+11	0.00023375	0.00353407	15.31903410
3395.82249	60000.00000			
46369972.	1.942198E+11	0.00023875	0.00359412	15.25390291
3398.24371	60000.00000			
46369972.	1.902358E+11	0.00024375	0.00365625	15.20000124
3399.70676	60000.00000			
46369972.	1.864119E+11	0.00024875	0.00373125	15.20000124
3394.54866	60000.00000			
46369972.	1.827388E+11	0.00025375	0.00380625	15.20000124
3384.50789	60000.00000			

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =
46369.97219 in-kip

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	240.000	in
Depth below ground surface	=	240.000	in
Equivalent Depth (see note)	=	240.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03792	pci
k	=	4.000	pci
A (cyclic)	=	0.8800	
B (cyclic)	=	0.5500	
Pst	=	4044.080	lbs/in
Psd	=	9836.996	lbs/in
Ps	=	4044.080	lbs/in
Cbar	=	2475.7068	
n	=	2.0833	
m	=	1334.5463	
yk	=	6.1831	in

pm	=	2224.244	lbs/in
ym	=	0.8000	in
pu	=	3558.790	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	64.0000	*
0.1333333	128.0000	*
0.2000000	192.0000	*
0.2666667	256.0000	*
0.3333333	320.0000	*
0.4000000	384.0000	*
0.4666667	448.0000	*
0.5333333	512.0000	*
0.6000000	576.0000	*
0.6666667	640.0000	*
0.7333333	704.0000	*
0.8000000	768.0000	*
1.3000	1248.0000	*
1.8000	1728.0000	*
49.8000	3558.7902	
97.8000	3558.7902	

* p value(s) computed using p = k * Eff x * y

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	600.000	in
Depth below ground surface	=	600.000	in
Equivalent Depth (see note)	=	600.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03839	pci
k	=	4.000	pci
A (cyclic)	=	0.8800	
B (cyclic)	=	0.5500	
Pst	=	21968.331	lbs/in
Psd	=	24900.572	lbs/in
Ps	=	21968.331	lbs/in
Cbar	=	13448.5843	
n	=	2.0833	

m	=	7249.5494	
yk	=	27.5015	in
pm	=	12082.582	lbs/in
ym	=	0.8000	in
pu	=	19332.132	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	160.0000	*
0.1333333	320.0000	*
0.2000000	480.0000	*
0.2666667	640.0000	*
0.3333333	800.0000	*
0.4000000	960.0000	*
0.4666667	1120.0000	*
0.5333333	1280.0000	*
0.6000000	1440.0000	*
0.6666667	1600.0000	*
0.7333333	1760.0000	*
0.8000000	1920.0000	*
1.3000	3120.0000	*
1.8000	4320.0000	*
49.8000	19332.1317	
97.8000	19332.1317	

* p value(s) computed using p = k * Eff x * y

p-y Curve in Sand Computed Using Reese Criteria for Cyclic Loading Conditions

Soil Layer Number	=	1	
Depth below pile head	=	1200.000	in
Depth below ground surface	=	1200.000	in
Equivalent Depth (see note)	=	1200.000	in
Pile Diameter	=	48.000	in
Angle of Friction	=	28.000	deg.
Avg. Eff. Unit Weight	=	0.03918	pci
k	=	4.000	pci
A (cyclic)	=	0.8800	
B (cyclic)	=	0.5500	
Pst	=	84753.969	lbs/in
Psd	=	50828.083	lbs/in
Ps	=	50828.083	lbs/in

Cbar	=	31115.9618	
n	=	2.0833	
m	=	16773.2675	
yk	=	36.3950	in
pm	=	27955.446	lbs/in
ym	=	0.8000	in
pu	=	44728.713	lbs/in
yu	=	1.8000	in
p-multiplier	=	1.00000	
y-multiplier	=	1.00000	

This p-y curve is computed using the equivalent depth.

y, in	p, lbs/in	
0.0000	0.0000	
0.0666667	320.0000	*
0.1333333	640.0000	*
0.2000000	960.0000	*
0.2666667	1280.0000	*
0.3333333	1600.0000	*
0.4000000	1920.0000	*
0.4666667	2240.0000	*
0.5333333	2560.0000	*
0.6000000	2880.0000	*
0.6666667	3200.0000	*
0.7333333	3520.0000	*
0.8000000	3840.0000	*
1.3000	6240.0000	*
1.8000	8640.0000	*
49.8000	44728.7134	
97.8000	44728.7134	

* p value(s) computed using p = k * Eff x * y

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

Pile-head boundary conditions are Shear and Slope (Pile-head Condition Type 2)
Specified shear force at pile head = 20800.000 lbs
Specified slope at pile head = 0.000E+00 in/in

Specified axial load at pile head = 774700.000 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2
0.000	0.129180	-3.79E+06	20800.	-4.82E-18	776.994	1.12E+12
0.000	0.000					
14.400	0.128829	-3.49E+06	20747.	-4.69E-05	749.382	1.12E+12
-7.421	829.440					
28.800	0.127830	-3.19E+06	20587.	-8.99E-05	721.865	1.12E+12
-14.726	1658.880					
43.200	0.126239	-2.89E+06	20324.	-0.000129	694.588	1.11E+12
-21.814	2488.320					
57.600	0.124110	-2.60E+06	19961.	-0.000165	667.689	1.11E+12
-28.595	3317.760					
72.000	0.121497	-2.31E+06	19503.	-0.000196	641.301	1.11E+12
-34.991	4147.200					
86.400	0.118451	-2.03E+06	18957.	-0.000225	615.551	1.11E+12
-40.937	4976.640					
100.800	0.115024	-1.76E+06	18328.	-0.000249	590.555	1.10E+12
-46.378	5806.080					
115.200	0.111267	-1.50E+06	17625.	-0.000271	566.422	1.10E+12
-51.272	6635.520					
129.600	0.107226	-1.25E+06	16855.	-0.000289	543.248	1.10E+12
-55.586	7464.960					
144.000	0.102949	-1.01E+06	16028.	-0.000304	521.118	1.10E+12
-59.299	8294.400					
158.400	0.098481	-7.80E+05	15152.	-0.000315	500.107	1.10E+12
-62.398	9123.840					
172.800	0.093866	-5.65E+05	14236.	-0.000324	480.278	1.10E+12
-64.880	9953.280					
187.200	0.089144	-3.63E+05	13288.	-0.000330	461.680	1.10E+12
-66.751	10783.					
201.600	0.084353	-1.75E+05	12318.	-0.000334	444.351	1.10E+12
-68.022	11612.					
216.000	0.079529	-786.782	11333.	-0.000335	428.320	1.10E+12
-68.713	12442.					
230.400	0.074705	1.59E+05	10343.	-0.000334	442.894	1.10E+12
-68.848	13271.					
244.800	0.069911	3.05E+05	9354.024	-0.000331	456.296	1.10E+12
-68.457	14100.					
259.200	0.065175	4.36E+05	8374.606	-0.000326	468.387	1.10E+12
-67.573	14930.					
273.600	0.060521	5.53E+05	7411.192	-0.000320	479.181	1.10E+12
-66.234	15759.					

288.000	0.055972	6.56E+05	6470.055	-0.000312	488.702	1.10E+12	-64.479	16589.
302.400	0.051547	7.46E+05	5556.879	-0.000302	496.983	1.10E+12	-62.351	17418.
316.800	0.047263	8.23E+05	4676.738	-0.000292	504.064	1.10E+12	-59.891	18248.
331.200	0.043134	8.87E+05	3834.081	-0.000281	509.989	1.10E+12	-57.144	19077.
345.600	0.039174	9.40E+05	3032.730	-0.000269	514.811	1.10E+12	-54.154	19907.
360.000	0.035392	9.81E+05	2275.878	-0.000256	518.586	1.10E+12	-50.964	20736.
374.400	0.031795	1.01E+06	1566.103	-0.000243	521.374	1.10E+12	-47.616	21565.
388.800	0.028389	1.03E+06	905.384	-0.000230	523.240	1.10E+12	-44.151	22395.
403.200	0.025179	1.04E+06	295.120	-0.000216	524.248	1.10E+12	-40.608	23224.
417.600	0.022165	1.04E+06	-263.839	-0.000202	524.467	1.10E+12	-37.025	24054.
432.000	0.019350	1.04E+06	-771.160	-0.000189	523.964	1.10E+12	-33.436	24883.
446.400	0.016731	1.03E+06	-1226.996	-0.000175	522.809	1.10E+12	-29.874	25713.
460.800	0.014306	1.01E+06	-1631.944	-0.000162	521.069	1.10E+12	-26.369	26542.
475.200	0.012072	9.83E+05	-1987.009	-0.000149	518.813	1.10E+12	-22.946	27372.
489.600	0.010024	9.54E+05	-2293.558	-0.000136	516.104	1.10E+12	-19.630	28201.
504.000	0.008156	9.20E+05	-2553.282	-0.000124	513.008	1.10E+12	-16.442	29030.
518.400	0.006462	8.83E+05	-2768.152	-0.000112	509.585	1.10E+12	-13.401	29860.
532.800	0.004936	8.43E+05	-2940.377	-0.000100	505.895	1.10E+12	-10.520	30689.
547.200	0.003569	8.01E+05	-3072.365	-8.97E-05	501.992	1.10E+12	-7.812	31519.
561.600	0.002354	7.57E+05	-3166.679	-7.94E-05	497.930	1.10E+12	-5.287	32348.
576.000	0.001281	7.11E+05	-3226.001	-6.98E-05	493.756	1.10E+12	-2.952	33178.
590.400	0.000343	6.65E+05	-3253.096	-6.08E-05	489.516	1.10E+12	-0.811172	34007.
604.800	-0.000468	6.19E+05	-3250.777	-5.23E-05	485.251	1.10E+12	1.133	34836.
619.200	-0.001163	5.73E+05	-3221.873	-4.45E-05	481.000	1.10E+12	2.881	35666.
633.600	-0.001750	5.27E+05	-3169.199	-3.73E-05	476.797	1.10E+12	4.435	36495.
648.000	-0.002236	4.82E+05	-3095.532	-3.06E-05	472.670	1.10E+12	5.797	37325.

662.400	-0.002632	4.39E+05	-3003.583	-2.46E-05	468.648	1.10E+12	6.974	38154.
676.800	-0.002945	3.96E+05	-2895.978	-1.91E-05	464.754	1.10E+12	7.971	38984.
691.200	-0.003182	3.56E+05	-2775.241	-1.42E-05	461.006	1.10E+12	8.798	39813.
705.600	-0.003352	3.17E+05	-2643.776	-9.74E-06	457.421	1.10E+12	9.461	40643.
720.000	-0.003463	2.80E+05	-2503.854	-5.82E-06	454.013	1.10E+12	9.972	41472.
734.400	-0.003520	2.45E+05	-2357.605	-2.38E-06	450.791	1.10E+12	10.340	42301.
748.800	-0.003531	2.12E+05	-2207.007	6.23E-07	447.764	1.10E+12	10.576	43131.
763.200	-0.003502	1.81E+05	-2053.884	3.21E-06	444.936	1.10E+12	10.691	43960.
777.600	-0.003439	1.53E+05	-1899.899	5.40E-06	442.309	1.10E+12	10.696	44790.
792.000	-0.003347	1.26E+05	-1746.556	7.23E-06	439.885	1.10E+12	10.602	45619.
806.400	-0.003230	1.02E+05	-1595.197	8.73E-06	437.662	1.10E+12	10.420	46449.
820.800	-0.003095	80215.	-1447.007	9.93E-06	435.636	1.10E+12	10.162	47278.
835.200	-0.002944	60315.	-1303.018	1.09E-05	433.803	1.10E+12	9.837	48108.
849.600	-0.002782	42446.	-1164.111	1.15E-05	432.157	1.10E+12	9.456	48937.
864.000	-0.002612	26532.	-1031.023	1.20E-05	430.691	1.10E+12	9.029	49766.
878.400	-0.002437	12485.	-904.358	1.22E-05	429.398	1.10E+12	8.564	50596.
892.800	-0.002260	213.200	-784.589	1.23E-05	428.267	1.10E+12	8.071	51425.
907.200	-0.002082	-10386.	-672.070	1.23E-05	429.204	1.10E+12	7.557	52255.
921.600	-0.001907	-19416.	-567.045	1.21E-05	430.036	1.10E+12	7.030	53084.
936.000	-0.001735	-26986.	-469.655	1.18E-05	430.733	1.10E+12	6.496	53914.
950.400	-0.001568	-33204.	-379.949	1.14E-05	431.306	1.10E+12	5.963	54743.
964.800	-0.001408	-38182.	-297.894	1.09E-05	431.764	1.10E+12	5.434	55572.
979.200	-0.001255	-42026.	-223.384	1.04E-05	432.118	1.10E+12	4.915	56402.
993.600	-0.001110	-44846.	-156.246	9.79E-06	432.378	1.10E+12	4.410	57231.
1008.	-0.000973	-46745.	-96.255	9.19E-06	432.553	1.10E+12	3.922	58061.
1022.	-0.000845	-47823.	-43.138	8.57E-06	432.652	1.10E+12	3.455	58890.

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  1037. -0.000726   -48178.     3.416  7.94E-06   432.685  1.10E+12
 3.011    59720.
  1051. -0.000616   -47902.    43.748  7.31E-06   432.660  1.10E+12
 2.591    60549.
  1066. -0.000515   -47082.    78.224  6.68E-06   432.584  1.10E+12
 2.197    61379.
  1080. -0.000424   -45798.   107.223  6.07E-06   432.466  1.10E+12
 1.830    62208.
  1094. -0.000341   -44129.   131.136  5.48E-06   432.312  1.10E+12
 1.491    63037.
  1109. -0.000266   -42144.   150.358  4.92E-06   432.129  1.10E+12
 1.179    63867.
  1123. -0.000199   -39908.   165.282  4.38E-06   431.923  1.10E+12
0.893960    64696.
  1138. -0.000140   -37482.   176.296  3.87E-06   431.700  1.10E+12
0.635765    65526.
  1152. -8.75E-05   -34917.   183.778  3.39E-06   431.464  1.10E+12
0.403420    66355.
  1166. -4.20E-05   -32265.   188.093  2.95E-06   431.219  1.10E+12
0.195887    67185.
  1181. -2.53E-06   -29566.   189.589  2.55E-06   430.971  1.10E+12
0.011936    68014.
  1195.  3.13E-05   -26861.   188.597  2.18E-06   430.722  1.10E+12
-0.149818    68844.
  1210.  6.01E-05   -24183.   185.424  1.84E-06   430.475  1.10E+12
-0.290886    69673.
  1224.  8.43E-05   -21562.   180.357  1.54E-06   430.234  1.10E+12
-0.412868    70502.
  1238.  0.000104   -19023.   173.658  1.27E-06   430.000  1.10E+12
-0.517432    71332.
  1253.  0.000121   -16589.   165.568  1.04E-06   429.776  1.10E+12
-0.606280    72161.
  1267.  0.000134   -14278.   156.298  8.36E-07   429.563  1.10E+12
-0.681123    72991.
  1282.  0.000145   -12106.   146.040  6.63E-07   429.363  1.10E+12
-0.743660    73820.
  1296.  0.000153   -10087.   134.958  5.17E-07   429.177  1.10E+12
-0.795556    74650.
  1310.  0.000160 -8231.033   123.193  3.97E-07   429.006  1.10E+12
-0.838416    75479.
  1325.  0.000165 -6547.803   110.865  3.00E-07   428.851  1.10E+12
-0.873772    76308.
  1339.  0.000169 -5044.798    98.072  2.23E-07   428.712  1.10E+12
-0.903061    77138.
  1354.  0.000171 -3728.313    84.891  1.66E-07   428.591  1.10E+12
-0.927607    77967.
  1368.  0.000173 -2603.629    71.382  1.24E-07   428.487  1.10E+12
-0.948609    78797.
  1382.  0.000175 -1675.268    57.589  9.61E-08   428.402  1.10E+12
-0.967122    79626.
  1397.  0.000176  -947.203    43.541  7.89E-08   428.335  1.10E+12
-0.984041    80456.
```



```
  1411.  0.000177  -423.050    29.255  6.99E-08   428.287  1.10E+12
-1.000    81285.
  1426.  0.000178  -106.214    14.741  6.64E-08   428.257  1.10E+12
-1.016    82115.
  1440.  0.000179     0.000     0.000  6.57E-08   428.248  1.10E+12
-1.032    41472.
```

Please note that because this analysis makes computations of ultimate moment
capacity and pile response using nonlinear bending stiffness that the above
values of total stress due to combined axial stress and bending may not be
representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection              =     0.12918000 in
Computed slope at pile head       =  -4.818676E-18
Maximum bending moment            =     -3786453. lbs-in
Maximum shear force               =    20800.00000 lbs
Depth of maximum bending moment   =        0.00000 in
Depth of maximum shear force      =        0.00000 in
Number of iterations              =              5
Number of zero deflection points  =              2
```

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

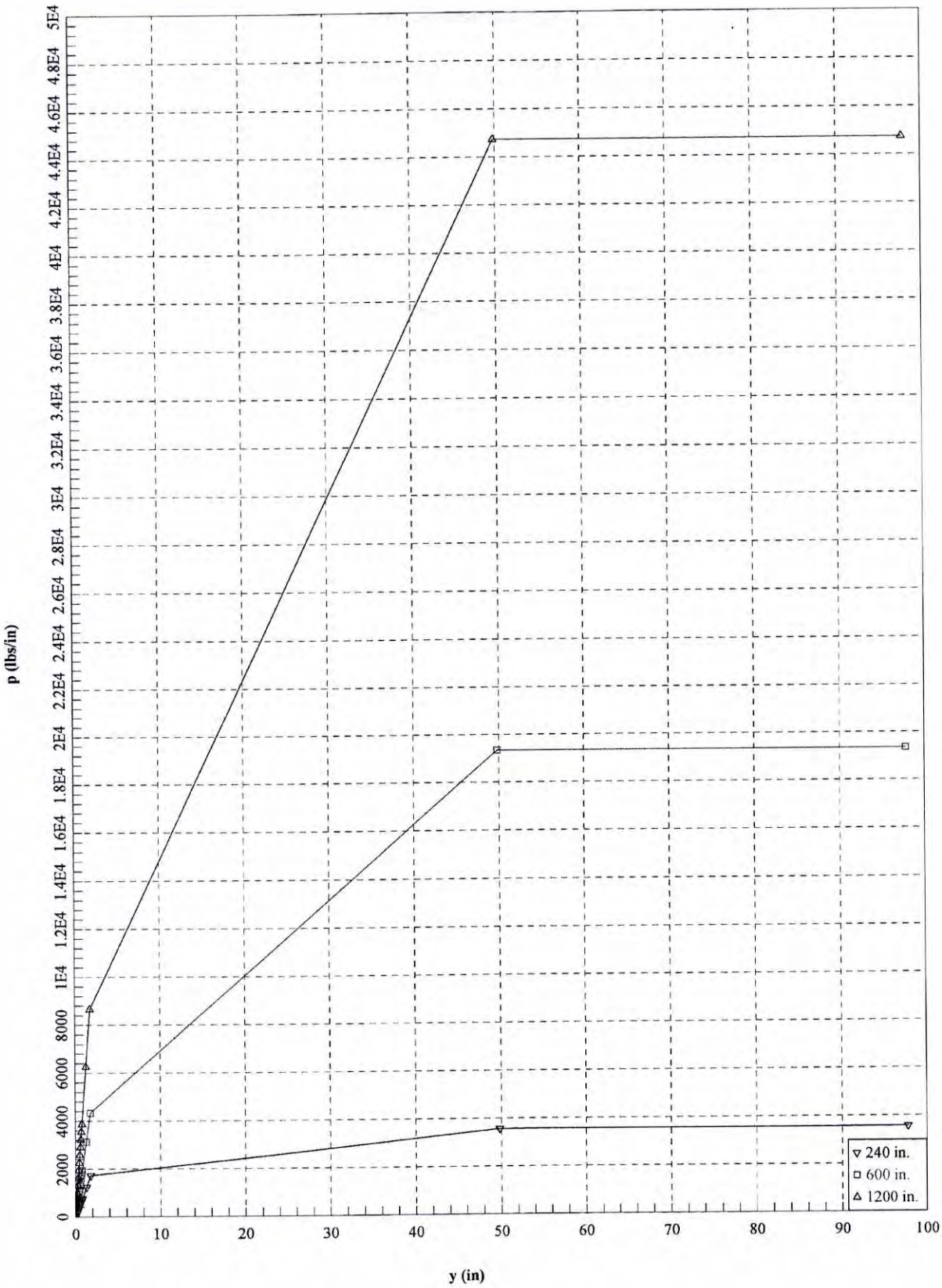
```
Type 1 = Shear and Moment,          y = pile-head displacment in
Type 2 = Shear and Slope,           M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness,  V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment,     S = Pile-head Slope, radians
Type 5 = Deflection and Slope,      R = Rot. Stiffness of Pile-head
in-lbs/rad
```

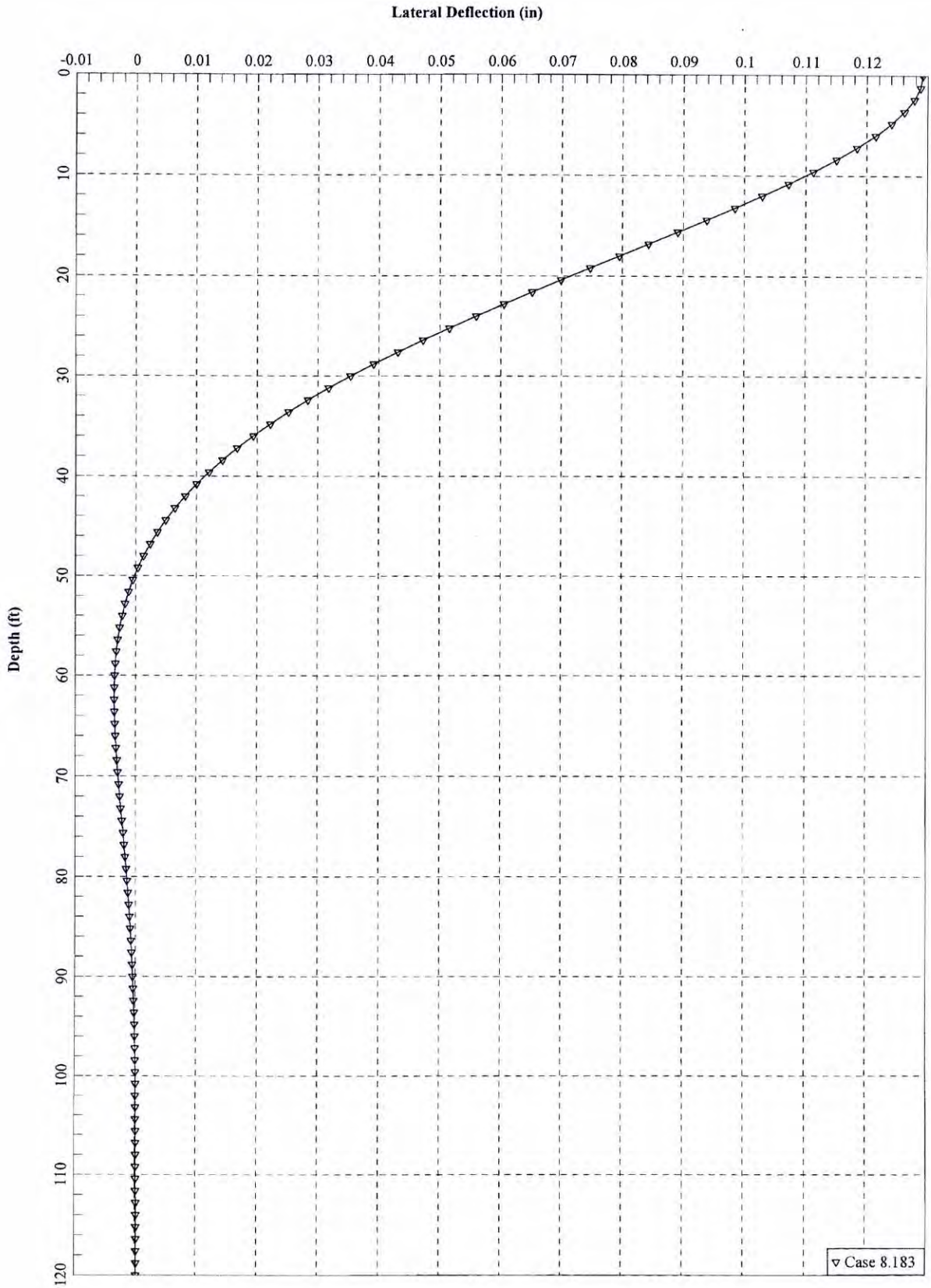
Load Pile-Head Pile-Head Axial Pile-Head Maximum

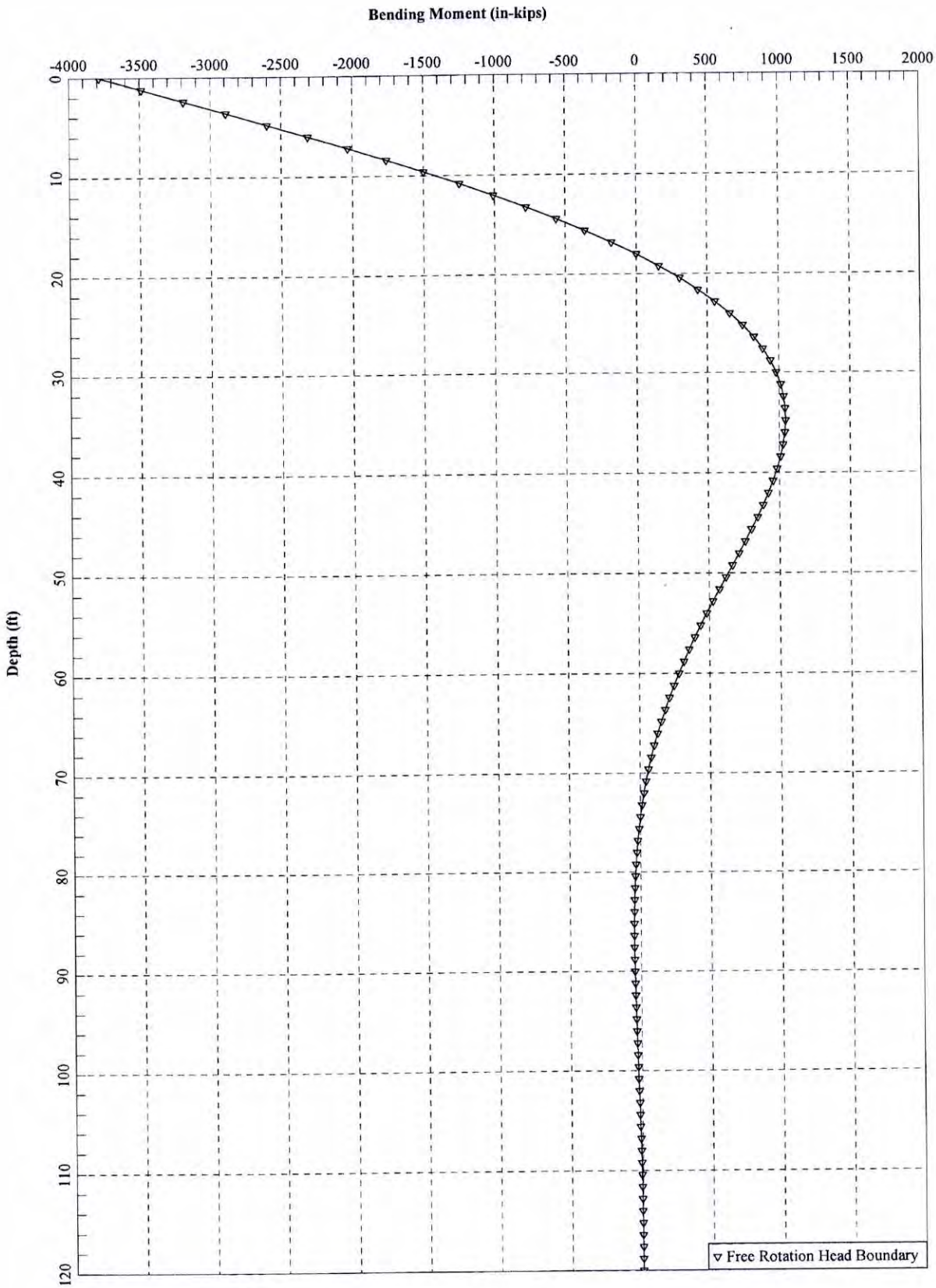
fresh kill_drilled shaft_fixed head.lpo

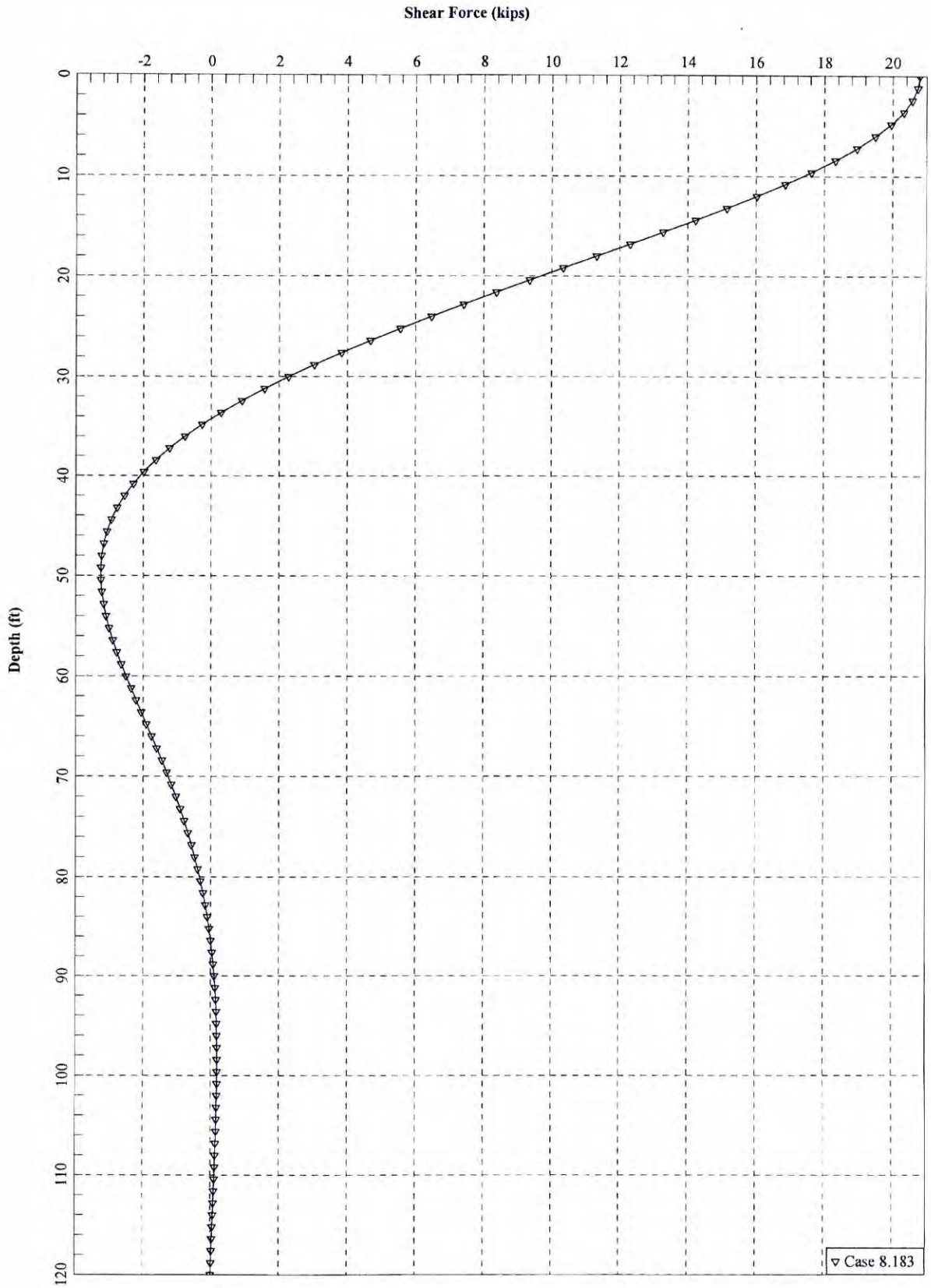
Type	Condition 1	Condition 2	Load lbs	Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
2	V= 20800.	S= 0.000	774700.	0.1291800	-3786453.	20800.0000

The analysis ended normally.


p (lbs/in)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
2E4
2.2E4
2.4E4
2.6E4
2.8E4
3E4
3.2E4
3.4E4
3.6E4
3.8E4
4E4
4.2E4
4.4E4
4.6E4
4.8E4
5E4
0
10
20
30
40
50
60
70
80
90
100
y (in)
240 in.
600 in.
1200 in.


Lateral Deflection (in)
-0.01
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 8.183


Bending Moment (in-kips)
-4000
-3500
-3000
-2500
-2000
-1500
-1000
-500
0
500
1000
1500
2000
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Free Rotation Head Boundary


Shear Force (kips)
-2
0
2
4
6
8
10
12
14
16
18
20
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 8.183

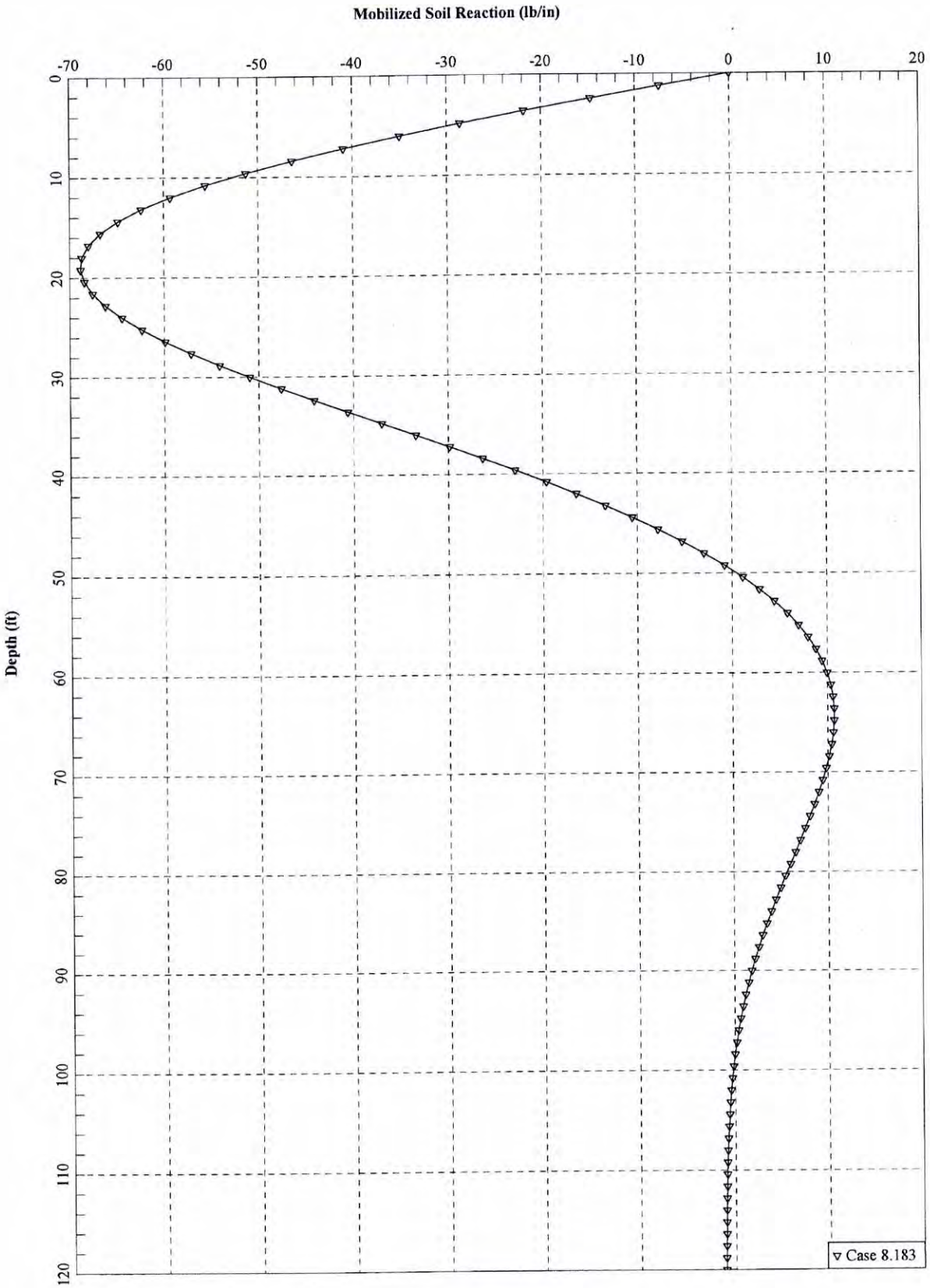

Mobilized Soil Reaction (lb/in)
-70
-60
-50
-40
-30
-20
-10
0
10
20
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
Case 8.183

EXHIBIT 5

Furnace Associates, Inc.
11220 Assett Loop, Suite 201
Manassas, Virginia 20109

Fact Sheet: Plan for Installation of Solar Panels

Lorton Renewable Energy Park, Lorton Landfill, Virginia

How is Solar Power Generated?

Solar power is created by conversion of sunlight energy into electricity. This occurs directly using photovoltaic (PV) cells or indirectly using concentrated solar power (CSP) systems. CSP systems involve use of lenses or mirrors to focus a large area of sunlight into a small beam, which is typically used to heat water for steam-powered turbines. Commercial CSP systems require abundant cheap water, cheap land, and plenty of sun to produce thermal energy before it can be used to produce electrical energy. For these reasons, a CSP system is not suitable for Lorton Renewable Energy Park.

PV systems consist of multiple PV cells which convert sunlight directly into electric energy using the photoelectric effect, which in simple terms is the movement (excitement) of electrons caused by interaction between sunlight energy and the semiconductor materials. The electrons are collected to form a direct current (DC) of electricity. PV cells are semiconductors typically made of thin film amorphous silicon coating on glass. Solar panels (also known as solar modules, PV modules, or PV panels) are packaged assemblies of 50 to 100 PV cells. Because a single solar panel can produce only a limited amount of power, PV installations contain several panels assembled in arrays. DC output from each array is combined using combiner and junction boxes and connected to the electricity grid via inverters, which convert DC electricity to alternating current (AC) electricity.

PV System Installations

PV systems can be mounted as fixed systems with rigid foundations or have tracking mechanisms to follow the movement of sunlight throughout the day. Fixed tilt flat panel systems are the most common. In the Northern Hemisphere, panels should face south and be tilted approximately equal to site latitude. A tracker system includes a tracking mechanism to allow the panel to rotate around one or two axes, and follow sunlight throughout the day and/or seasonally. Single-axis trackers rotate around the north-south position and track daily sun movement. Dual-axis tracking systems face the sun's position at all times by rotating simultaneously around the north-south and east-west positions. Although more expensive than fixed tilt systems, trackers can increase the power output over that of fixed systems. However, if fixed-tilt systems are used, more panels can be installed per unit area of land.

Fixed PV system at Pennsauken Landfill, New Jersey

Single-axis trackers with roughly 20 degree tilt at Nellis Air Force Base, Nevada

How big are Solar Panels and how Efficient are they?

Individual solar panels are relatively small to facilitate ease of handling and installation. Commercial solar panels are about 10-18 square feet in area (with maximum side dimensions of 65 in. × 40 in.), about 1½ in. thick, and weigh up to 50 lbs. Once assembled into arrays, however, the total size of a PV system is limited only by space, topography, power needs, and financial capital.

Currently the best achieved sunlight conversion rate (i.e., solar panel efficiency) is around 20%. The energy density of a solar panel is the efficiency described in terms of peak power output per unit of surface area, commonly expressed in units of watts per square foot (W/ft^2). Modern mass-produced solar panels typically have energy density values of about $15W/ft^2$ (hence popular reference to a "150W panel" which is $10ft^2$ in size).

How Much Electricity will the Solar Panels at Lorton Generate?

A 1 megawatt (MW) PV system is planned for installation on south-facing side slopes at Lorton Renewable Energy Park. Based on the above, this will require 1,000,000 ÷ 15 = 66,667ft^2 of total panel area, or roughly 6,670 panels. Due to the need to allow sufficient space between panels run wiring systems, provide access, and avoid having panels shade one other, about five to seven acres of landfill surface area will be required.

After taking into account the weather and latitude of the Lorton Renewable Energy Park, it should be expected that a 150W panel would produce about 180kWh per year, on average. Therefore, the total expected power output from a 1MW solar system would be 180kWh/panel × 6,670 panels = 1.2 million kWh per year. The average U.S. home consumes about 1,200 kWh monthly; therefore, the solar panels at Lorton would be expected to offset annual electricity demand from 1,200,000/(1,200 × 12) = 83 homes.

Are there Potential Aesthetic or Environmental Concerns with Solar Panels?

Heat and Glare: PV cells are designed to absorb sunlight to produce energy – the more sunlight they absorb, the more energy they produce. Any incident sunlight that is reflected or generates heat is wasted energy. Overall, modern PV cells absorb about two-thirds of total incident sunlight and reflect only one-third of the sunlight reaching their surface. Most solar panels are now designed with at least one anti-reflective layer and may have multiple layers thereby further reducing reflectivity. According to one study, the reflectivity of solar panels is less than that of dry sand and similar to needle-leaf coniferous tree forests, grass-type vegetation, or a field of planted crops such as corn.

Birds and Insects: There is no evidence of solar panels causing significant issues for birds. Solar panels may be a source of polarized light pollution that may cause ecological traps for insects, which may use the dark surfaces to deposit their eggs and thus become easy target for predators. To avoid this, white grids that reduce the attractiveness of such false habitats can be used. However, these may reduce the efficiency of solar panels by 2%.

Aircraft: No special precautions or requirements limiting the installation of solar panels next to airfields were found. In general, the reflection on airplanes from solar panels is reported to be less than that from large industrial rooftops, and significantly less than from lakes or sea.

Stability of Solar Panels

Several foundation types can be used to support PV solar power systems. For landfill covers, shallow or aboveground footings large enough to spread the weight of the solar panel and the foundation itself are preferred so as to not penetrate the final cover system and minimize imposed loads and settlement of final cover soils and underlying wastes. The stability of solar panel foundations at Lorton will need to be analysed to verify an adequate factor of safety for wind loading against overturning and sliding. Solar panels are typically certified to withstand a maximum mechanical loading of 50 pounds per square foot, which converts to a wind speed of approximately 105 miles per hour. Based on historical weather information reviewed for the site area, withstanding maximum wind speeds on this order is considered a reasonable design criterion. Overturning failures can be prevented by adding more weight to the bottom of precast/ballasted foundations and changing their orientation to minimize wind exposure. Sliding failures can be prevented by providing adequate ballast and proper drainage of the subgrade material.

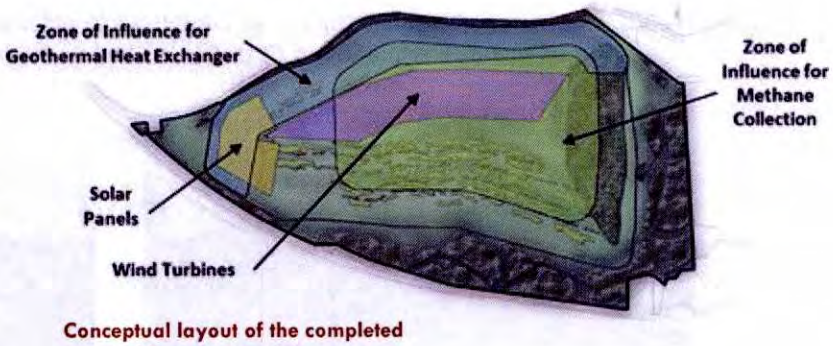
EXHIBIT 6

Fact Sheet: Plan for Installation of Wind Turbines

Lorton Renewable Energy Park, Lorton Landfill, Virginia

Overview and Vision for the Renewable Energy Park

Furnace Associates Inc's long-term vision for the Lorton Landfill property is to transition the site from a waste disposal facility to a state-of-the-art renewable energy park. The renewable energy park would phase implementation of four renewable energy technologies to generate up to nine megawatts (MW) of power, including solar panels (1MW), wind turbines (3MW), methane gas to energy (4MW), and geothermal heat exchange (1MW). Once developed, the renewable energy produced would help reduce the carbon footprint of the local community by reducing or offsetting their use of fossil fuels.



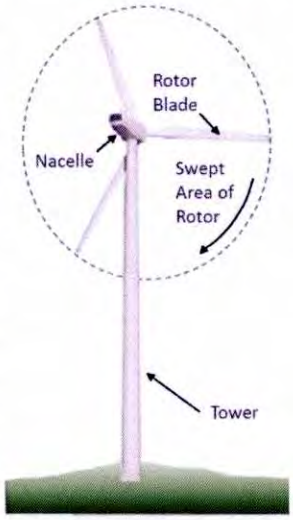
Conceptual layout of the completed renewable energy park

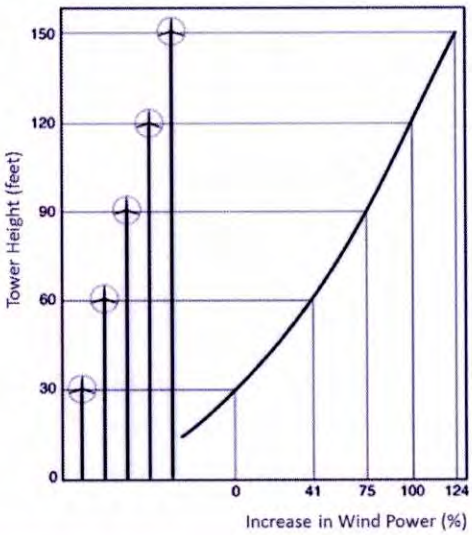
How is Wind Power Generated?

Wind power is created by conversion of the kinetic energy of moving air to mechanical energy using a turbine. The spinning rotor blades turn a shaft that is connected to a generator housed within an enclosure referred to as a nacelle behind the rotor hub. The mechanical energy generated is converted into electricity. The generator produces DC output, which is converted to AC and then connected to the power grid.

Wind turbines need moderate but steady winds for producing energy. Medium-sized turbines start producing some energy in wind speeds as low as 6-7 mph but require wind speeds of 30-35 mph or more for peak output. The efficiency of wind turbines depends mainly on the amount of energy extracted by the blades (swept area of the rotor) and the installation height of the rotor. Greater rotor height provides better access to steady, higher-speed winds for greater power generation. However, increasing the height of turbines adds to the cost of installation (mainly due to increasingly complex foundational requirements). At the Lorton renewable energy park, the anticipated height of the turbine towers is 120 feet.

Wind turbine components and height/power performance





Wind Turbines at Lorton Landfill

Constructing a vegetated berm around the landfill footprint would increase the top deck area available for installation of mid-scale wind turbines at heights above the surrounding terrain where higher, steadier, and more reliable wind speeds are available throughout the year. This will help ensure a more efficient and steady rate of power generation. The berm therefore allows the implementation of wind technologies at the energy park without the need for very tall turbines or increasing the planned height of the landfill.

Approximately 30 acres of the top deck area will be oriented favorably to the prevailing wind conditions. Assuming 5-7 acres are required per 1MW of wind power installed, the total area required for a 3MW wind power system is 15-21 acres, although wider spacing between turbines promotes greater efficiency. Furnace Associates Inc proposes to install a farm of 12 mid-sized 250 kilowatt (kW) capacity turbines rather than large-scale turbines. The electricity generated by the turbines would be distributed to the power grid.

The total power output of wind turbines fluctuates due to daily variations in wind speed and direction, turbulence effects from the ground, and other factors. However, assuming that Furnace Associates Inc installs twelve 250kW turbines at the Lorton Renewable Energy Park as planned to develop a 3MW wind farm, the combined power output of the turbines would be expected to be over 2.1 million kWh per year.

Illustrative view of installed turbines on top of completed landfill as seen from the Lorton Valley Development at 5th Place and Whitehaven Ct (Left) and Lorton Station at Potter's Hill Circle (Right)

What Type of Wind Turbine will be used?

Several options exist at the mid-sized scale (200-300kW) for wind turbines. Three examples from different manufacturers are provided below.

Aeronautica 29-225

Manufactured in: United States

Plate capacity:	225kW
Rotor height:	100-160 feet
No. of Blades:	3
Diameter of Blades:	100 feet

Wind Energy Systems WES30

Manufactured in: Netherlands

Plate capacity:	250kW
Rotor height:	100-160 feet
No. of Blades:	2
Diameter of Blades:	100 feet

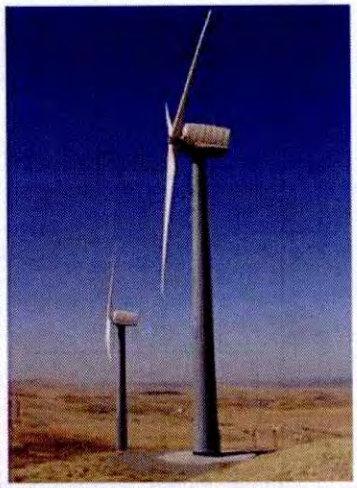
See more about this turbine model:

http://www.youtube.com/watch?v=ITtcv-Sefr8

Powerworks WEG MS-2

Manufactured in: United Kingdom

Plate capacity:	250kW
Rotor height:	85 feet
No. of Blades:	3
Diameter of Blades:	85 feet

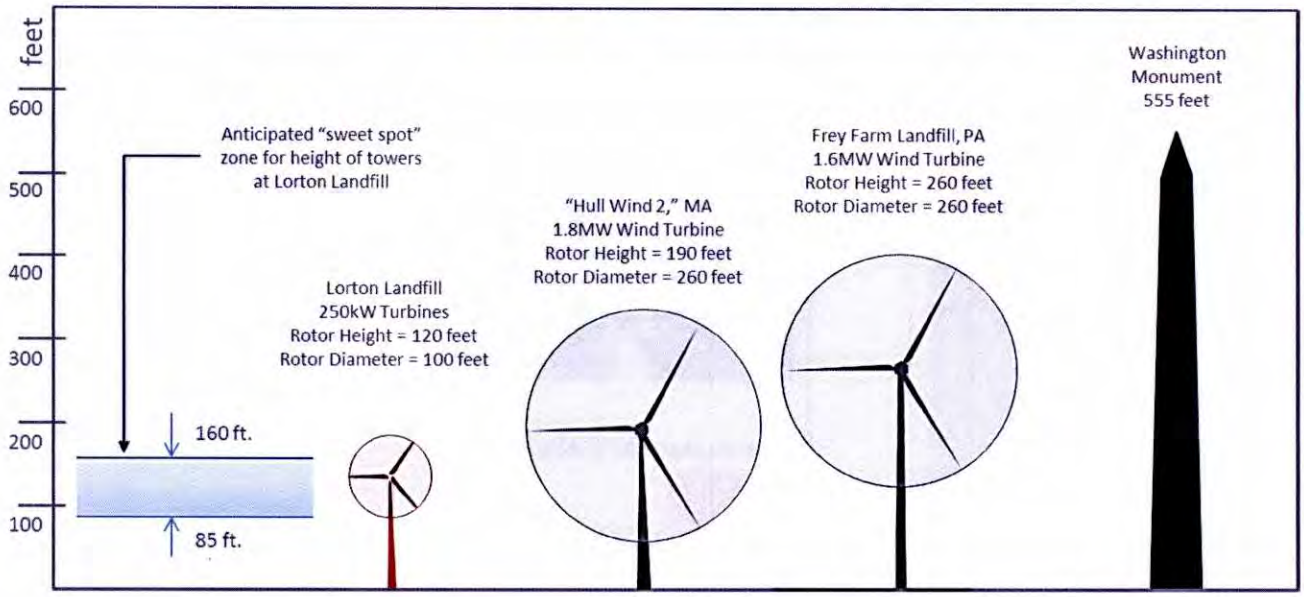


How big will the Wind Turbines be?

At this scale, most rotor swept area diameters are on the order of 100 feet, with tower heights varying from 85 to 160 feet depending on wind conditions. Due to their aerodynamic design, the width of a turbine blade varies from about three feet at the tip to ten feet near the center of the tower. Blades are typically manufactured from fiberglass reinforced polyester while towers are assembled from conical steel sections.

The mid-sized turbine intended for the Lorton Renewable Energy Park is shown on the scale chart below, relative to the Washington Monument, a well-known local landmark. For comparison, the size of two larger wind turbines used in landfill-based projects at sites in Pennsylvania and Massachusetts is also provided.

Scale of mid-sized turbines planned at Lorton relative to other turbines and landmarks



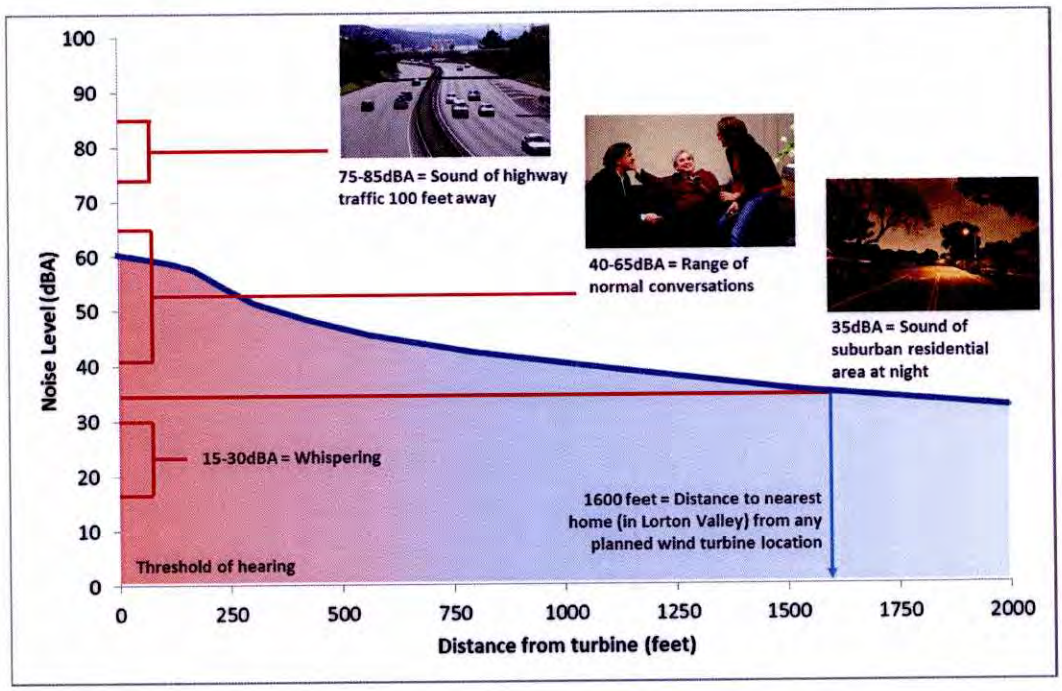
Environmental Benefits

Wind energy is a clean, non-polluting source of energy. Unlike conventional power plants, wind power plants emit no air pollutants or greenhouse gases. It is estimated that a 3MW wind system such as that proposed at Lorton would prevent the release of nearly 6 million pounds of carbon dioxide every year for the life of the system. That's equivalent to the average annual carbon dioxide emissions from over 1,500 cars.

Will the Turbines be very noisy?

Modern wind turbines produce negligible noise above the ambient backdrop of residential communities. The turbine blades produce a sound as they encounter turbulence in the air (similar to the sound made by wind passing through trees), but this noise is masked by the background noise associated with blowing wind. A modern mid-sized turbine a distance away of over 500 feet is no noisier than a kitchen refrigerator running normally.

Expected turbine noise levels at the Lorton Renewable Energy Park



Environmental noise is measured in decibel A-weighting (dBA). Each 10dBA increase in noise level represents about twice the amount of noise experienced (loudness). For example, 50dBA is twice as loud as 40dBA. Similarly, 60dBA is twice as loud as 50dBA and four times as loud as 40dBA. From the chart above, at a distance of 1,600 feet away from the turbines, the noise (at less than 40dBA) would be only 1/16th that of nearby traffic on I-95 (at about 80dBA) and less than half that of a normal conversation (at about 50dBA). The turbines would not add any noise above the ambient level of suburban residential areas at night.

Are there Potential Aesthetic or Environmental Impacts from Turbines?

Birds can fly into wind turbines, as they do with other tall structures; however, the collision rate of birds with turbines is reportedly very low, similar to that for electricity transmission lines. In fact, wind energy's overall impact on birds is extremely low compared to other human-related causes of death. Buildings (particularly with glass facades), communications towers, traffic, and house cats are responsible for far great numbers of bird deaths per year than wind turbines.

Lights would be required for the wind turbines contemplated for the Lorton Renewable Energy Park under Federal Aviation Administration (FAA) regulations for aviation safety. Not all the wind turbines, however, would need to be lighted – only certain turbines on the outside of the energy park layout would need lights. A dual lighting system which consists of red lights for nighttime and high or medium intensity flashing white lights for daytime and twilight is generally required.

This fact sheet was prepared for Furnace Associates Inc by Geosyntec Consultants utilizing information from a number of published sources. References and additional information can be

Geosyntec consultants

EXHIBIT 7

Wind Turbine Systems at Landfills in the United States

Furnace Associates, Inc.
10001 Furnace Road
Lorton, VA 22079-2604

As of December 2011, two successful landfill-based wind turbine systems have been installed in the United States and are fully operational. These projects have fewer turbines but the ones installed are significantly taller with larger rotors than those proposed for the Lorton Renewable Energy Park.

Frey Farm Landfill (Lancaster County, Pennsylvania)

Through a cooperative partnership, the Lancaster County Solid Waste Authority installed two wind turbines at Frey Farm Landfill in Conestoga, PA. The 3.2MW system became operational in January 2011 and provides 25% of the power needs at the adjacent Turkey Hill Dairy, makers of ice cream and other dairy products.

Photo courtesy of www.lcswma.org

Quick Facts

Size of Project:	Two 1.6MW turbines
Manufacturer:	General Electric (USA)
Capacity Factor:	27%*
Annual Output:	7.76 million kWh*
Tower Height:	260 feet
Rotor Diameter:	260 feet (3 blades)
Project Website:	http://www.pplrenewableenergy.com/wind.htm

* anticipated

"Hull Wind 2" (Plymouth County, Massachusetts)

Enthusiastic support for "Hull Wind 1," a 660kW publicly-owned turbine installed on the tip of the Hull peninsula in 2001, led to installation of the larger 1.8MW "Hull Wind 2" turbine on a landfill on the outskirts of town in 2006. Townsfolk have shown considerable pride in the two turbines, which supply over 10% of the town's electricity.

Quick Facts

Size of Project:	1.8MW turbine
Manufacturer:	Vestas (Denmark)
Capacity Factor:	24%
Annual Output:	3.74 million kWh
Tower Height:	190 feet
Rotor Diameter:	260 feet (3 blades)
Project Website:	http://hullwind.org

Geosyntec consultants
engineers | scientists | innovators

This factsheet was prepared for Furnace Associates, Inc. by Geosyntec Consultants utilizing information from several published sources. References and additional information can be provided on request.

GENERAL ELECTRIC TURBINES

FREY FARM LANDFILL, LANCASTER, PA

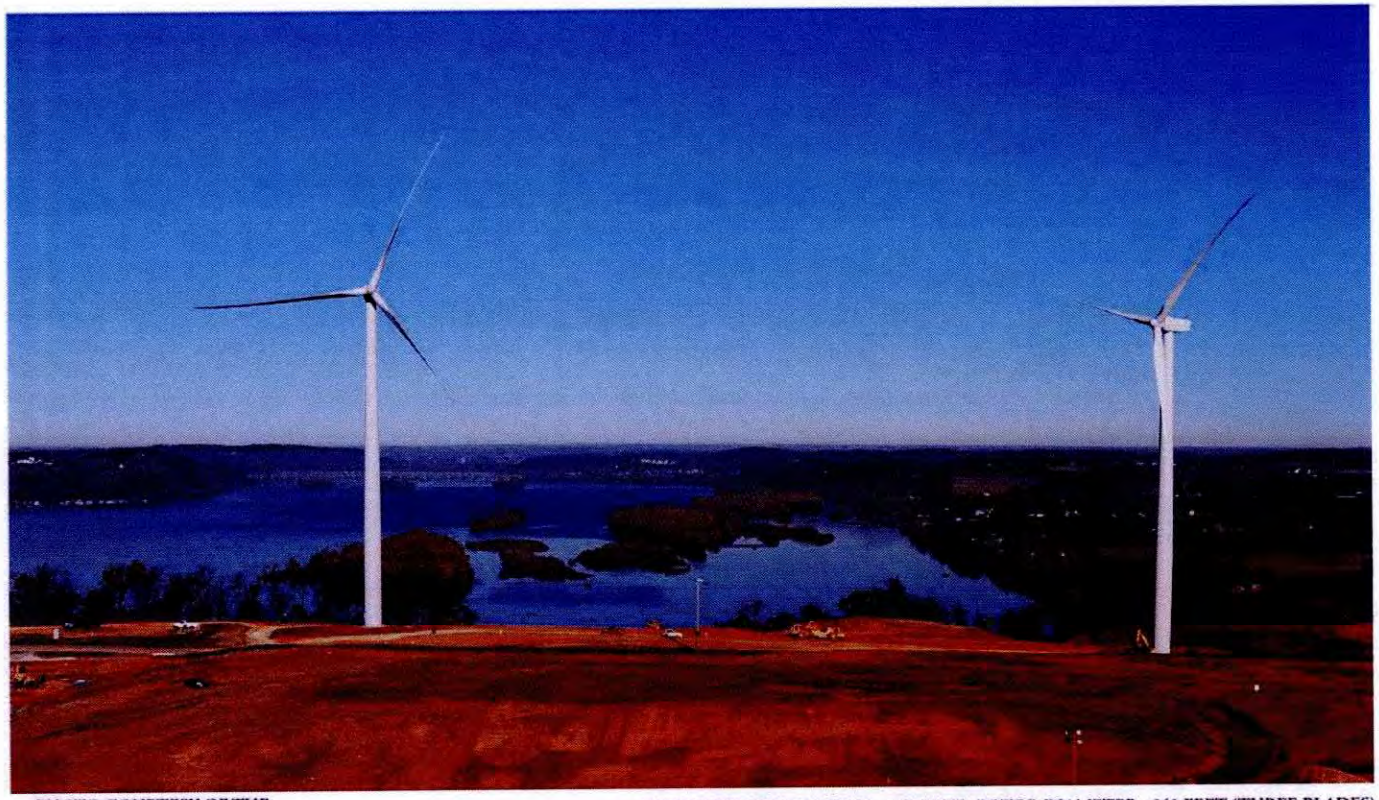


PHOTO COURTESY OF THE LANCASTER COUNTY SOLID WASTE MANAGEMENT AUTHORITY

TURBINE TOWER HEIGHT = 260 FEET. ROTOR DIAMETER =260 FEET (THREE BLADES)

LORTON GREEN ENERGY PARK

Lorton, Virginia

REVISED: JANUARY, 2012
PROJECT # 05107.01

HULL 'WIND 2' TURBINE

PLYMOUTH COUNTY LANDFILL, MA

TURBINE TOWER HEIGHT = 190 FEET. ROTOR DIAMETER =260 FEET (THREE BLADES)

LORTON GREEN ENERGY PARK

Lorton, Virginia

REVISED: JANUARY, 2012
PROJECT # 05117.01

EXHIBIT 8

Geosyntec consultants

COMPUTATION COVER SHEET

Client: Furnace Associates Inc. **Project:** Lorton Landfill **Project #:** MV0917 **Task #:** 2

TITLE OF COMPUTATIONS FINAL COVER GEOMEMBRANE PUNCTURE RESISTANCE

COMPUTATIONS BY:
Signature _____ 7/31/2013 DATE
Printed Name and Title: Lin Chai, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY: (Peer Reviewer)
Signature _____ 7/31/2013 DATE
Printed Name and Title: Chunling Li, Project Engineer

COMPUTATIONS CHECKED BY:
Signature _____ 7/31/2013 DATE
Printed Name and Title: Chunling Li, Project Engineer

COMPUTATIONS BACKCHECKED BY: (Originator)
Signature _____ 7/31/2013 DATE
Printed Name and Title: Lin Chai, Staff Engineer

APPROVED BY: (PM or Designate)
Signature _____ 8/1/2013 DATE
Printed Name and Title: Thomas B. Ramsey, Associate

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

FINAL COVER GEOMEMBRANE PUNCTURE RESISTANCE

PURPOSE

The purpose of this analysis is to evaluate the ability of the geomembrane cap used at Lorton landfill to resist puncture damage resulting from development of wind towers on the landfill. In order for the geomembrane to work efficiently as a barrier layer, puncturing of the geomembrane should be minimized.

METHOD

The factor of safety against puncture (FS) resistance for a given loading condition is defined as the ratio of the allowable force (F_{allow}) to the required force ($F_{required}$) and given as:

$$FS = \frac{F_{allow}}{F_{required}} \tag{1}$$

For this analysis, the factor of safety is calculated based on an estimate of the actual force acting on the geomembrane ($F_{required}$) for a series of assumed loading conditions (i.e., construction traffic) and the allowable force on the geomembrane surface (F_{allow}) is calculated according to the design methodology proposed by Koerner [2005]. The resulting factors of safety for each of the loading conditions are compared to the minimum design criteria and the outcome is reported.

ANALYSIS

Geomembrane Allowable Pressure

The allowable pressure on the geomembrane (p_{allow}) is computed based on the methodology presented by Koerner [2005]. The governing equation for the methodology presented by Koerner is as follows:

$$p_{allow} = \left(50 + 0.00045\,\frac{M}{H^2}\right) \times \left(\frac{1}{MF_S \times MF_{PD} \times MF_A}\right) \times \left(\frac{1}{RF_{CR} \times RF_{CBD}}\right) \tag{2}$$

where:

p_{allow}	=	Allowable pressure on geomembrane, (kPa)
M	=	Mass per unit area of a protective geotextile separation layer, (g/m^2)
H	=	Height of protrusions within the adjoining soil mass, (m)

MF_S = Modification factor for protrusions shape
MF_{PD} = Modification factor for packing density
MF_A = Modification factor for arching in solids
RF_{CR} = Reduction factor for creep
RF_{CBD} = Reduction factor for chemical and biological degradation

For the analysis presented herein the protection provided by an overlying geotextile filter is conservatively neglected and the first term in equation 2 is replaced with a value F_{lab}, which is defined as the ultimate puncture resistance (force, lbs) of the geomembrane as measured according to the procedure, *Standard Test Method, for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products*, ASTM D4833. The revised equation is presented as follows:

$$F_{allow} = (F_{lab}) \times \left(\frac{1}{MF_S \times MF_{PD} \times MF_A}\right) \times \left(\frac{1}{RF_{CR} \times RF_{CBD}}\right) \quad (3)$$

The second term in equation 3 involves modification factors to account for shape, packing density and arching of soil used. The modification factors used in current calculations are based on Koerner [2005] and presented in Table 1.

Table 1: Modification factors for geomembrane puncture

Notation	*Modification Factor for Cover System Geomembrane*	
	Factor	Comments
MF_S	1.0	Angular particles (conservative)
MF_{PD}	1.0	Isolated protrusions (conservative)
MF_A	1.0	Hydrostatic conditions (conservative)

The third term in equation 2, RF_{CR} and RF_{CBD}, represents the reduction factors to account for long term creep and degradation of the geomembrane. Geomembrane puncture damage for protrusion height smaller than 12 mm is usually not explicitly addressed in the literature because such small protrusions are not expected to damage the geomembrane. As the maximum particle size for silt layer (4.75 mm) was less than 12 mm, the geomembrane puncture damage reduction factors under worst case scenario are assumed based on values provided by Koerner [2005]. The reduction factor for creep, RF_{CR}, is assumed to be 1.5. Because the water in the final cover system is relatively clean, the reduction factor for chemical and biological degradation, RF_{CBD}, is assumed to be value of 1.1, which corresponds to the mild leachate conditions. Reduction factors used are summarized in Table 2.

Table 2: Reduction factors for geomembrane puncture

Notation	*Cover System - 40mil HDPE Geomembrane*	
	Factor	Comments
RF_{CR}	1.5	For protrusion height of 12 mm
RF_{CBD}	1.1	Mild leachate conditions

Typical puncture resistance values of geomembrane were obtained from experimental results from GRI (2012). The values for 40 mil HDPE geomembrane are 72 lbs for smooth geomembrane and 60 lbs for texture geomembrane (see Figure 2). For this analysis, the puncture resistance is conservatively assumed to be 60 lbs.

Based on above inputs, the allowable force on geomembrane is calculated as:

$$F_{allow} = (60) \times (\frac{1}{1.0 \times 1.0 \times 1.0}) \times (\frac{1}{1.5 \times 1.1}) = 36.4 lbs\ (0.16 kN)$$

For the sand and silt materials typically used for the final cover soil, the maximum particle size is typically less than 5 mm. Because information of geomembrane puncture damage for particle sizes smaller than 12 mm is not addressed in the literature, a maximum particle size of 12 mm is conservatively assumed in this analysis. Assuming that the full diameter of the particle is in contact with the geomembrane, the allowable pressure applied by the particle to the geomembrane is calculated as follows:

$$p_{allow} = \frac{F_{allow}}{\left(\pi\ D_{average}^{2} / 4\right)} = 0.16 kN\ /\ \left(\frac{3.14 \times (12/1000\,m)^2}{4}\right) = 1{,}415 kPa\ (205\,psi)$$

Geomembrane Required Pressure (Design Load)

The total vertical stress on the geomembrane is calculated as the sum of the overlying soil pressure and the pressure exerted by the construction equipment as follows:

$$p_{act} = (\gamma_{ave} \times T) + q_{eqp} \qquad (3)$$

where:

p_{act} = vertical stress on the geomembrane
γ_{ave} = average unit weight of the material above geomembrane
T = thickness of the soil material above geomembrane
q_{eqp} = equipment ground pressure

AASHTO (American Association of State Highway and Transportation Officials) design truck model is used for ground pressure calculation demonstration. For example, an AASHTO HS-25 truck (see Figure 3) has three axles: one steering axle (single tire) and two rear axles (dual tires). Steering axle includes two wheels (one tire for each wheel) and caries 10,000 lbs load. Each rear axle includes two wheels (two tires for each wheel), and carries 40,000 lbs load. *The tire contact area of a wheel consisting of one or two tires is assumed to be a single rectangle, whose width is 20.0 in. and whose length is 10.0 in.* (AASHTO, 2007). Therefore, the ground pressure for front axle and rear axle can be calculated as follow:

Front Axle: 10,000 lb / (20 × 10 × 2) in^2 = 25 psi.
Each Rear Axle: 40,000 lb / (20 × 10 × 2) in^2 = 100 psi.

As a result, equipment ground pressure, q_{eqp}, for this truck is 100 psi for design calculation. Figure 4 summarized the equipment ground pressures (surface pressures) for different types of vehicles. Ground pressure values of two types of trucks are selected for this analysis: Loaded Dump Truck (75 psi) and Concrete-In-Transit Mixer Truck (95 psi).

For this evaluation, it is assumed that the soils overlying the geomembrane include, from top to bottom, 1 ft gravel and 2 ft of protective cover soil (see Figure 1). Assume the gravel and cover soil have the same unit weight of 120 pcf. Table 3 presents the required information about the assumed construction equipment and the calculated design pressures.

Table 3: Construction Equipment Information and Calculated Design Pressures

Load Type	Ground pressure q_{eqp} (psi)	Vertical Stress p_{act} (psi)
Loaded Dump Truck (1)	75	77.5 (2)
Concrete In – Transit Mixer Truck (1)	95	97.5 (2)

Notes:
(1) Equipment data taken from NDS;
(2) Including one foot of overlying soil with a unit weight 120 pcf;
(3) Assuming 2 ft of overlying cover soil with a unit weight of 120 pcf.

Factor of Safety against Puncture Failure

The factor of safety against puncture resistance for the load above the geomembrane is calculated based on equation 1. The results for factor of safety (FS) values for the most critical case are shown in Table 4.

Table 4: Factor of safety for geomembrane puncture

Case Description	Allowable Pressure on Geomembrane p_{allow} (psi)	Applied Pressure on Geomembrane p_{act} (psi)	Factor of safety, $FS=p_{allow}/p_{act}$
Concrete In – Transit Mixer Truck	205	97.5	2.13

SUMMARY

Based on the analysis presented here, the typical construction truck operating with one foot of gravel and two feet of cover soil will not compromise the geomembrane puncture resistance. Other vehicles with equal or lower ground pressures may also operate safely.

REFERENCES

AASHTO, *LRFD Seismic Bridge Design*, American Association of State Highway and Transportation Officials, first edition, 2007.

ADS, *Drainage Handbook*, ADS, Inc., pp 2-13, April 2011.

"Foundations and Earth Structures Design Manual 7.2", Department of the Navy, Naval Facilities Engineering Command, Alexandria, Virginia, May 1982.

GRI, "*GRI Test Method GM13: Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes*", Geosynthetic Institute, Folsom, PA, 2012.

Koerner, R. M., *Designing with geosynthetics*, Pearson-Prentice Hall Publ. Co., Upper Saddle River, NJ, 796 pgs, 2005.

Narejo, D., Koerner, R.M. and Wilson Fahmy, R.F., 1996, "Puncture Protection of Geomembranes Part II: Experimental", *Geosynthetics International*, Vol. 3, No. 5, pp. 629-653.

NDS, *Permeable Pavement Axle Loads and Surface Pressure*, NDS, online resource: http://www.ndspro.com/images/stories/pdfs/permeable-pavers/nds-permeable-paving-axle-load-surface-pressure.pdf

FIGURES

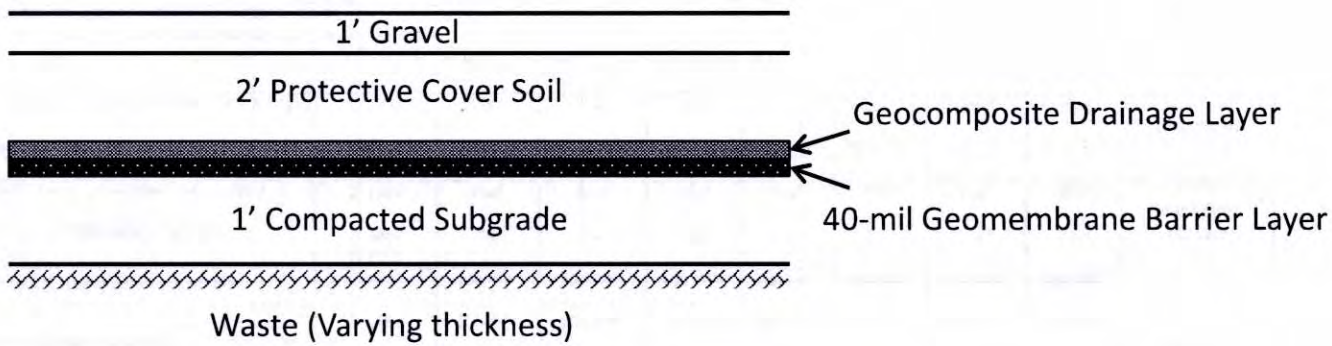
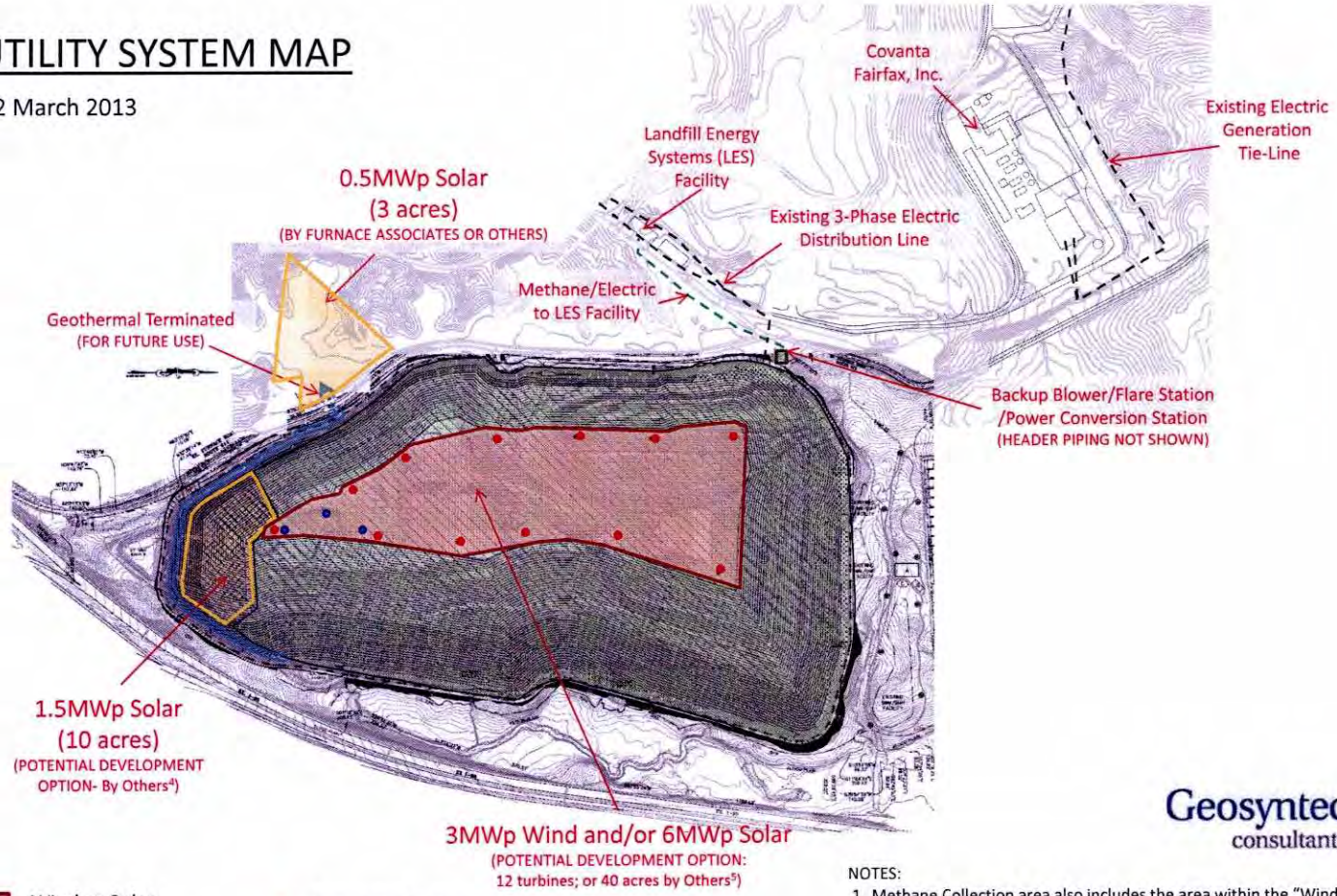


Figure 1. Cross Section of Cover Access Road (not to scale).

EXHIBIT 9

UTILITY SYSTEM MAP

22 March 2013



Geosyntec consultants

- Wind or Solar Electric Generation[5]
- Solar Electric Generation
- Methane Collection[1]
- Geothermal Infrastructure[2]
- Potential Future Wind Turbine (by others)
- Phase 1 Wind Turbine (by Applicant)[3]

NOTES:

1. Methane Collection area also includes the area within the "Wind or Solar Electric Generation" area.
2. Geothermal Infrastructure piping to be installed with the landfill operations and terminated for future use
3. The initial three (3) wind turbines to be constructed by the Applicant during Phase 1 of the landfill development and then removed after their useful life in accordance with the landfill phasing plans.
4. Potential Solar development options available within Phase 5 of the landfill development.
5. At the conclusion of Phase 5 of development, the area denoted could include 12 turbines or include additional solar development by others.

EXHIBIT 10

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-5158-OE

Issued Date: 11/29/2012

Paul Farrell, P.E.
EnviroSolutions, Inc
11220 Assett Loop
Suite 201
Manassas, VA 20109

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Met Tower Anemometer
Location:	Lorton, VA
Latitude:	38-41-25.57N NAD 83
Longitude:	77-13-58.85W
Heights:	355 feet site elevation (SE)
	165 feet above ground level (AGL)
	520 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, paint/red lights - Chapters 3(Marked),4,5(Red),&12.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

While the structure does not constitute a hazard to air navigation, it would be located within or near a military training area and/or route.

This determination expires on 05/29/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-5158-OE.

Signature Control No: 172490261-177948694 (DNE -WT)
Michael Blaich
Specialist

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-5150-OE

Issued Date: 12/10/2012

Paul Farrell, P.E.
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Manassas, VA 20109

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Wind turbine
Location:	Lorton, VA
Latitude:	38-41-05.72N NAD 83
Longitude:	77-14-04.64W
Heights:	380 feet site elevation (SE)
	160 feet above ground level (AGL)
	540 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

While the structure does not constitute a hazard to air navigation, it would be located within or near a military training area and/or route.

This determination expires on 06/10/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-5150-OE.

Signature Control No: 172320788-178595590 (DNE -WT)
Michael Blaich
Specialist

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-5151-OE

Issued Date: 12/10/2012

Paul Farrell, P.E.
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Manassas, VA 20109

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Wind turbine
Location:	Lorton, VA
Latitude:	38-41-01.27N NAD 83
Longitude:	77-14-01.60W
Heights:	380 feet site elevation (SE)
	160 feet above ground level (AGL)
	540 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

While the structure does not constitute a hazard to air navigation, it would be located within or near a military training area and/or route.

This determination expires on 06/10/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-5151-OE.

Signature Control No: 172320999-178595591 (DNE -WT)
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Specialist

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Aeronautical Study No.
2012-WTE-5152-OE

Issued Date: 12/10/2012

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**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Wind turbine
Location:	Lorton, VA
Latitude:	38-41-09.94N NAD 83
Longitude:	77-14-01.34W
Heights:	380 feet site elevation (SE)
	160 feet above ground level (AGL)
	540 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

While the structure does not constitute a hazard to air navigation, it would be located within or near a military training area and/or route.

This determination expires on 06/10/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-5152-OE.

Signature Control No: 172321183-178595592 (DNE -WT)
Michael Blaich
Specialist

EXHIBIT 11

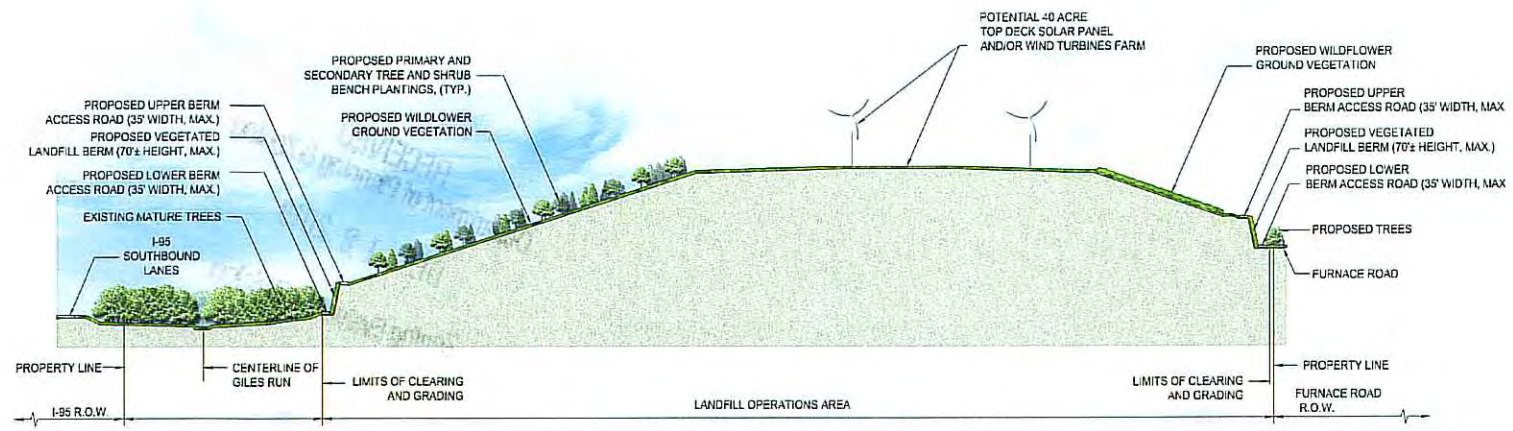
SUMMARY OF OPERATING AND PROPOSED LANDFILL-BASED WIND TURBINE PROJECTS
FURNACE ASSOCIATES, INC.

PREPARED BY GEOSYNTEC CONSULTANTS, 24 JULY 2013

Wind Turbine Project Name	Location	Status	Owner	Regulator	Turbine Information			Turbine details (see note 3)	More information
					Manufacturer	Capacity	Tower Height		
Operating, on-mound wind turbines									
Hull Wind 2	Hull, Ma	Operating since May 2006	Town of Hull	Mass DEP	Vestas V80	1.8 MW	200 ft	On-mound pile foundation	http://www.mass.gov/dep/energy/hull2.pdf
Kingston Landfill	Kingston Southeast, MA	Operating since June 2012	Town of Kingston	Mass DEP	Hyundai	1.8 MW	200-ft	On mound pile foundation	http://www.mass.gov/eea/agencies/massdep/service/energy/landfills/landfills-with-post-closure-use-permits-for-renewables.html
Karlsruhe West Landfill Windmill	Karlsruhe, Germany	Operating since 1999, 2000, 2003		State of Baden-Wurttemberg		750 kW (2), 1.5 MW (1)	280-ft (3)	On mound-domeshaped foundation	http://www.energieforum-karlsruhe.de/index.php?id=61&l=1
Frottmaning Landfill	Munich, Germany	Operating since 1999		No regulations (see Note 1)	Enercon E-66	1.5 MW	230-ft	On-mound footing with four hydraulic "safety foundations"	http://en.structurae.de/structures/data/index.cfm?id=s0060163
Windfarm Neu Wulmstorf	Hamburg, Germany	Operating since 2001				600 kW (3)		concrete foundation	http://vcsewiki.czp.cuni.cz/w/images/9/9d/13-DepNW-Soi-Wind-eng3.pdf
Confidential Site UK	UK landfill	Operating - no info	Pharmaceutical company		Norden N90	2.5 MW	262-ft	Deep foundations with pylons	from case study by Chunling Li
Wood County Landfill	Bowling Green, OH	Operating - Nov 2003	City of Bowling Green Public Utilities, American Municipal Power - Ohio, and Green Mountain Energy Corporation		Vestas	1.8 MW (4)	256-ft	off-mound	http://www.wcswmd.org/turbine.html
Columbia Ridge Recycling and Landfill	north central Oregon	Operating	Waste Management			100 MW (67)		off-mound	http://wmnorthwest.com/landfill/columbiaridge.htm
Frey Farm Wind	Lancaster County, PA	Operating since Jan 2001	Lancaster County SWMA	PA DEP	General Electric	1.6 MW (2)	262-ft	Off-mound	http://www.pplrenewableenergy.com/NR/rdonlyres/7B21A6BC-C8EA-45A5-A0FD-D983E8186A1F/22775/FreyFarmWind20110620.pdf
Proposed Wind turbines on landfill									
Fresh Kills Landfill	Staten Island	Proposed	NYDPR	NYDEC		2.5 MW (7)		On mound	http://www.statenislandusa.com/pdf/FreshKillsWindFarmFinalSummary.pdf
Madaket Wind Turbine Project	Nantucket, MA	Proposed (See Note 2)	Town of Nantucket			900 kW		Off-mound	http://www.madaketwind.org/
Carnaby Site	Yorkshire, UK	Approved - should have been operational since summer 2012 but couldn't find confirmation		East Riding of Yorkshire Council		3 MW (2)			http://www.edie.net/news/6/First-wind-turbines-approved-for-former-landfill-site/19725/
Burntstump Landfill	Arnold, UK	Proposed		Gedling Borough Council		11 kW	90-ft	.	http://www.thisisnottingham.co.uk/Wind-turbine-built-landfill-site-near-Arnold/story-17527465-detail/story.html#axzz2zuVoUrQ
Wind Turbine on a Landfill Site	Eastern England	Proposed - investigation						Pile foundations on mound recommended	http://www.slrconsulting.com/projects/wind-turbine-on-a-landfill-site

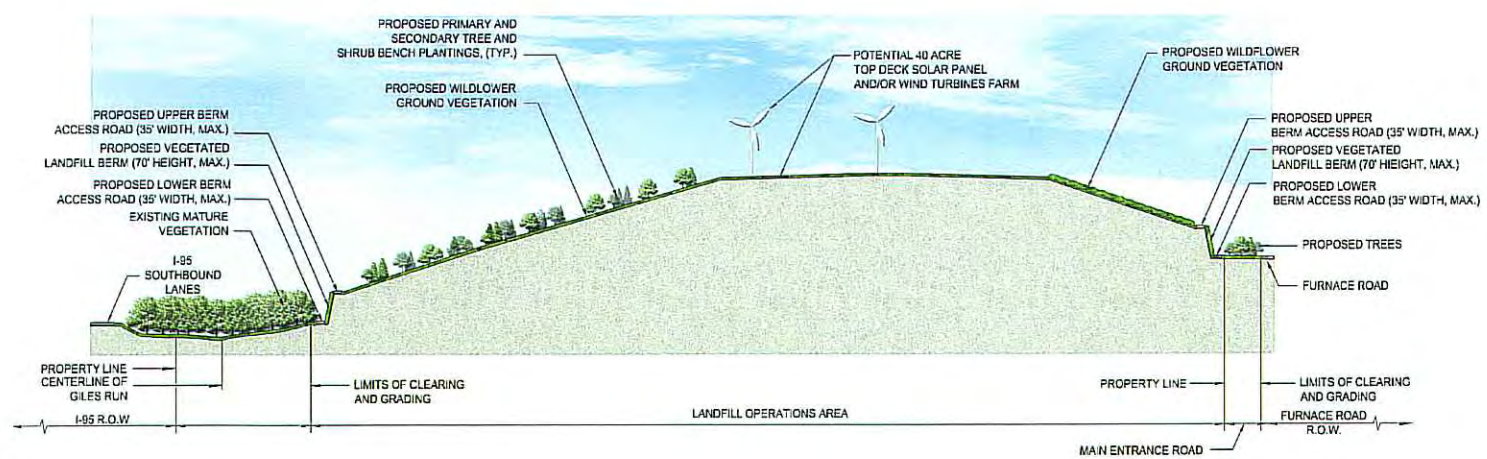
Notes:
1.Because the landfill was closed before the currently applicable landfill closure and cover system regulations were enacted
2. Project placed on hold after voters on annual town meeting voted 62%-38% agains Wind Turbine Funding

ILLUSTRATIVE SECTIONS



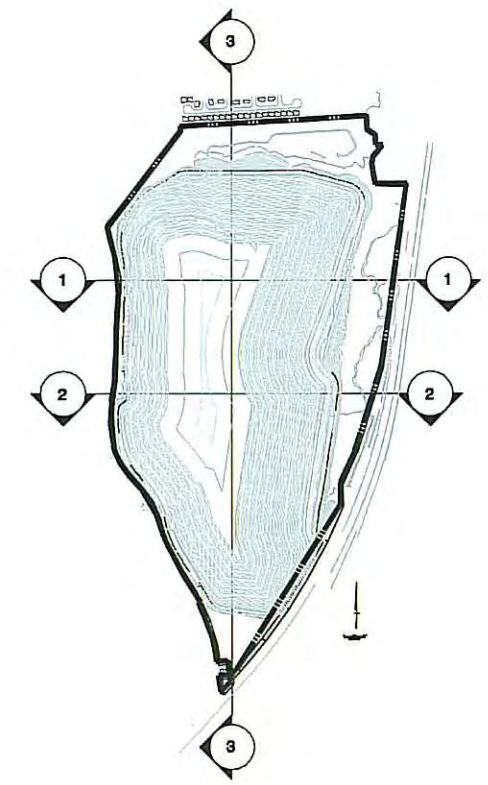
1 EAST-WEST SECTION
SECTION

SCALE 1" = 2

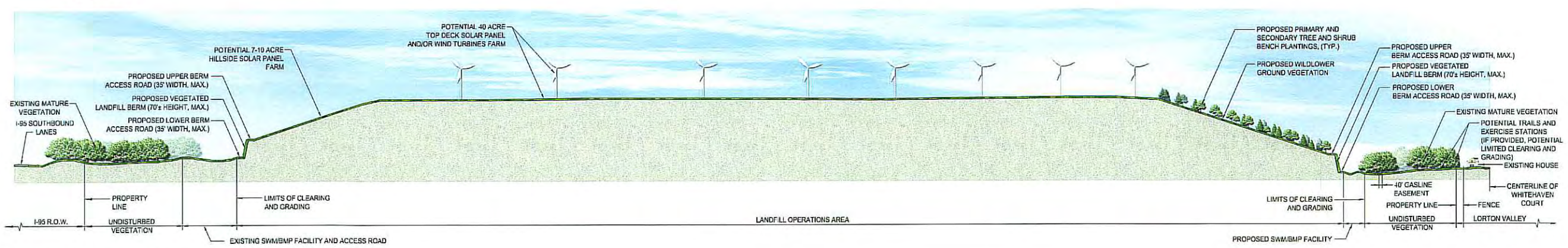


2 EAST-WEST SECTION
SECTION

SCALE 1" = 200'



KEY MAP
NO SCALE



3 NORTH-SOUTH SECTION
SECTION

SCALE 1" = 200'

PROPOSED LORTON LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

DECEMBER 11, 2013

APPENDIX 2C

SEA 80-L/V-061-2 - Lorton Landfill
Accessory Use Determination Request for Three Pilot Wind Turbines

The following information pertains solely to three wind turbines proposed to be installed by the Applicant (Furnace Associates, Inc.) by the end of the first phase of landfill development, as shown on the SEA Plat dated December 10, 2013. These three turbines would be removed by the Applicant at the beginning of final Phase 5 to enable filling and capping of that area hosting the turbines prior to landfill closure. The three wind turbines are an integral part of the pilot renewable energy program which would consist of four renewable energy elements within a single site. While it's not unusual to see wind turbines located on landfills, approval and implementation of this application would be unique in the United States because it will be the only site with four renewable energy uses. The Lorton Landfill is uniquely situated due to its proximity to a substantial water body and its elevation, giving it access to wind speeds adequate to support the turbine function. The Applicant submits that these three wind turbines clearly would constitute an "accessory use" because the majority, and ultimately all, of electricity generated by the turbines would be consumed by landfill facilities.

These three pilot wind turbines would be anticipated to become fully operational in 2019 and remain until approximately 18 years until their removal at the beginning of Phase 5. **The combined annual electricity production of the three turbines is estimated by the renewable energy experts at Geosyntec Consultants ("Geosyntec") to be approximately 585,139 kWh direct current ("DC") and 450,557 kWh after the requisite conversion to alternate current ("AC").** Such conversion is required whether for use on-site or for use delivered from the grid, and results in a loss of energy produced by the turbines. Furnace Associates will commit to install an "inverter" or similar device to accomplish such conversion to AC.

As with any development project, infra-structure capacity provided at the outset will exceed initial demand from the project, but that demand will increase to full capacity during build-out. Similarly, electrical energy consumption by the "principal use" (the landfill) will increase incrementally as landfill activities progress and related support facilities (such as pumps associated with the extraction of leachate, and methane gas recovery infrastructure) are installed and increase demand for electricity.

Geosyntec has estimated that during Phase 1, within the first year or two of full turbine operation, energy consumption by the landfill will be 213,488 kWh, or roughly 47 percent of the electricity produced by the three wind turbines (450,557 kWh after conversion to AC). We anticipate that early in Phase 2 annual electricity consumption will be approximately 340,652 kWh, or roughly 76 percent of wind turbine AC production. Within approximately 6 to 7 years after initiating operation of the three wind turbines, landfill electrical consumption is expected to exceed electricity production by the three wind turbines.

This data are projections based on reasonable assumptions made by engineers experienced in designing landfills and renewable energy systems in the United States and internationally. Beginning early in their useful life, these three wind turbines will become the primary supplier of electricity powering landfill operations. The operation of wind turbines powering landfilling activities, provided in conjunction with three other renewable energy components, would be unique in the United States and further lend to the importance of data associated with this pilot program. Whenever electricity production by the turbines cannot meet landfill demand, the balance of electrical needs will be obtained from the grid.

Geosyntec consultants
9211Arboretum Parkway, Suite 200
Richmond, Virginia 23236
PH 804.767.2206
FAX 804.767.2182
www.geosyntec.com

Memorandum

Date: 30 January 2014 (Revised)

To: Conrad Mehan – Furnace Associates, Inc.

From: Scott Sheridan, P.E. and Kyle LaClair, P.E. – Geosyntec Consultants

Copies: Gary Hewes and Paul Farrell – Furnace Associates, Inc.
Frank McDermott – Hunton & Williams, LLP

Subject: Technical Clarifications for Fairfax County Consideration
Lorton Landfill, Fairfax County, Virginia

As requested by Furnace Associates, Inc. (FAI) on 15 January 2014, Geosyntec Consultants (Geosyntec) has prepared this memorandum (memo) to provide additional engineering responses on the following technical topics, based on ongoing discussions between FAI and Fairfax County staff pursuant to the Special Exception Amendment Application 80-L/V-061-2 (SEA-2).

A. Elaborate on how the earthen berm is installed, its structural integrity, and the benefits of the berm as it relates to the overall stability of the landfill;

B. Discuss the environmental benefits of two layers of synthetic liner as it relates to reducing leachate generation within the existing portion of the landfill;

C. Discuss the location of the proposed limits of debris in proximity to the Resource Protection Area (RPA) and why moving the limits of debris closer to the RPA is not an environmental threat.

D. Describe the need for and use of retaining walls on the eastern portion of the property as shown in the SEA application; and,

E. Highlight the benefits of adding leachate tanks to the SEA application.

These topics discussed below serve as general discussion only and are based on conceptual designs and preliminary site investigations by Geosyntec, as well as our experience and that of the industry as a whole. Details of the final berm design related to each topic will be determined upon the continuation of the permitting process through Fairfax County and the Virginia Department of Environmental Quality (DEQ). Fairfax County's Geotechnical Review Board (GRB) and DEQ must review and approve the berm design before any permit authorizing its construction will be issued.

A. Vegetated Earthen Berm Design and Installation

The following sections provide general discussion of the design and installation of the vegetated earthen berm. Benefits to the overall stability of the landfill will be highlighted.

Landfill Earthen Berm Components

An engineered earthen berm consists of reinforced berm fill characterized by exterior (i.e., away from the landfill) and interior slopes (i.e., towards the landfill) as shown in Detail 4 of Drawing 15 in the SEA Plat. The earthen berm is designed to act as a buttress allowing for an increase in the elevations to which debris can be placed on the side slopes with relatively minimal impact to the site. An earthen berm consists of three general components depicted in Figure 1, the reinforced zone, the non-reinforced zone, and the facing.

Berm Facing

The earthen berm facing forms the exterior vegetated slope that is shown in Detail 4 of Drawing 15 in the SEA Plat. The design of the earthen berm face includes a configuration of welded wire baskets, struts, facing geogrid, erosion control mat, select fill, and topsoil that are designed to facilitate installation and provide a suitable zone for establishment of a sustainable vegetative cover over the exterior slope. The welded wire baskets simply function as a temporary installation form that allows for the placement of the other facing components. The baskets are intended to slowly degrade over time and are not intended or relied upon to provide stability to the earthen berm. Of particular importance in the facing is the function and design of the facing geogrid. The facing geogrid in conjunction with the berm geogrid provides stability in the vegetated berm face.

Reinforced Zone

The reinforced zone consists of berm geogrid and berm fill placed in lifts and is located in the portion of the berm closest to the face. The reinforced zone interacts with the facing to allow for the near vertical exterior slope. Each lift is typically 18 inches thick with the berm geogrid underlying the structural fill, and each lift is typically placed in two 9-inch thick compacted layers. The berm geogrid provides stabilizing reinforcement of the berm and is designed with varying embedment lengths and allowable strengths determined from the design calculations conducted to verify a strength and stability consistent with industry standards; these characteristics vary based on topography and subsurface soil conditions.

Non-Reinforced Zone

The non-reinforced zone consists of bulk structural fill material. The zone is adjacent to the reinforced zone and makes up the landfill side of the berm. The non-reinforced zone rests on the

landfill side slope and is characterized by the inner slope which buttresses the additional debris placed on the landfill side slope.

Design of the Berm

Design Calculations

Earthen berms in a landfill context are designed using many calculations and are required to meet stringent design standards. The intent of an earthen berm design is to determine appropriate geogrid and berm fill parameter values. The calculations used to design an earthen berm include the following:

- External global stability;
- Internal global stability;
- Bearing Capacity;
- Berm Sliding;
- Berm Overturning;
- Berm Eccentricity;
- Geogrid Rupture;
- Geogrid Pullout.

These calculations are conducted using design software developed specifically to design earthen berms and evaluate their stability. For example Slide, developed by Rocscience, Inc., will be used to evaluate the external and internal global stability of the berm. Additionally, MSEW, developed by ADAMA Engineering, will be used to evaluate berm sliding, overturning, and eccentricity along with geogrid pullout and rupture. After the models are prepared for each software package, various conditions are evaluated. The goal of the design is to determine berm fill and geogrid properties that will satisfy the standards required for each design evaluation.

Design Standards

The required parameter values for geogrid and berm fill are adjusted to ensure compliance with the factors of safety according to the Federal Highway Administration Publication No. FHWA-NHI-10-025 (reinforced slope circular) and the solid debris regulations provided in the Virginia Administrative Code (VAC) Section 9 VAC 20-81 (solid waste regulations). The reinforced slope circular provides guidance and direction for the design of the earthen embankment with recommended factors of safety. The Virginia solid waste regulations provide requirements for minimum factors of safety for the stability of landfill components, such as the earthen embankment. A factor of safety is the ratio of the forces resisting movement and the forces driving movement. For example, a factor of safety equal to "two" indicates the forces resisting movement are twice as large as forces driving movement. Virginia solid waste regulations require that the earthen berm have a factor of safety for stability of 1.5.

Other key components of the design include the following:

- Berm fill. Technical specifications for the berm fill material will be developed during the design process and must be approved by the GRB and DEQ. The purpose of the technical specification for berm fill material is to provide the parameters and construction techniques required for the fill material to meet the assumptions used in the design. Granular fill material is preferred; however, optional designs are often incorporated to allow for more fine grained materials to be used. These alternate designs may include back and base drains to allow the free flow of water away from the reinforced zone or encapsulation of the berm fill with an impermeable barrier, as approved by the GRB and DEQ.

- Stormwater design. The stormwater system on top of an earthen berm is designed to direct stormwater away from the face of the berm and the reinforced zone and into a perimeter stormwater channel. The stormwater channel will convey runoff into a series of pipes and catch basins that will discharge the runoff away from the berm and into stormwater basins.

Construction Standards

Virginia solid waste regulations further require an extensive system of construction quality assurance (CQA) prior to and during construction to verify that the construction satisfies the intent of the design. CQA activities include analytical testing, field testing, and field observations, and these activities are described in a CQA Plan that must be approved by DEQ. Analytical testing will be conducted prior to and during construction to evaluate whether or not material properties satisfy the properties required by the technical specifications. Materials that do not satisfy the technical specifications will be rejected from their intended use.

Field testing will be conducted during construction according to the technical specifications and the CQA Plan. For example, the berm fill is required to be compacted to a minimum of 95 percent of the fill's maximum dry density, which is determined during preconstruction and construction analytical testing. Additionally, the moisture will be restricted to a range around the optimal moisture content. This is particularly critical for the placement of fine grained materials. Moisture conditioning, including adding water to or drying back the berm fill, will be required to meet the required moisture content range. To verify that the placement of the berm fill satisfies the requirements of the technical specifications, certified third-party construction quality assurance (CQA) personnel will be onsite full-time. Among many other responsibilities the CQA personnel will test the compaction and moisture content of the berm fill as it is placed. Any portion of the berm fill that does not satisfy the technical specifications will be reworked until specifications are achieved.

CQA personnel will also observe construction on a full-time basis, preparing daily field reports describing the activities conducted during the day. The daily field observations along with analytical and field testing will be combined into a construction documentation report in which construction will be certified by a professional engineer. The report is required by the Virginia solid waste regulations, and its acceptance by the DEQ is a necessary pre-requisite for the operation of landfill activities within the respective berm area.

Benefits of the Berm

An earthen berm provides strengthening of the materials beneath the footprint of the berm and a resisting force to the debris that rests against the berm's interior slope. Specifically, for the Lorton Landfill, the earthen berm also allows for the flattening of steep landfill side slopes. Each of these functions is described in more detail below.

Strengthening of the Foundation

An earthen berm provides strengthening of underlying materials. The earthen berm exerts a downward force on the material on which it rests due to the weight distributed over a broad base. The berm compresses the underlying materials and squeezes water out of the pores of the subgrade material. This process allows the material to compress and strengthen. The magnitude of this effect is greater the closer to the base of the berm. The result of this effect of the berm is the strengthening of the underlying materials on which the berm rests.

Resisting Force

The debris placed on the side slopes exerts a force in an outward direction (i.e., away from the landfill). If not properly resisted, the side slope can become unstable and fail. An earthen berm provides a resisting force with a magnitude sufficient to resist the outward force of the debris on the landfill side slope; in fact, the resisting force is typically designed to be at least twice the magnitude of the outward force.

Improved Stability of the Landfill

The earthen berm provides improved landfill stability through both improved global stability and veneer stability. Global stability refers to the stability of the underlying foundation and debris mass of the landfill, and veneer stability refers to the stability of the surficial layers on the side slopes of the landfill. Both are dependent on the slope of the landfill. The closed side slopes along the eastern edge of the landfill have been certified by a professional engineer and accepted by the DEQ as satisfying permit requirements and meeting existing factors of safety for the global stability and the veneer stability, i.e., 1.4 and 1.2, respectively. The use of an earthen berm at the Lorton Landfill will allow for the flattening of the side slopes in certain sections of the landfill; in fact, the design of the earthen berm and the new slope of the landfill will satisfy

the current standard of a minimum factor of safety of 1.5. By meeting the current standard the earthen embankment will improve the stability of the landfill.

Other Advantages

Earthen berms can provide advantages over other means of grade change as stated below:

- An earthen berm is relatively easy to install, which reduces the need for specialized labor or equipment;
- The berm can be used with variable foundation conditions;
- The berm is flexible and accommodates total and differential settlements;
- The berm is well suited to resist the impact of seismic events because it does not consist of rigid materials;
- The berm can adapt to curves in its alignment;
- The berm can be designed to incorporate the environmental controls necessary for the operation of a landfill; and,
- The berm can be vegetated to create an aesthetically pleasing screen.

Considering the rigid standards required in the Virginia solid waste regulations for design and construction and the benefits of the earthen berm described above, installation of the berm will significantly enhance the stability of the site and thereby increase the protection of Giles Run and the Resource Protection Area along it.

B. Benefits of a Two Layer Liner System

At least portions of the Lorton Landfill were originally a sand and gravel mine that was converted into a landfill with a clay liner system that satisfied the standards at the time it was constructed. Upon taking over operation of the landfill in 2004, FAI constructed approximately 30 acres of base liner that includes a geomembrane; however, the majority of the existing landfill is underlain by a compacted clay liner. The currently permitted cap is designed with a clay layer with a maximum permeability of $1x10^{-5}$ centimeters per second.

The addition of debris capacity on the side slopes is considered by the DEQ to be a “piggyback”. A landfill piggyback is common in landfills throughout Virginia, including the adjacent Fairfax County I-95 Landfill. DEQ requires that piggybacks be underlain by a base liner system that meets the requirements of the current waste regulation. Therefore, a geomembrane overlain by an 18-inch thick drainage layer will be installed over the side slopes in lieu of the currently permitted clay layer in areas where the piggyback is proposed (i.e., the entire perimeter slopes). The geomembrane and drainage layer will function as the base liner, providing an impermeable barrier that better prevents liquid from entering the existing debris mass. In addition, the piggyback will be capped with a capping system that is designed to be more stringent than the current cap design. Therefore, the two-layer liner systems (cap and piggyback liner) will benefit

the environment by minimizing potential infiltration of leachate into the existing landfill that is underlain by a clay liner, ultimately reducing the risk of groundwater impact.

C. Proposed Buffer between the Limits of Debris and the 100-year Floodplain.

Current Virginia and Fairfax County regulations and industry standards do not require a buffer between the limits of debris and the 100-year floodplain. Section 9VAC20-81-120 of the Virginia Administrative Code, Section 5-0102.2 of the Fairfax County Public Facilities Manual, and Chapter 118 of the Fairfax County Code only requires that the landfill not encroach closer to Giles River than the greater of the RPA or the 100-year floodplain. Therefore, the proposed 75-foot buffer for the Lorton Landfill exceeds all current, scientifically determined standards.

D. Location of Proposed Retaining Walls

There are several retaining walls proposed along the eastern side of the property and shown on the SEA Plat. The purpose of the retaining walls is to prevent the earthen embankment from the lower perimeter utility road from impacting the RPA. The lower perimeter utility road serves two (2) purposes; 1) provides a vehicular route to perform routine inspection and maintenance activities for the berm and 2) allows for utilities to be placed in the road, such as storm sewer pipes, leachate collection pipes, and gas collection system piping. The grades of the lower perimeter utility road on the eastern side of the property where the proposed retaining walls are located were derived to accommodate gravity storm sewer pipes from Basin No. 3 to extend to existing stormwater outfalls on the eastern side of the property. The retaining walls prevent the embankment of the perimeter road from impacting the RPA, specifically where fingers of the RPA jut landward further into the property. Retaining walls are an accepted practice to protect the RPA from disturbance.

E. Benefits of Adding Leachate Tanks

Leachate tanks are commonly used as a means to manage leachate flows and increase environmental protection during unusual weather or sewer events. An increase in leachate generation is a consequence of lining areas of the landfill that were not previously lined with a synthetic liner, which has significant environmental benefit. The primary role of the leachate tanks is to allow sufficient storage for the landfill operator to manage the leachate flow peaks and to average discharge to the public sewer connection in accordance with the landfill discharge permit. In addition, the leachate storage will allow for consistent pre-treatment as required by the public sewer discharge permit.

The secondary purpose of the leachate storage tanks will be to act as a buffer to manage leachate onsite in the unlikely event that the direct connection to the public sewer system becomes unavailable. The ability to store leachate onsite will afford time for the landfill operator to react

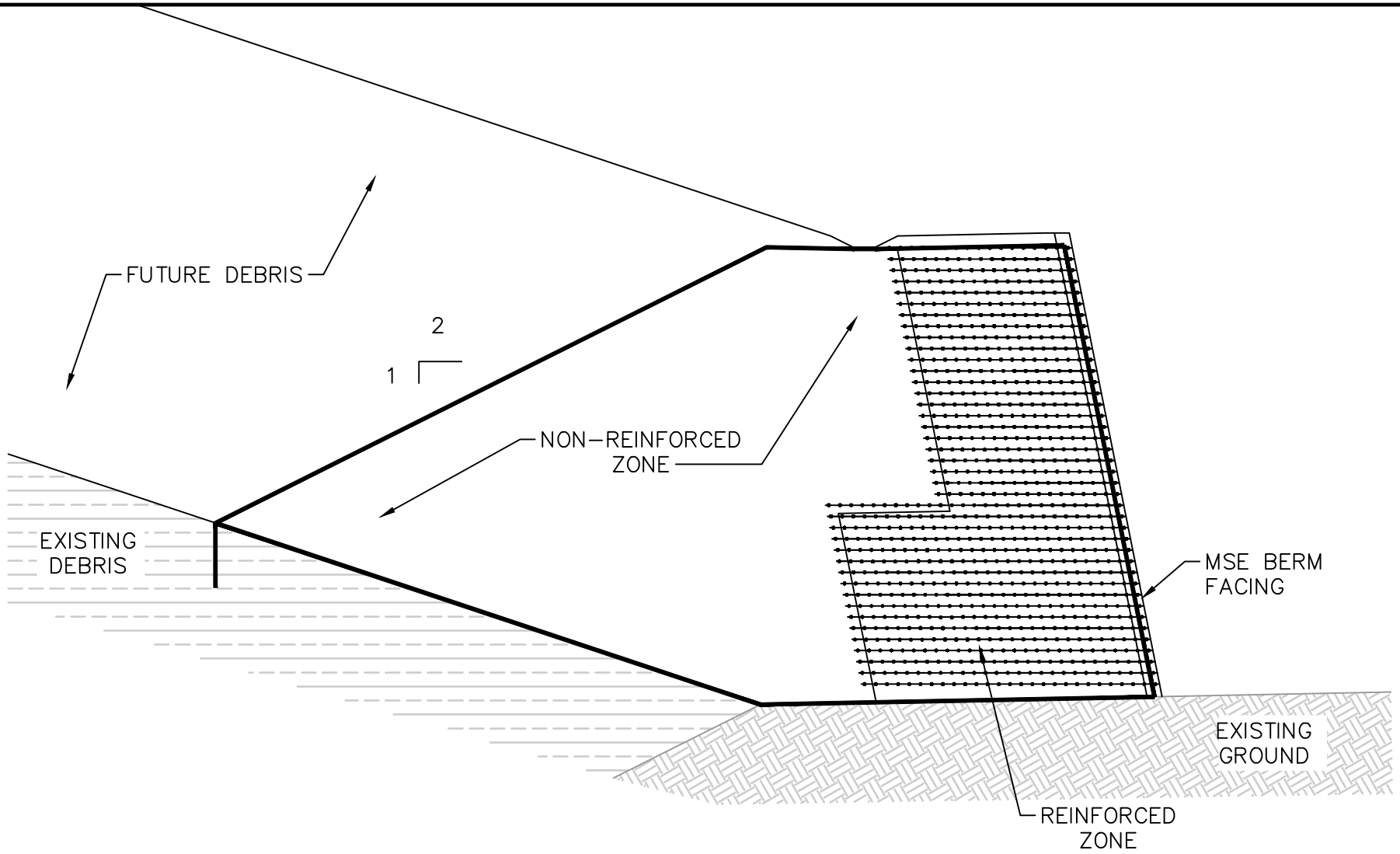
to such an event. The tanks would also provide a means to allow pumping and hauling operations by truck if necessary in such extreme circumstance.

Per the state regulations (Section 9VAC20-81-210 Leachate Control), storage tank capacity must handle a certain volume of leachate based on the estimated leachate generation of the facility. The leachate storage will be further detailed with the final design of the proposed facility; however, for reference, the regulation is reiterated below.

B. Tanks and surface impoundments used for storage of leachate shall have a flow equalization and surge capacity at least equal to the maximum expected production of leachate for any seven-day period for the life of the facility estimated under subdivision A 1 of this section…

Geosyntec appreciates the opportunity to continue providing consulting services to FAI. If you have any questions regarding the information presented in this memorandum please contact Scott Sheridan or Kyle LaClair at (804) 767-2206.

*****



MSE BERM COMPONENT SCHEMATIC

Geosyntec consultants

FIGURE 1

PROJECT NO:

JANUARY 2014

L:\E\ENVIROSOLUTIONS INC\MV10XX (2014 ESI SERVICES)\LORTON LANDFILL\FIGURES\0000F001

SPECIAL EXCEPTION AFFIDAVIT

DATE: December 20, 2013 121265a
(enter date affidavit is notarized)

I, Charles B. Fromm, do hereby state that I am an
(enter name of applicant or authorized agent)

(check one) [ ] applicant
[✓] applicant's authorized agent listed in Par. 1(a) below

in Application No.(s): SEA 80-L/V-061-2
(enter County-assigned application number(s), e.g. SE 88-V-001)

and that, to the best of my knowledge and belief, the following information is true:

==========

1(a). The following constitutes a listing of the names and addresses of all **APPLICANTS, TITLE OWNERS, CONTRACT PURCHASERS,** and **LESSEES** of the land described in the application,* and, if any of the foregoing is a **TRUSTEE,**** each **BENEFICIARY** of such trust, and all **ATTORNEYS** and **REAL ESTATE BROKERS,** and all **AGENTS** who have acted on behalf of any of the foregoing with respect to the application:

(**NOTE:** All relationships to the application listed above in **BOLD** print are to be disclosed. Multiple relationships may be listed together, e.g., **Attorney/Agent, Contract Purchaser/Lessee, Applicant/Title Owner**, etc. For a multiparcel application, list the Tax Map Number(s) of the parcel(s) for each owner(s) in the Relationship column.)

NAME (enter first name, middle initial, and last name)	**ADDRESS** (enter number, street, city, state, and zip code)	**RELATIONSHIP(S)** (enter applicable relationships listed in **BOLD** above)
Furnace Associates, Inc.(1) Agents: Charles B. Fromm Conrad R. Mehan Gary R. Hewes Edward Paul Farrell, Jr. Clayton L. Walton Eric K. Wallace Marc L. Bourhis Larry W. Bayne David R. Howard, Jr.	11220 Assett Loop, Suite 201 Manassas, VA 20109	Applicant/Title Owner of Parcels 113-1-((1))-5, 7, 8 and 113-3-((1))-1, 2, 4
Hunton & Williams LLP(10)	1751 Pinnacle Drive, Suite 1700 McLean, VA 22102	Attorneys/Agents for Applicant
Francis A. McDermott John C. McGranahan, Jr. Nicholas H. Grainger	1751 Pinnacle Drive, Suite 1700 McLean, VA 22012	Attorneys/Agents for Applicant

(check if applicable) [✓] There are more relationships to be listed and Par. 1(a) is continued on a "Special Exception Attachment to Par. 1(a)" form.

* In the case of a condominium, the title owner, contract purchaser, or lessee of 10% or more of the units in the condominium.

** List as follows: Name of trustee, Trustee for (name of trust, if applicable), for the benefit of: (state name of each beneficiary).

12126Sa

Special Exception Attachment to Par. 1(a)

DATE: December 30, 2013
(enter date affidavit is notarized)

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

(**NOTE**: All relationships to the application are to be disclosed. Multiple relationships may be listed together, e.g., **Attorney/Agent, Contract Purchaser/Lessee, Applicant/Title Owner**, etc. For a multiparcel application, list the Tax Map Number(s) of the parcel (s) for each owner(s) in the Relationship column.)

NAME (enter first name, middle initial, and last name)	**ADDRESS** (enter number, street, city, state, and zip code)	**RELATIONSHIP(S)** (enter applicable relationships listed in **BOLD** above)
Elaine O'Flaherty Cox Susan K. Yantis	1751 Pinnacle Drive, Suite 1700 McLean, VA 22102	Planners/Agents for Applicant
Jeannie A. Mathews	1751 Pinnacle Drive, Suite 1700 McLean, VA 22102	Paralegal/Agent for Applicant
The BC Consultants, Inc.(11) Agents: James H. Scanlon Matthew S. Lawrence Dennis D. Dixon	12600 Fair Lakes Circle, Suite 100 Fairfax, VA 22033	Engineers/Agents for Applicant
Geosyntec Consultants, Inc.(12) Agents: Scott K. Sheridan Kyle E. LaClair Thomas B. Ramsey Jeremy W. F. Morris	9211 Arboretum Parkway, Suite 200 Richmond, VA 23832	Environmental Engineers/Agents for Applicant
Lecos & Associates, LLC(13) Agent: William D. Lecos	6324 Beachway Drive Falls Church, VA 22044	Consultant/Agent for Applicant
M. J. Wells & Associates, Inc.(14) Agents: William F. Johnson Robin L. Antonucci Kevin R. Fellin Brian J. Horan	1420 Spring Hill Road, Suite 600 McLean, VA 22102	Traffic Consultants/Agents for Applicant
Wetland Studies and Solutions, Inc.(15) Agents: Kimberly A. Snyder Mark W. Headley Benjamin N. Rosner	5300 Wellington Branch Drive, Suite 100 Gainesville, VA 20155	Cultural and Natural Resource Consultants/Agents for Applicant

(check if applicable) [ ] There are more relationships to be listed and Par. 1(a) is continued further on a "Special Exception Attachment to Par. 1(a)" form.

121265a

SPECIAL EXCEPTION AFFIDAVIT

DATE: December 30, 2013
(enter date affidavit is notarized)

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number(s))

==========

1(b). The following constitutes a listing*** of the **SHAREHOLDERS** of all corporations disclosed in this affidavit who own 10% or more of any class of stock issued by said corporation, and where such corporation has 10 or less shareholders, a listing of all of the shareholders:

(**NOTE**: Include **SOLE PROPRIETORSHIPS, LIMITED LIABILITY COMPANIES,** and **REAL ESTATE INVESTMENT TRUSTS** herein.)

CORPORATION INFORMATION

NAME & ADDRESS OF CORPORATION: (enter complete name and number, street, city, state, and zip code) (1)Furnace Associates, Inc.
11220 Assett Loop, Suite 201
Manassas, VA 20109

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF SHAREHOLDERS: (enter first name, middle initial and last name)
EnviroSolutions Real Property Holdings, Inc.(2)

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued on a "Special Exception Affidavit Attachment 1(b)" form.

*** All listings which include partnerships, corporations, or trusts, to include the names of beneficiaries, must be broken down successively until: (a) only individual persons are listed or (b) the listing for a corporation having more than 10 shareholders has no shareholder owning 10% or more of any class of stock. ***In the case of an APPLICANT, TITLE OWNER, CONTRACT PURCHASER, or LESSEE* of the land that is a partnership, corporation, or trust, such successive breakdown must include a listing and further breakdown of all of its partners, of its shareholders as required above, and of beneficiaries of any trusts. Such successive breakdown must also include breakdowns of any partnership, corporation, or trust owning 10% or more of the APPLICANT, TITLE OWNER, CONTRACT PURCHASER, or LESSEE* of the land. Limited liability companies and real estate investment trusts and their equivalents are treated as corporations, with members being deemed the equivalent of shareholders; managing members shall also be listed.*** Use footnote numbers to designate partnerships or corporations, which have further listings on an attachment page, and reference the same footnote numbers on the attachment page.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(2)EnviroSolutions Real Property Holdings, Inc.
11220 Assett Loop, Suite 201
Manassas, VA 20109

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
EnviroSolutions Holdings, Inc.(3)

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(3)EnviroSolutions Holdings, Inc.
11220 Assett Loop, Suite 201
Manassas, VA 20109

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[✓] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
ASOF II Investments, LLC(4)
NZC Guggenheim Master Fund Limited(6)
PennantPark Investment Corporation(9)

==========

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(4)ASOF II Investments, LLC
299 Park Avenue, 34th Floor
New York, NY 10171

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
American Securities Opportunities Fund II (B), L.P. (Does not own 10% of Furnace Associates, Inc.)
American Securities Opportunities Fund II, L.P.(5)

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(6)NZC Guggenheim Master Fund Limited (a Cayman Islands exempted company)
c/o Guggenheim Investment Management, LLC
135 East 57th Street
New York, NY 10022

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
NZC Guggenheim Fund LLC(7)
NZC Guggenheim Fund Ltd.(8)

==========

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(7)NZC Guggenheim Fund LLC
c/o Guggenheim Investment Management, LLC
135 East 57th Street
New York, NY 10022

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[✓] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(8)NZC Guggenheim Fund Ltd.
c/o Guggenheim Investment Management, LLC
135 East 57th Street
New York, NY 10022

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[✓] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)

==========

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(9)PennantPark Investment Corporation
590 Madison Avenue, 15th Floor
New York, NY 10022

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[✓] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
Publicly Traded

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(11)The BC Consultants, Inc.
12600 Fair Lakes Circle, Suite 100
Fairfax, VA 22033

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
James H. Scanlon (sole shareholder)

==========

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(12)Geosyntec Consultants, Inc.
9211 Arboretum Parkway, Suite 200
Richmond, VA 23832

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[✓] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(13)Lecos & Associates, LLC
6324 Beachway Drive
Falls Church, VA 22044

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
William D. Lecos

==========

(check if applicable) [✓] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

Special Exception Attachment to Par. 1(b)

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(14)M. J. Wells & Associates, Inc.
1420 Spring Hill Road, Suite 600
McLean, VA 22102

DESCRIPTION OF CORPORATION: (check one statement)

[ ] There are 10 or less shareholders, and all of the shareholders are listed below.
[✓] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
M. J. Wells & Associates, Inc. Employee Stock Ownership Trust (ESOT) (All employees are eligible Plan participants; however, none owns 10% or more of any class of stock.)

==========

NAME & ADDRESS OF CORPORATION: (enter complete name, number, street, city, state, and zip code)
(15)Wetland Studies and Solutions, Inc.
5300 Wellington Branch Drive, Suite 100
Gainesville, VA 20155

DESCRIPTION OF CORPORATION: (check one statement)

[✓] There are 10 or less shareholders, and all of the shareholders are listed below.
[ ] There are more than 10 shareholders, and all of the shareholders owning 10% or more of any class of stock issued by said corporation are listed below.
[ ] There are more than 10 shareholders, but no shareholder owns 10% or more of any class of stock issued by said corporation, and no shareholders are listed below.

NAMES OF THE SHAREHOLDERS: (enter first name, middle initial, and last name)
Michael S. Rolband

==========

(check if applicable) [ ] There is more corporation information and Par. 1(b) is continued further on a "Special Exception Attachment to Par. 1(b)" form.

SPECIAL EXCEPTION AFFIDAVIT

DATE: December 20, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number(s))

==========

1(c). The following constitutes a listing*** of all of the **PARTNERS,** both **GENERAL** and **LIMITED**, in any partnership disclosed in this affidavit:

PARTNERSHIP INFORMATION

PARTNERSHIP NAME & ADDRESS: (enter complete name, and number, street, city, state, and zip code)
(5)American Securities Opportunities Fund II, L.P.
299 Park Avenue, 34th Floor
New York, NY 10171

(check if applicable) [ ] The above-listed partnership has no limited partners·

NAMES AND TITLE OF THE PARTNERS (enter first name, middle initial, last name, and title, e.g. **General Partner, Limited Partner, or General and Limited Partner**)

GENERAL PARTNER:

ASOF Associates II, LLC (Does not own 10% of Furnace Associates, Inc.)

LIMITED PARTNERS:

There are 83 limited partners/private equity investors, none of whom owns 10% or more of Furnace Associates, Inc.

(check if applicable) [✓] There is more partnership information and Par. 1(c) is continued on a "Special Exception Affidavit Attachment to Par. 1(c)" form.

*** All listings which include partnerships, corporations, or trusts, to include the names of beneficiaries, must be broken down successively until: (a) only individual persons are listed or (b) the listing for a corporation having more than 10 shareholders has no shareholder owning 10% or more of any class of stock. ***In the case of an APPLICANT, TITLE OWNER, CONTRACT PURCHASER, or LESSEE* of the land that is a partnership, corporation, or trust, such successive breakdown must include a listing and further breakdown of all of its partners, of its shareholders as required above, and of beneficiaries of any trusts. Such successive breakdown must also include breakdowns of any partnership, corporation, or trust owning 10% or more of the APPLICANT, TITLE OWNER, CONTRACT PURCHASER, or LESSEE* of the land. Limited liability companies and real estate investment trusts and their equivalents are treated as corporations, with members being deemed the equivalent of shareholders; managing members shall also be listed.*** Use footnote numbers to designate partnerships or corporations, which have further listings on an attachment page, and reference the same footnote numbers on the attachment page.

Special Exception Attachment to Par. 1(c)

121265a

DATE: December 30, 2013
(enter date affidavit is notarized)

for Application No. (s): SEA 89-L/V-061-2
(enter County-assigned application number (s))

PARTNERSHIP NAME & ADDRESS: (enter complete name & number, street, city, state & zip code)

(10)Hunton & Williams LLP
1751 Pinnacle Drive, Suite 1700
McLean, VA 22102

(check if applicable) [✓] The above-listed partnership has no limited partners.

NAMES AND TITLES OF THE PARTNERS: (enter first name, middle initial, last name, and title, e.g., **General Partner, Limited Partner, or General and Limited Partner)**

Robert A. Acosta-Lewis
Lawrence C. Adams
Michael F. Albers
Kenneth J. Alcott
Fernando C. Alonso
Walter J. Andrews
Charles E. G. Ashton
Chinawat Assavapokee (nmi)
L. Scott Austin
Ian Phillip Band
Sean M. Beard
John J. Beardsworth, Jr.
Ryan A. Becker
Steven H. Becker
Stephen John Bennett
Melinda R. Beres
Lucas Bergkamp (nmi)
Lon A. Berk
Mark B. Bierbower
Stephen R. Blacklocks
Jeffry M. Blair
Matthew P. Bosher
James W. Bowen
Lawrence J. Bracken, II
James P. Bradley
Sheldon T. Bradshaw
David F. Brandley, Jr.
Craig A. Bromby
Benjamin P. Browder
A. Todd Brown, Sr.
Tyler P. Brown
F. William Brownell
Kevin J. Buckley
Kristy A. Niehaus Bulleit
Joseph B. Buonanno
Nadia S. Burgard
Eric R. Burner
M. Brett Burns
P. Scott Burton
Ellis M. Butler
Ferdinand A. Calice
Matthew J. Calvert
Daniel M. Campbell
Thomas H. Cantrill
Curtis G. Carlson
Jean Gordon Carter
Charles D. Case
James N. Christman
Whittington W. Clement
Herve' Cogels (nmi)
Cassandra C. Collins
Stacy M. Colvin
S. Gregory Cope
Ashley Cummings (nmi)
Alexandra B. Cunningham
Samuel A. Danon
Barry R. Davidson
John A. Decker
John J. Delionado
Stephen P. Demm
Dee Ann Dorsey
Edward L. Douma
Colleen P. Doyle
Alison M. Dreizen
Sean P. Ducharme
Deidre G. Duncan
Roger Dyer (nmi)
Frederick R. Eames
Heather Archer Eastep
Maya M. Eckstein
W. Jeffery Edwards
John C. Eichman
Emmett N. Ellis
Edward W. Elmore, Jr.
Frank E. Emory, Jr.
Juan C. Enjamio
John D. Epps
Phillip J. Eskenazi
Joseph P. Esposito
Kelly L. Faglioni
Susan S. Failla
Eric H. Feiler
Kevin C. Felz
Edward F. Fernandes
Jamillia Padua Ferris
Norman W. Fichthorn
Andrea Bear Field
Kevin J. Finto
Melanie Fitzgerald (nmi)
Michael F. Fitzpatrick, Jr.
Robert N. Flowers
William M. Flynn
Laura M. Franze
David S. Freed
Lauren E. Freeman
Steven C. Friend
Edward J. Fuhr
Charles A. Gall
Daniel C. Garner
Douglas M. Garrou
Richard D. Gary
Kevin M. Georgerian
John T. Gerhart, Jr.
Jeffrey W. Giese
Neil K. Gilman
C. Christopher Giragosian
Douglas S. Granger
Laurie A. Grasso
J. William Gray, Jr.
Charles E. Greef
Christopher C. Green
Robert J. Grey, Jr.
Greta T. Griffith
Brett L. Gross
Bradley W. Grout
Steven M. Haas
Brian L. Hager
Robert J. Hahn
Jarrett L. Hale
Leslie S. Hansen
Eric J. Hanson
Ronald M. Hanson
Jason W. Harbour

(check if applicable) [✓] There is more partnership information and Par. 1(c) is continued further on a "Special Exception Attachment to Par. 1(c)" form.

Special Exception Attachment to Par. 1(c)

DATE: December 20, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

PARTNERSHIP NAME & ADDRESS: (enter complete name & number, street, city, state & zip code)

(10)Hunton & Williams LLP (continued)
1751 Pinnace Drlive, Suite 1700
McLean, VA 22102

(check if applicable) [✓] The above-listed partnership has no limited partners.

NAMES AND TITLES OF THE PARTNERS: (enter first name, middle initial, last name, and title, e.g., **General Partner, Limited Partner, or General and Limited Partner)**

Ray V. Hartwell, III
Jeffrey L. Harvey
John D. Hawkins
Rudene Mercer Haynes
Mark S. Hedberg
Gregory G. Hesse
David A. Higbee
Thomas Y. Hiner
D. Bruce Hoffman
Robert E. Hogfoss
John R. Holzgraefe
Cecelia Philipps Horner
George C. Howell, III
Paul C. Huck, Jr.
Kevin F. Hull
Donald P. Irwin
Jamie Zysk Isani
Judith H. Itkin
Makram B. Jaber
Timothy L. Jacobs
Lori Elliott Jarvis
Matthew D. Jenkins
Harry M. Johnson, III
James A. Jones, III
Kevin W. Jones
Laura Ellen Jones
Dan J. Jordanger
Roland Juarez (nmi)
Thomas R. Julin
W. Alan Kailer
Andrew Kamensky (nmi)
Michael G. Keeley
G. Roth Kehoe, II
David A. Kelly
Douglas W. Kenyon
Michael C. Kerrigan
Ryan T. Ketchum
Scott H. Kimpel
Robert A. King
Edward B. Koehler
John T. Konther
Torsten M. Kracht
Christopher G. Kulp
David Craig Landin
Gregory F. Lang
Andrew W. Lawrence
Daniel M. LeBey
Bradley T. Lennie
L. Steven Leshin
Catherine D. Little
Steven R. Loeshelle
David C. Lonergan
Nash E. Long, III
Kirk A. Lovric
David S. Lowman, Jr.
Kimberly C. MacLeod
Michael J. Madden, Jr.
Tyler Maddry (nmi)
Manuel E. Maisog
Douglas M. Mancino
Alan J. Marcuis
Brian R. Marek
Fernando Margarit (nmi)
Laura C. Marshall
Thelma Marshall (nmi)
Jeffrey N. Martin
John S. Martin
J. Michael Martinez de Andino
Walfrido J. Martinez
Laurie Uustal Mathews
John Gary Maynard, III
William H. McBride
Michael C. McCann
T. Allen McConnell
Francis A. McDermott
Alexander G. McGeoch
John C. McGranahan, Jr.
Gustavo J. Membiela
Mark W. Menezes
Gary C. Messplay
Peter J. Mignone
Patrick E. Mitchell
Jack A. Molenkamp
T. Justin Moore, III
Thurston R. Moore
Robert J. Morrow
Ann Marie Mortimer
Michael J. Mueller
Eric J. Murdock
Ted J. Murphy
Thomas P. Murphy
David A. Mustone
James P. Naughton
Wim Nauwelaerts (nmi)
Eric J. Nedell
Michael Nedzbala (nmi)
William L. Newton
Henry V. Nickel
Lonnie D. Nunley, III
Michael A. Oakes
Peter K. O'Brien
John T. O'Connor
Leslie A. Okinaka
John D. O'Neill, Jr.
Pam Gates O'Quinn
Michael A. O'Shea
Brian V. Otero
Raj Pande (nmi)
Randall S. Parks
Peter S. Partee, Sr.
J. Steven Patterson
William S. Patterson
Eric R. Pogue
Robert Dean Pope
Curtis D. Porterfield
Laurence H. Posorske
Kurtis A. Powell
Lewis F. Powell, III
J. Waverly Pulley, III
Robert T. Quackenboss
Dionne C. Rainey
Katherine E. Ramsey
John Jay Range

(check if applicable) [✓] There is more partnership information and Par. 1(c) is continued further on a "Special Exception Attachment to Par. 1(c)" form.

121265a

Special Exception Attachment to Par. 1(c)

DATE: December 30, 2013
(enter date affidavit is notarized)

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number (s))

PARTNERSHIP NAME & ADDRESS: (enter complete name & number, street, city, state & zip code)

(10)Hunton & Williams LLP (continued)
1751 Pinnace Drlive, Suite 1700
McLean, VA 22102

(check if applicable) [✓] The above-listed partnership has no limited partners.

NAMES AND TITLES OF THE PARTNERS: (enter first name, middle initial, last name, and title, e.g., **General Partner, Limited Partner, or General and Limited Partner**)

Stuart A. Raphael
Robert S. Rausch
Belynda B. Reck
Baker R. Rector
Shawn Patrick Regan
Sona Rewari (nmi)
Thomas A. Rice
Michael P. Richman
Jennings G. ("J. G.") Ritter, II
Kathy E. B. Robb
Daryl B. Robertson
Gregory B. Robertson
Patrick L. Robson
Robert M. Rolfe
Ronald D. Rosener
Trevor K. Ross
Brent A. Rosser
William L. S. Rowe
Ronald L. Rubin
Marguerite R. ("Rita") Ruby
D. Alan Rudlin
Mary Nash K. Rusher
D. Kyle Sampson
Karen M. Sanzaro
Stephen M. Sayers
Arthur E. Schmalz
Gregory J. Schmitt
John R. Schneider
Howard E. Schreiber
Jeffrey P. Schroeder
Robert M. Schulman
Carl F. Schwartz
P. Watson Seaman
James S. Seevers, Jr.
Douglass P. Selby
Joel R. Sharp
Michael R. Shebelskie
Rita A. Sheffey
Ryan A. Shores
George P. Sibley, III
Donald F. Simone
Aaron P. Simpson
Jo Anne E. Sirgado
Laurence E. Skinner
Thomas G. Slater, Jr.
Caryl Greenberg Smith
John R. ("J. R.") Smith
Yisun Song (nmi)
Lisa J. Sotto
Joseph C. Stanko, Jr.
Todd M. Stenerson
John J. Stenger
Gregory N. Stillman
Fradyn Suarez (nmi)
Yeongyo Anna Suh
C. Randolph Sullivan
Jeffrey M. Sullivan
Andrew J. Tapscott
Robert M. Tata
Rodger L. Tate
W. Lake Taylor, Jr.
Wendell L. Taylor
John Charles Thomas
Gary E. Thompson
Paul M. Tiao
B. Cary Tolley, III
Bridget C. Treacy
Andrew J. Turner
Julie I. Ungerman
Daniel E. Uyesato
Surasak Vajasit (nmi)
Mark C. Van Deusen
Emily Burkhardt Vicente
Daniel G. Vivarelli, Jr.
Mark R. Vowell
Amanda L. Wait
Linda L. Walsh
William A. Walsh, Jr.
William L. Wehrum
Peter G. Weinstock
Malcolm C. Weiss
Kevin J. White
Amy McDaniel Williams
Mitchell G. Williams
Holly H. Williamson
Michael G. Wilson
Allison D. Wood
David C. Wright
Richard L. Wyatt, Jr.
David R. Yates
Lee B. Zeugin
Manida Zinmerman (nmi)

FORMER PARTNERS:

Thomas J. Cawley
Cameron N. Cosby
Cyane B. Crump
Andrew E. Jillson
Stephen S. Maris
Fraser A. McAlpine
Brooks M. Smith
Lynnette R. Warman
Evan D. Wolff

(check if applicable) [ ] There is more partnership information and Par. 1(c) is continued further on a "Special Exception Attachment to Par. 1(c)" form.

SPECIAL EXCEPTION AFFIDAVIT

DATE: December 30, 2013
(enter date affidavit is notarized)

121265a

for Application No. (s): SEA 80-L/V-061-2
(enter County-assigned application number(s))

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1(d). One of the following boxes **must** be checked:

[ ] In addition to the names listed in Paragraphs 1(a), 1(b), and 1(c) above, the following is a listing of any and all other individuals who own in the aggregate (directly and as a shareholder, partner, and beneficiary of a trust) 10% or more of the **APPLICANT, TITLE OWNER, CONTRACT PURCHASER,** or **LESSEE*** of the land:

[✓] Other than the names listed in Paragraphs 1(a), 1(b), and 1(c) above, no individual owns in the aggregate (directly and as a shareholder, partner, and beneficiary of a trust) 10% or more of the **APPLICANT, TITLE OWNER, CONTRACT PURCHASER,** or **LESSEE*** of the land.

2. That no member of the Fairfax County Board of Supervisors, Planning Commission, or any member of his or her immediate household owns or has any financial interest in the subject land either individually, by ownership of stock in a corporation owning such land, or through an interest in a partnership owning such land.

EXCEPT AS FOLLOWS: (**NOTE**: If answer is none, enter "**NONE**" on the line below.)

NONE

(check if applicable) [ ] There are more interests to be listed and Par. 2 is continued on a "Special Exception Attachment to Par. 2" form.

Application No.(s): SEA 80-L/V-061-2

(county-assigned application number(s), to be entered by County Staff)

SPECIAL EXCEPTION AFFIDAVIT

DATE: December 30, 2013

(enter date affidavit is notarized)

121265a

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3. That within the twelve-month period prior to the public hearing of this application, no member of the Fairfax County Board of Supervisors, Planning Commission, or any member of his or her immediate household, either directly or by way of partnership in which any of them is a partner, employee, agent, or attorney, or through a partner of any of them, or through a corporation in which any of them is an officer, director, employee, agent, or attorney or holds 10% or more of the outstanding bonds or shares of stock of a particular class, has, or has had any business or financial relationship, other than any ordinary depositor or customer relationship with or by a retail establishment, public utility, or bank, including any gift or donation having a value of more than $100, singularly or in the aggregate, with any of those listed in Par. 1 above.

EXCEPT AS FOLLOWS: (**NOTE**: If answer is none, enter "**NONE**" on line below.)

Conrad R. Mehan, Agent for Applicant, contributed in excess of $100 each to Supervisors Cook, Herrity, Gross and McKay.

Francis A. McDermott of Hunton & Williams LLP, Attorneys for Applicant, contributed in excess of $100 each to Supervisors Herrity and Cook.

NOTE: Business or financial relationships of the type described in this paragraph that arise after the filing of this application and before each public hearing must be disclosed prior to the public hearings. See Par. 4 below.)

(check if applicable) [ ] There are more disclosures to be listed and Par. 3 is continued on a "Special Exception Attachment to Par. 3" form.

4. **That the information contained in this affidavit is complete, that all partnerships, corporations, and trusts owning 10% or more of the APPLICANT, TITLE OWNER, CONTRACT PURCHASER, or LESSEE* of the land have been listed and broken down, and that prior to each and every public hearing on this matter, I will reexamine this affidavit and provide any changed or supplemental information, including business or financial relationships of the type described in Paragraph 3 above, that arise on or after the date of this application.**

==========

WITNESS the following signature:

(check one) [ ] Applicant [✓] Applicant's Authorized Agent

Charles B. Fromm, Agent for Applicant

(type or print first name, middle initial, last name, and & title of signee)

Subscribed and sworn to before me this 30 day of December 2013, in the State/Comm. of Virginia, County/City of Prince William.

Notary Public

My commission expires: 8/31/17

VICTORIA LEIGH RAMA NOTARY PUBLIC REG. # 7553218 COMMONWEALTH OF VIRGINIA

County of Fairfax, Virginia

MEMORANDUM

DATE: November 1, 2013

TO: Barbara Berlin, Director
Zoning Evaluation Division, DPZ

FROM: Pamela G. Nee, Chief PGN
Environment and Development Review Branch, DPZ

SUBJECT: **Land Use Analysis**
SEA 80-L-061-02, Lorton Landfill

The memorandum, prepared by Michelle Stahlhut, includes citations from the Comprehensive Plan that provide guidance for the evaluation of the general development plan/special exception plat dated March 22, 2013 and revised thru October 7, 2013. The extent to which the application conforms to the applicable guidance contained in the Comprehensive Plan is noted. Possible solutions to remedy identified issues are suggested. Other solutions may be acceptable, provided that they achieve the desired degree of mitigation and are also compatible with Plan policies.

DESCRIPTION OF THE APPLICATION

The applicant, Furnace Associates, L.L.C., is requesting a special exception amendment of a 249.82 acre site located in the Lower Potomac Planning District of the Area IV volume of the Comprehensive Plan. The site is zoned R-1 and used as a construction and demolition debris (CDD) landfill. The applicant is requesting to extend the useful life of the existing construction debris landfill until December 31, 2040, and includes construction of a vegetated berm around the perimeter of the landfill to support additional landfilling capacity, removing a previous requirement that the property be dedicated for park use at the end of its useful life, establishing an interim alternative energy demonstration project, and providing a space for active recreational use after closure.

LOCATION AND CHARACTER OF THE AREA

The subject property is triangular in shape and bounded by Furnace Road to the west, Interstate 95 (I-95) to the east and the single-family detached development of Lorton Valley South to the north. There is an existing single-family detached dwelling located at the southern tip of the site which is not part of the application.

COMPREHENSIVE PLAN CITATIONS

Fairfax County Comprehensive Plan, 2013 Edition, Area IV, Lower Potomac Planning District as amended through April 9, 2013, LP2 Lorton-South Route 1 Community Planning Sector, pages 58-64:, the Plan states:

"RECOMMENDED LAND USE PLAN

The land use plan in the Lorton-South Route 1 area includes: "gateway" site and building design; low and high density residential areas; industrial areas; "Town Center" and related uses; public facility use; recreational area; and environmentally sensitive areas. Although these uses are generally contained in one or two distinct subareas of the sector, it is envisioned that they will work in concert to create a comprehensive and interrelated community. Descriptions of the general concepts and recommendations are summarized below. . . .

Recreational Area

The largest area planned for recreation or public park uses in the sector is located south of Dixon Street, west of I-95 and east of Furnace Road. While the area currently contains a large private debris landfill, it is envisioned that when landfill operations cease that this area will be developed with private or public recreational uses such as a golf course. . . .

Sub-unit B4

Sub-unit B4 contains a private debris landfill. To help mitigate any visual impacts upon the surrounding area, buffers should be maintained around the landfill. When the landfill is built-out, it is recommended that the site ultimately be developed with active recreational uses such as a golf course.

Sub-unit B5

Sub-unit B5 is located north of the Occoquan River, west of I-95 and east of the Laurel Hill site. This is a "gateway" site and special attention should be employed in the use and development of this sub-unit.

Sub-unit B5 is planned for mixed-use development to include but not limited to office, industrial, industrial/flex uses with ancillary restaurant and child care facility uses up to .25 FAR in keeping with their riverfront and gateway locations, under . . . conditions: . . . .

As an alternative use, Sub-unit B5 and Land Unit C are planned for hotel/motel conference center and office complex uses up to .25 FAR. . . "

LAND USE ANALYSIS

The approximately 250-acre subject property is mostly located within Sub-Unit B4 of the Lorton-South Route 1 Community Planning Sector and currently contains the construction demolition debris (CDD) landfill. A small portion of the landfill operation is located in Sub-Unit B5 but the approved uses are not being expanded in this area. The current approval allows the existing landfill operation with closure in 2019.

Visual Impact

The Comprehensive Plan states, "To help mitigate any visual impacts upon the surrounding area, buffers should be maintained around the landfill." The applicant is proposing in Phase 3 to remove trees on the north side of the landfill in order to install a new stormwater pond, and is proposing supplemental evergreen and deciduous trees and shrubs in the transitional screening area closest to the adjacent residential area. The applicant has provided a section depicting the visual impact of tree removal and stormwater pond installation on the SEA Plat Sheet 21. Based on this exhibit, it appears that the visual impact will not be significant. Removal of mature trees in this area is subject to additional review and comment by the Department of Public Works and Environmental Services (DPWES) Urban Forestry Management.

End Use

The applicant is requesting to extend the useful life of the existing construction debris landfill until December 31, 2040, and includes construction of a vegetated berm around the perimeter of the landfill to support additional landfilling capacity, removing a previous requirement that the property be dedicated for park use at the end of its useful life, establishing an interim alternative energy demonstration project, and providing a space for active recreational use after closure.

The Comprehensive Plan calls for public or private active recreational uses as the end use for this site and does not specifically define "active recreation." The applicant is proposing two possible active recreation uses, consisting of either a private golf driving range and/or a model airplane field, or similar private club or benefit association uses, which would be installed by lessee(s) either: (a) subsequent to cessation of the "interim" Green Energy Program or (b) upon release of the applicant by the Virginia Department of Environmental Quality (DEQ) from post-closure monitoring and maintenance of the landfill, whichever is the later to occur. The lessee would be responsible for controlled access and all liability arising out of that access and use of the closed landfill property.

The applicant surmises that the active recreational uses could commence approximately 20 years after the closure of the landfill (approximately 2060), depending on whether the Green Energy Program is developed; however, the intent of the Plan is for recreation uses to be developed when landfill operations cease. Staff recommends that the final use be tied to the post-closure monitoring period and release by DEQ only (expected in approximately 2050) and not the cessation of the potential Green Energy Park. Staff recognizes that in the event the Green Energy Program is developed, there is a potential timing conflict with the wind turbine portion which may possibly begin installation in 2040.

CONCLUSION

With demonstration of minimal visual impact from the reduction in buffer, and commencement of the active recreational uses at the expected end of the post-closure monitoring period and release by DEQ, staff finds that the proposed development is in harmony with the land use recommendations of the Comprehensive Plan.

PGN/MKS

County of Fairfax, Virginia

MEMORANDUM

DATE: October 30, 2013

TO: Barbara Berlin, Director
Zoning Evaluation Division,
Department of Planning and Zoning

FROM: Angela Kadar Rodeheaver, Chief MAD for AKR
Site Analysis Section
Department of Transportation

FILE: 3-5 (SE 80-L/V-061)

SUBJECT: Transportation Impact

REFERENCE: SEA 80 L/V-061-02; Furnace Associates, Inc.
Traffic Zone: 1634
Land Identification Map: 113-1 ((01)) 5, 7, 8
113-3 ((01)) 1, 2, 4

Transmitted herewith are comments from the Department of Transportation with respect to the referenced application.

- The applicant should commit to providing traffic control devices/ measures, in addition to signage, to further strengthen the turning restrictions for trucks to/ from the north. If additional devices/ measures are needed in the future they would be subject to VDOT and FCDOT approval.

AKR/AK /w:SE80LV061FurnaceAssociates

Fairfax County Department of Transportation
4050 Legato Road, Suite 400 Fairfax, Virginia,
22033-2895
phone: (703) 877-5600 TTY: (703) 877-5602
Fax: (703) 877 5723
www.fairfaxcounty.gov/fcdot

FCDOT
Serving Fairfax County for 25 Years and More

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
4975 Alliance Drive
Fairfax, VA 22030

GREGORY A. WHIRLEY
COMMISSIONER

December 13, 2013

To: Ms. Barbara Berlin
Director, Zoning Evaluation Division

From: Paul J. Kraucunas, P.E.
Land Development Program Manager

Subject: Lorton Green Energy Park and Debris Landfill
SEA 80-L-061-2

This office has reviewed the revised application received on December 12, 2013 and offers the following comments.

Sheet 6

1. The emergency access should be closed with the construction of the new right-in access at the south end of the site. This is a previous comment that the applicant has not addressed appropriately. I do not feel this entrance needs to be maintained if a new second entrance is constructed in the immediate area. If an emergency does arise the main entrance could be utilized.

2. Construct a suitable right-turn lane to serve the new right-in access. This is a previous comment which has not been addressed. It is assumed that this new second entrance will have a fence and gate (NOT SHOWN). Vehicles waiting for the gate to open can stand in this requested right-turn lane. The turn lane will also improve traffic flow on Furnace Road. If the turn lane is not constructed, the gate for this entrance needs to place 100'+ internal to site to provide a standing area for waiting trucks.

Sheet 12

3. There does not appear to be any way for vehicles to access the site as the grading shown on Sheet 13 blocks the main entrance with a 4' berm. This is a previous comment which has not been adequately addressed.

Sheet 13

4. There does not appear to be any way for vehicles to access the second entrance as the grading shown on Sheet 13 blocks the main entrance with a 4' berm. This is a previous concern raised with the engineer which has not been adequately addressed.

Please contact me if have any questions.

County of Fairfax, Virginia

MEMORANDUM

DATE: December 18, 2013

TO: Mary Ann Tsai, Staff Coordinator
Zoning Evaluation Division, DPZ

FROM: Jay Banks, Urban Forester II
Forest Conservation Branch, DPWES

SUBJECT: Lorton Green Energy Park & Debris Landfill SEA 80-L/V-061-02

RE: Request to review Special Exception Amendment application

At the request of the Department of Planning and Zoning, staff from the Urban Forest Management Division (UFMD) completed a review of the SEA 80-L-061-02 stamped "Received, Department of Planning and Zoning, December 12, 2013".

1. **Comment:** On several sheets, two proposed leachate tanks are shown as part of the Phase Two operations and landscaping. One tank is located in the northeast corner and one at the southwest corner. It is unclear if the proposed tank at the southwest corner is located outside of the previously approved transitional screening area. Further, the zoning of the property directly across from tank area on the subject property has not been identified on the plan sheets to assist in establishing the correct type of transitional screening required.

   Recommendation: The zoning and use of the neighboring property near the area of the proposed south west leachate tank should be shown on all appropriate plan sheets. Additionally, all transitional screening requirements within the area of the proposed leachate tank should be adequately addressed.

JSB/

UFMDID #: 113000

cc: DPZ File

Department of Public Works and Environmental Services
Urban Forest Management Division
12055 Government Center Parkway, Suite 518
Fairfax, Virginia 22035-5503
Phone 703-324-1770, TTY: 703-324-1877, Fax: 703-803-7769
www.fairfaxcounty.gov/dpwes

County of Fairfax, Virginia

MEMORANDUM

DATE: November 1, 2013

TO: Barbara Berlin, Director
Zoning Evaluation Division, DPZ

FROM: Pamela G. Nee, Chief
Environment and Development Review Branch, DPZ

SUBJECT: **ENVIRONMENTAL ASSESSMENT** for: **SEA 80-L-061-02**
Furnace Associates, Inc.

This memorandum, prepared by Maya Dhavale, includes citations from the Comprehensive Plan that provide guidance for the evaluation of the above referenced special exception plat as revised through October 7, 2013. Possible solutions to remedy identified environmental impacts are suggested. Other solutions may be acceptable, provided that they achieve the desired degree of mitigation and are also compatible with Plan policies.

COMPREHENSIVE PLAN CITATIONS:

The Comprehensive Plan is the basis for the evaluation of this application. The assessment of the proposal for conformity with the environmental recommendations of the Comprehensive Plan is guided by the following citations from the Plan:

Fairfax County Comprehensive Plan, 2013 Edition, Policy Plan, Environment, as amended through February 12, 2013, page 7:

"Objective 2: **Prevent and reduce pollution of surface and groundwater resources. Protect and restore the ecological integrity of streams in Fairfax County.**

Policy a. Maintain a best management practices (BMP) program for Fairfax County and ensure that new development and redevelopment complies with the County's best management practice (BMP) requirements."

Fairfax County Comprehensive Plan, 2013 Edition, Policy Plan, Environment, as amended through February 12, 2013, page 9:

"Proposals that include the use or storage of hazardous materials should provide adequate containment facilities, monitoring, and spill prevention strategies to protect surface and groundwater resources consistent with State regulations."

Fairfax County Comprehensive Plan, 2013 Edition, Policy Plan, Environment, as amended through February 12, 2013, page 18:

"Objective 10: Conserve and restore tree cover on developed and developing sites. Provide tree cover on sites where it is absent prior to development.

Policy a. Protect or restore the maximum amount of tree cover on developed and developing sites consistent with planned land use and good silvicultural practices."

ENVIRONMENTAL ANALYSIS:

This section characterizes the environmental concerns raised by an evaluation of this site and the proposed land use. Solutions are suggested to remedy the concerns that have been identified by staff. There may be other acceptable solutions.

Stormwater

The application proposes modification of the existing stormwater management system, specifically the elimination of smaller stormwater ponds in the southeastern portion of the site, and consolidation to an existing stormwater pond in the northern portion of the site. The proposed expanded existing pond will result in a loss of vegetation. Additionally, there are concerns as to the efficacy of the proposed stormwater management. Staff wishes to defer to the comments from the Department of Public Works and Environmental Services (DPWES), and their detailed analysis of these concerns.

Tree Cover

The loss of vegetation from the proposed expansion of the stormwater pond is a concern. There is also a concern for the health and quantity of the plantings additionally conditioned with the approved 2007 SEA. Staff recommends a thorough examination of the property, in concert with DPWES Urban Forestry Management, to determine the most appropriate tree cover and planting plan.

Energy Park Use

This application proposes use of a green energy park. One component of this park is the installation of energy generation technology (e.g. wind turbines, solar panels, geothermal infrastructure) in and on the top of the completed, capped landfill. Staff notes the applicant's consultants are familiar with the installation of such structures on a capped landfill, but wants to emphasize the necessity of the cap of the landfill being properly sealed following any installation which breeches the cap to avoid pollution of water resources.

PGN:MPD

County of Fairfax, Virginia

MEMORANDUM

DATE: January 28, 2014

TO: Mary Ann Tsai; Staff Coordinator
Zoning Evaluation Division
Department of Planning and Zoning

FROM: Thakur Dhakal, Senior Engineer III
Site Development and Inspections Division
Department of Public Works and Environmental Services

SUBJECT: Special Exception Plat Amendment #SEA 80-LV-061-2; Lorton Landfill; SEA Plat dated December 12, 2013, LDS Project #1883-ZONA-002-1, Tax Map #113-1-01-0005, 0007, 0008, 113-3-01-0001, 0002, 0004; Mount Vernon District; Mill Branch Watershed

We have reviewed the subject application and offer the following Stormwater management comments.

Chesapeake Bay Preservation Ordinance (CBPO)
There is Resource Protection Area (RPA) on this property and the project does not propose disturbance within RPA. However, an RPA re-delineation shall be done prior to site plan approval.

Water quality controls must be satisfied for this development (PFM 6-0401.2). Applicant indicates that the BMP requirements for the site will be met for redevelopment through conservation easements. The approximate locations of conservation easements depicted on the plat, however, details of each conservation easements are not provided.

The plan proposes 15% phosphorus removal which will not be adequate under new Stormwater regulation. However, if the project is not grandfathered, it should meet proposed PFM requirements. The application does not provide information on how the site meets the proposed Stormwater Ordinance requirements. In site plan submission, a detail BMP computation must be provided. BMP requirement must be met on each phases of the plan.

Compared to the location and area of disturbance, the proposed conservation easement does not provide water quality benefit for the proposed landfill. Even though it is adequate under current regulation, the proposed phosphorus removal would be inadequate for the upcoming regulations. Every effort shall be made to provide BMP more than that of minimum necessary

Department of Public Works and Environmental Services
Land Development Services, Site Development and Inspections Division
12055 Government Center Parkway, Suite 535
Fairfax, Virginia 22035-5503
Phone 703-324-1720 • TTY 711 • FAX 703-324-8359

Floodplain
There are regulated floodplains on the site. A floodplain study will be required before the site plan approval.

Downstream Drainage Complaints
There are several downstream drainage complaints on file. More information on these complaints is available from the Maintenance & Stormwater Management Division (703 877 2800). Detention is mandatory when there are downstream drainage complaints.

Stormwater Detention
Applicant indicates to provide the Stormwater detention requirements with dry and/or wet ponds. The pond #3 is indicated to be designed for proportional improvement. Detail computations for proportional improvement shall.be provided on site plan. The peak release rate must also be reduced by a percentage below the good forested condition proportional to the development.

All Stormwater detention facilities shall be designed in accordance with PFM and detailed evaluation and analysis shall be provided on site plan. (PFM 6-0203.4C (1) (ii))

Runoff Reduction Method:
Applicant indicates that the development occurs in phases. Part of the development may occur after the new Stormwater management regulations will be adopted and we recommend that Stormwater management computations be provided with Virginia Runoff Reduction method to ensure it meets the future regulations. However, please note that the site plans submitted for approval prior to the adoption of new regulations will be reviewed under current regulations.

Onsite Major Storm Drainage System and Overland Relief
Applicant needs to provide an overland relief narrative and arrows showing runoff flow path of the 100-year storm event.

Downstream Drainage System
An outfall narrative has been provided, however a detail outfall analysis with narrative must be provided on site plan.

Part of the drainage pipes are designed to run over the ground and cross a minor floodplain. Minimum cover for storm sewer pipe should be 24 inch. Adequate care for safety and structural correction shall be provided on the design of these pipes.

Drainage Diversion

During the development, the natural drainage divide shall be honored. If natural drainage divides cannot be honored, a drainage diversion justification narrative must be provided. The increase and decrease in discharge rates, volumes, and durations of concentrated and non-concentrated Stormwater runoff leaving a development site due to the diverted flow shall not have an adverse impact (e.g., soil erosion; sedimentation; yard, dwelling, building, or private structure flooding; duration of ponding water; inadequate overland relief) on adjacent or downstream properties. (PFM 6-0202.2A)

Stormwater Planning Comments

This case is located in the Mill Branch Watershed. There are several water quality control plans located near the subject site. Please coordinate with Stormwater Planning Division to address their comments.
Please visit http://www.fairfaxcounty.gov/dpwes/watersheds/publications/lo/lo_122110.pdf for more details.

Dam Breach

None of this property is within the dam breach inundation zone.

These comments are based on the 2011 version of the Public Facilities Manual (PFM). A new Stormwater ordinance and updates to the PFM's Stormwater requirements are being developed as a result of changes to state code (see 4VAC50-60 adopted May 24, 2011). The site plan for this application may be required to conform to the updated PFM and the new ordinance.

Please contact me at 703-324-1720 if you require additional information.

TD/

cc: Fred Rose, Chief, Watershed Planning & Assessment Branch, Stormwater Planning Division, DPWES
Clinton Abernathy, Acting Chief, South Branch, SDID, DPWES
Zoning Application File

County of Fairfax, Virginia

MEMORANDUM

DATE: December 16, 2013

TO: Barbara C. Berlin, Director
Zoning Evaluation Division, DPZ

FROM: Chris Caperton, Chief
Public Facilities Planning Branch, DPZ

SUBJECT: Section 15.2-2232 Review
Application 2232-V13-18 (concurrent with **SEA 80-L/V-061-2**)
Furnace Associates, Inc.
Green Energy Wind Turbine and Solar Panel Electric Generating Facilities and Quasi-Public Use
10001, 10201, 10209, 10215, 10219 and 10229 Furnace Road, Lorton 22079
Tax Map 113-1 ((1)) 5 pt., 7 and 8; 113-3 ((1)) 1, 2 and 4

Pursuant to Va. Code Sec. 15.2-2232, the Facilities Planning Branch of the Planning Division offers the following comments and recommendation on the proposed Furnace Associates green energy wind turbine and solar panel electric generating facilities and quasi-public use.

PROJECT DESCRIPTION

The applicant, Furnace Associates, Inc., proposes to construct green energy wind turbines and solar panel electric generating facilities and a quasi-public use on a 249.82 acre parcel as described in the 2232 Review Application. The proposal is also subject to review and approval of SEA 80-L/V-061-2. The applicant proposes to phase implementation of four renewable energy technologies, including solar panels, wind turbines, methane gas to energy and geothermal heat exchange.

BACKGROUND

The Office of the County Attorney opined that two of the four renewable energy infrastructures proposed, specifically, the solar panels and wind turbines, are considered a public utility and therefore require 2232 review and approval. The proposed facility is summarized below and within the 2232 Review Application (Attachment A) and includes, by reference, the plans included within the SEA 80-L/V-061-2 staff report.

Location: The 249.82 acre property is generally located between Interstate 95 (I-95) and Furnace Road, south of Lorton Road and east of the County landfill, incinerator, and the Landfill Energy Systems facility at 10001, 10201, 10209, 10215, 10219 and 10229 Furnace Road, Lorton 22079. Two parcels adjacent to the application property, also owned by the applicant, are located on the west side of Furnace Road.

Site: The subject property has operated as a landfill since the 1970s and is currently zoned to the R-1 zoning district, subject to development conditions dated November 16, 1981 and amended on January 8, 2007. The current approval allows the existing landfill operation with closure in 2019.

Proposed Facility: The concurrent SEA application proposes several uses on the subject property to be performed in a total of six (6) phases of development through 2050. The purpose of this 2232 review is solely for the solar panels and wind turbines proposed at the maximum 412-foot elevation of the landfill. As noted in application 2232-V13-17, the applicant is committing to install a separate solar panel farm on its adjacent property on the west side of Furnace Road subject to PCA 2000-MV-034 approval.

Initially, the applicant proposes to install three (3) wind turbines, approximately 180 feet in height, to begin operation during Phase 1 on the southern portion of the site, as depicted on Sheet 6 of the Plan submission included within the application materials. The SEA proposes the creation, in Phase 5, of a 40-acre platform at the maximum 412-foot elevation of the landfill. A maximum of twelve (12) additional wind turbines and/or a solar panel farm will be provided by the applicant at this phase of development. The initial three (3) turbines are proposed to be removed and/or replaced for a maximum of twelve (12) turbines at the end of Phase 5 of development.

During Phase 4, the applicant proposes to create a 10-acre elevated platform at the southern end of the landfill for the potential establishment of a solar panel farm. The applicant indicates that the potential for additional solar renewable energy facilities would also exist by the end of Phase 5 on the 40-acre platform.

COMPREHENSIVE PLAN CITATIONS

Fairfax County Comprehensive Plan, 2013 Edition, Area IV, Lower Potomac Planning District as amended through April 9, 2013, LP2 Lorton-South Route 1 Community Planning Sector, pages 58-105, Page 75 specifically states:

> "The land use plan in the Lorton-South Route 1 area includes: "gateway" site and building design; low and high density residential areas; industrial areas; "Town Center" and related uses; public facility use; recreational area; and environmentally sensitive areas. Although these uses are generally contained in one or two distinct subareas of the sector, it is envisioned that they will work in concert to create a comprehensive and interrelated

community. Descriptions of the general concepts and recommendations are summarized below. . . .

Recreational Area

The largest area planned for recreation or public park uses in the sector is located south of Dixon Street, west of I-95 and east of Furnace Road. While the area currently contains a large private debris landfill, it is envisioned that when landfill operations cease that this area will be developed with private or public recreational uses such as a golf course. . . .

Sub-unit B4

Sub-unit B4 contains a private debris landfill. To help mitigate any visual impacts upon the surrounding area, buffers should be maintained around the landfill. When the landfill is built-out, it is recommended that the site ultimately be developed with active recreational uses such as a golf course."

STAFF ANALYSIS

Fairfax County Department of Planning and Zoning (DPZ) - Planning Division – Historic Preservation (Attachment B)

- Because there are two National Register of Historic Places (NR) Historic Districts in the vicinity of the application property, one of which the applicant has documented will be visually affected by the proposed installation of the solar panels and wind turbines, staff recommends the applicant comply with Section 106 of the National Historic Preservation Act of 1966, as amended, as may be necessary. If federal licensing or permitting for the installation of the solar panels and wind turbines is required, this may be considered an undertaking that requires Section 106 review. The applicant should contact the VDHR for guidance.
- The applicant should provide to the DPZ, Planning Division, documentation as to whether or not Section 106 review is required in order to be reviewed and included in the staff report for SEA 80-L/V-061-2. If Section 106 review is required, or has been previously completed, the applicant should provide a copy of the completed Section 106 to DPZ, Planning Division, in order to be reviewed and included in the staff report for the SEA application.
- The Town of Occoquan should be given the opportunity to comment on this 2232 application.

CONFORMANCE WITH THE COMPREHENSIVE PLAN

Va. Code Sec. 15.2-2232, as amended, requires the Planning Commission to determine whether the general location or approximate location, character, and extent of the proposed facility, as amended, are substantially in accord with the adopted Comprehensive Plan:

Location, Character and Extent

As noted in the Historic Preservation memorandum (included as Attachment B), the subject property is not included within the boundaries of an Historic Overlay District and is not listed in the Inventory of Historic Sites or the National Register of Historic Places. However, it is noted that the D.C. Workhouse and Reformatory Natural Register Historic District extends across 511 acres in the vicinity of and/or adjacent to the application property. Although the placement of the wind turbines may be visible from the adjacent property, staff does not believe it would cause an adverse visual impact due to the location of the proposed wind turbines, atop the expanded landfill. Staff believes the subject property is considered a suitable location for this type of use. The turbines will be situated at a height and location as to minimize visual impacts from area residential neighborhoods to the north and the D.C. Workhouse and Reformatory Historic District west/northwest of the landfill. I-95 to the east serves as a buffer to this use, as does the existing landfill and open space to the south and west. No noise impacts are expected to emanate from the turbines.

The applicant has indicated that unlike conventional power plants, wind power plants emit no air pollutants or greenhouse gases and provide a clean, safe, non-polluting source of energy. As stated above, the applicant proposes to install three (3) wind turbines, approximately 180 feet in height, to begin operation during Phase 1 of development and located at the southern end of the property. They would not be visible to the residents of Lorton Valley, which is the community closet to the subject property. The applicant proposes the first wind turbine installation no later than 18 months after all necessary County, State and Federal approvals for the landfill and turbines have been obtained. The second and third wind turbines will be installed within 36 months after receiving such approvals. The final 40-acre platform at the maximum 412-foot elevation of the landfill will provide space for up to twelve (12) total wind turbines and/or a solar panel farm. With regard to the solar panels, they would be placed low to the ground and fixed in their locations and therefore should not create a negative visual impact on adjacent properties.

Multiple photo simulations were provided to staff for review depicting existing and projected conditions of the application property in 2013, 2019, 2033, 2040 and 2050. During review of the photo simulations, and as shown in the image on the following page, although a total of twelve (12) wind turbines are proposed to be located on the 40-acre platform at the 412-foot elevation of the landfill, it is staff's opinion that the proposal as requested would not appear to have any adverse negative visual impacts given their distances from residential properties. Also depicted in the image, the applicant proposes a more natural screening effect on the north and east slopes of the landfill providing a substantial vegetated berm in addition to a 50-foot vegetated buffer

between the immediately closest residential neighborhood to the north of the application property to soften the appearance of the wind turbines at their raised elevations.

It is noted that fifty percent (50%) of any revenue the applicant receives, in excess of 2.5 cents per kilowatt hour, from the sale of the electricity produced by the wind infrastructure is proposed to be donated to Fairfax County. In summary, as indicated by the applicant, these renewable energy features support the policies in the Comprehensive Plan which encourage application of energy conservation, in the design and construction of new development and redevelopment projects and the use of renewable energy resources.

LORTON STATION
AT ANNETTE DRIVE - 2050 (ELEVATION 412')

Photo simulation which depicts the vegetated berm and the potential for 12 wind turbines located at the maximum elevation of the subject property

CONCLUSION AND RECOMMENDATION

Staff concludes that the subject proposal, as amended, by Furnace Associates, Inc. 10001, 10201, 10209, 10215, 10219 and 10229 Furnace Road, Lorton 22079, satisfies the criteria of general or approximate location, character, and extent as specified in Va. Code Sec. 15.2-2232, as amended.

Therefore, staff recommends that the Planning Commission find the subject Application **2232-V13-18** substantially in accord with provisions of the adopted Comprehensive Plan.

CBC/DLP

COUNTY OF FAIRFAX, VIRGINIA
APPLICATION FOR DETERMINATION
PURSUANT TO VIRGINIA CODE SECTION 15.2–2232

**** This area to be completed by staff ****

APPLICATION NUMBER 2232-V13-18

Date application received November 5, 2013 by DPZ

Date(s) Revised

Date application accepted December 12, 2013 by Debbie Fenbuton

RECEIVED
NOV 05 2013
DEPARTMENT OF PLANNING & ZONING
PLANNING DIVISION

(Please Type or Clearly Print)

PART I: APPLICATION SUMMARY

LOCATION OF PROPOSED USE

Address 10001, 10201, 10209, 10215, 10219, 10229 Furnace Road

City/Town Lorton, VA Zip Code 22079

Place Name (example: Dale High School) Lorton Green Energy Park

Tax Map I.D. Number(s) 113-1-((1))-5(pt.), 7, 8; 113-3-((1))-1, 2, 4

Fairfax County Supervisor District Mt. Vernon

APPLICANT(S)

Name (Company or Agency) Furnace Associates, Inc.

Agent Name Francis A. McDermott

(Note: Failure to notify County of a change in agent may result in application processing delays)

Agent's Mailing Address Hunton & Williams LLP, 1751 Pinnacle Drive, Suite 1700

City/Town McLean State VA Zip Code 22102

Telephone Number (703) 714-7422 Fax (703) 714-7410

E-mail fmcdermott@hunton.com

Secondary Contact Elaine O'Flaherty Cox

Telephone Number (703) 714-7450 E-mail ecox@hunton.com

BRIEF DESCRIPTION OF PROPOSED USE

Green energy wind turbine and solar panel electric generating facilities and quasi-public use.

Total Area of Subject Parcel(s) ±249.82 acres

Zoning District R-1

Previous Zoning Approvals for all uses on site (proffered conditions, special permits, special exceptions, variances, development plans)

SE 80-L/V-061
SEA 80-L/V-061
SEA 80-L/V-061-2 (pending)

RECEIVED
NOV 05 2013
DEPARTMENT OF PLANNING & ZONING
PLANNING DIVISION

PROPERTY OWNER(s) OF RECORD

Owner Furnace Associates, Inc.

Street Address 11220 Assett Loop, Suite 201

City/Town Manassas State VA Zip Code 20109

Has property owner been contacted about this proposed use? ☑ YES ☐ NO

SIGNATURE

The undersigned acknowledges that additional Fairfax County land use review requirements may be identified during the review of this 2232 Review application and the fulfillment of such requirements is the responsibility of the applicant. The undersigned also acknowledges that all Fairfax County Zoning Ordinance requirements pertaining to this project shall be fulfilled.

In the event a new agent is assigned responsibility for this application, the applicant agrees to provide a letter to the Department of Planning and Zoning authorizing the transfer of responsibility for the application and providing all new contact information. In the event the applicant fails to notify County staff of a change in agent, the application may be subject to processing delays.

Signature of Applicant or Agent

Date 11/4/13

Submit completed application to:

Chris Caperton, Chief, Facilities Planning Branch
Fairfax County Department of Planning and Zoning
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
(703) 324-1380

VIRGINIA CODE § 15.2-2232 APPLICATION

PROPOSED GREEN ENERGY WIND TURBINE AND SOLAR PANEL ELECTRIC GENERATING FACILITIES AND QUASI-PUBLIC USE
10001, 10201, 10209, 10215, 10219, 10229 FURNACE ROAD

RECEIVED
NOV 05 2013
DEPARTMENT OF PLANNING & ZONING
PLANNING DIVISION

STATEMENT OF JUSTIFICATION

November 4, 2013

A. Description of the Proposed Wind and Solar Uses

Furnace Associates, Inc. ("Furnace"), the Applicant in pending Special Exception Amendment Application SEA 80-L/V-061-2 ("SEA-2"), seeks to amend prior approvals for the Lorton Construction Demolition Debris Landfill (the "Landfill") and proposes, as interim uses, state-of-the-art renewable energy electric generating, quasi-public facilities. This request, filed pursuant to Section 15.2-2232 of the Code of Virginia, is limited solely to wind turbine and solar renewable energy generating, quasi-public, uses as proposed in SEA-2 on the Landfill located at 10001, 10201, 10209, 10215, 10219 and 10229 Furnace Road and identified as Fairfax County Tax Map Parcels 113-1-((1))-5(pt.), 7, 8; 113-3-((1))-1, 2 and 4 (collectively, the "Property"). The Property consists of approximately 249.82 acres and is zoned to the R-1 (Residential) District.

The SEA-2 Plat dated March 22, 2013, as revised through November 1, 2013 consists of 45 sheets showing proposed facilities and the anticipated phased installation of the facilities. The Plat has been prepared by BC Consultants with input from Geosyntec Consultants ("Geosyntec"), the Applicant's green energy and landfill consultant. Numerous detailed Geosyntec documents have been submitted in conjunction with pending SEA-2 and discussed by Geosyntec with all referral agencies for more than two hours on July 25, 2013 and, including a study by Geosyntec evaluating the feasibility of renewable energy technologies on the Property later filed with the Department of Planning and Zoning ("ZED") on August 15, 2013. The technical information in this Statement reflects reports prepared by Geosyntec.

As a pilot project, Furnace has proposed to phase potential implementation of four renewable energy technologies which will have the combined capacity of 15.5 megawatt peak (MWp) of electricity, including solar panels (7.5MWp), wind turbines (3MWp), methane gas to energy (4MWp), and geothermal heat exchange (1MWp). Establishment of these four technologies in one place would be unique in the United States, create a transformational use in the Lorton area and reduce the carbon footprint of the area by reducing or offsetting the use of fossil fuels. Based on a County Attorney opinion, two (wind turbines and solar panels) of the four renewable energy infrastructures need Section 2232 determination. Note that Furnace is committing to install a separate solar panel farm on its adjacent property on the west side of Furnace Road which is the subject of pending Proffered Condition Amendment Application PCA 2000-MV-034 and a separate Section 2232 Application.

Three wind turbines would be installed and begin operation during Phase 1 in the south-central operations area, as depicted on SEA-2 Plat Sheet 6. Furnace proposes to install mid-sized 250

kilowatt (kW) capacity turbines, rather than large-scale turbines, up to 180 feet in height for the tower and rotor (see SEA-2 Plat Sheet 14). The electricity generated by the turbines would be distributed to the power grid through one of four viable paths yet to be selected. The SEA-2 Plat requires Furnace to create in Phase 5 a 40-acre platform for the potential of up to 12 wind turbines and/or a solar panel farm to be provided by the Applicant or others, as depicted on SEA-2 Plat Sheets 10 -13. This new, Phase 5 top deck area can take advantage of unusually favorable prevailing wind conditions given the 412-foot elevation plus the turbine height, and proximity to a major water body.

Each of these initial three wind turbines will have the capacity of one-quarter megawatt peak of electricity on that section of the platform. The first turbine will be installed no later than 18 months after all necessary County, Virginia, and Federal approvals for the Landfill and turbines have been obtained. The second and third turbines will be installed within 36 months after having received all such approvals. Fifty percent of any revenue, in excess of 2.5 cents per Kilowatt-hour, Furnace receives from the sale of the electricity produced by the wind infrastructure will be given to the County.

Wind energy is a clean, safe, non-polluting source of energy. Unlike conventional power plants, wind power plants emit no air pollutants or greenhouse gases. At the scale planned for the Lorton Landfill, rotor swept-area radii are on the order of 60 feet, with tower heights varying from 85 to 120 feet. Due to their aerodynamic design, the width of a turbine blade varies from about three feet at the tip to ten feet near the center of the tower. Blades are typically manufactured from fiberglass reinforced polyester while towers are assembled from conical steel sections. Additional technical information regarding wind energy systems is available at the American Wind Energy Association website at:

http://www.awea.org/learnabout/publications/factsheets/index.cfm

The wind power industry rates a turbine in terms of its "name plate" power generation capacity, which assumes that the wind conditions prevailing at a site are available to achieve maximum efficiency from a wind turbine for 24 hours a day, 365 days per year. Reference to a 1MW wind power system is thus in reality reference to a 1MW name plate (1MWp) system. The difference between the name plate capacity and actual output is called the "capacity factor," which is typically about 20% because of daily variations in wind speed and direction, turbulence effects from the ground, and other factors.

As shown on the SEA-2 Plat, in Phase 1 installation of three 250kWp wind turbines, for a combined estimated generation of .75MWp, is proposed. At Landfill closure, the initial three turbines will have been removed and the Landfill configuration completed to allow installation of twelve 250kWp turbines for an estimated combined output of 3MWp. The expected annual power output from each 250kWp turbine at 20% capacity factor is (250x24x365x0.2) = 438,000kWh. The average U.S. home consumes about 1,200 kWh monthly; therefore, each turbine would be expected to offset annual electricity demand from 438,000/(1,200×12) = 30 homes. Based on this, three turbines would provide enough power for about 90 homes. 12 turbines would provide enough power for about 360 homes.

Foundation design information and a diagram prepared by Geosyntec were filed with ZED on June 24, 2013. The Phase 1 turbines are located in an area of the Landfill that will be inactive

for a significant period while other Landfill areas are filled. The entire Landfill will be filled to final height and fully capped before any potential installation of the 12 turbines. Due to potential issues with differential settlement, proper foundation design is critical for any large structure installed on a landfill. The foundation design for wind turbines on top of a landfill will require either deep foundations (drilled shaft or piles, which penetrate the final cover) or shallow foundations (concrete rafts, which do not penetrate the cover). Design selection will be based on the settlement characteristics and bearing capacity of underlying cover, waste, and soil/rock properties, and regulatory conditions governing cover penetrations. Note that to avoid excessive movement of the wind turbines and transmission of high dynamic forces to the tower and foundation during high winds, automatic braking and cut-off systems are built into the turbines' control systems which stop operation if wind speeds exceed a given range.

During Phase 4, as shown on SEA-2 Plat Sheet 9, Furnace proposes to create a 10 acre elevated platform at the southern end of the Landfill operations area for establishment of a potential solar panel farm by the Applicant and/or others. The potential for additional solar renewable energy facilities would also exist by the end of Phase 5 on the 40 acre platform. The combined potential solar energy from those two solar panel platforms equates to approximately 7.5 MWp. Energy would be produced in the form of electricity from solar power using photovoltaic ("PV") cells. The PV cells are made of silicon, a semi-conductor material, which when exposed to the direct sunlight leads to the movement of electrons, thereby generating direct current ("DC") electricity. The electric current produced will likely be connected to power grid at the LES (formerly "Michigan Cogeneration") facility which is 500 feet east of the Landfill. The PV cells are designed to absorb sunlight to produce energy; the more sunlight they absorb the more energy they produce. Current PV cells absorb about 2/3rds of the total incident sunlight and reflect 1/3rd of the sunlight reaching their surface. Most solar panels are now designed with at least one anti-reflective layer and may have multiple layers, thereby further reducing reflectivity.

B. Requirement for Proposed Wind and Solar Uses

Numerous Board of Supervisors (the "Board") policies, reports, task forces and motions call for sustainability and use of renewable energy, including creation of a pilot, green energy program in Lorton. The wind and solar facilities proposed on the Property will implement the vision of the County's Energy Alliance Task Force (the "Task Force") and the broader, long-term sustainable energy goals established by the Board. One recommended goal of the Task Force specifically was to establish a "Green Energy Triangle" as a transformational use in Lorton.

The proposed wind and solar facilities would implement (i) County Energy Policy, which includes the objective of the "use of alternative and sustainable energy options" based on the Board's Environmental Agenda to "support alternative energy sources"; (ii) the "Cool Counties Climate Stabilization Declaration" to which the County is signatory and states that this policy is the cornerstone of renewable energy and commits to reducing greenhouse gases; and (iii) the County's 2014 Environmental Improvement Program ("EIP") which calls for development of a "Renewable Energy Demonstration Park".

The type of pilot green energy project being proposed by Furnace has been contemplated specifically by the Board in Lorton for several years. In its October 16, 2012 Motion the Board enthusiastically and unanimously endorsed the Board Chairman's "Private Sector Green Energy Task Force" recommendations with the purpose of "*stimulating a transformational energy*

project" and creating *"with the private sector, pilot projects to demonstrate the use of local alternative energy sources for small and large scale development. These projects should: a) Not require legislative changes, nor changes to county policy; b) Be revenue neutral for the county or have the potential for revenue generation and c) Could be initiated within 24 months. The Lorton Green Energy Triangle is a potential example."*

SEA-2 proposes to implement a key component of the February 5, 2013 DPWES Staff Report to the Board Environmental Committee recommending development of the Green Energy Triangle in Lorton. A key objective in this Staff Report is to rebrand the Lorton area. The Applicant's proposal further manifests the County Executive's FY 2014 report to the Board, which specifically cites the Green Energy Triangle as "leading to a re-branding of the Lorton area, changing its identity from being a site of the County's waste and debris disposal facilities to becoming a tangible expression of the County's renewable commitment". The SEA-2 green energy package is a direct result of the work of the Green Energy Task Force and the Board's Environmental Committee.

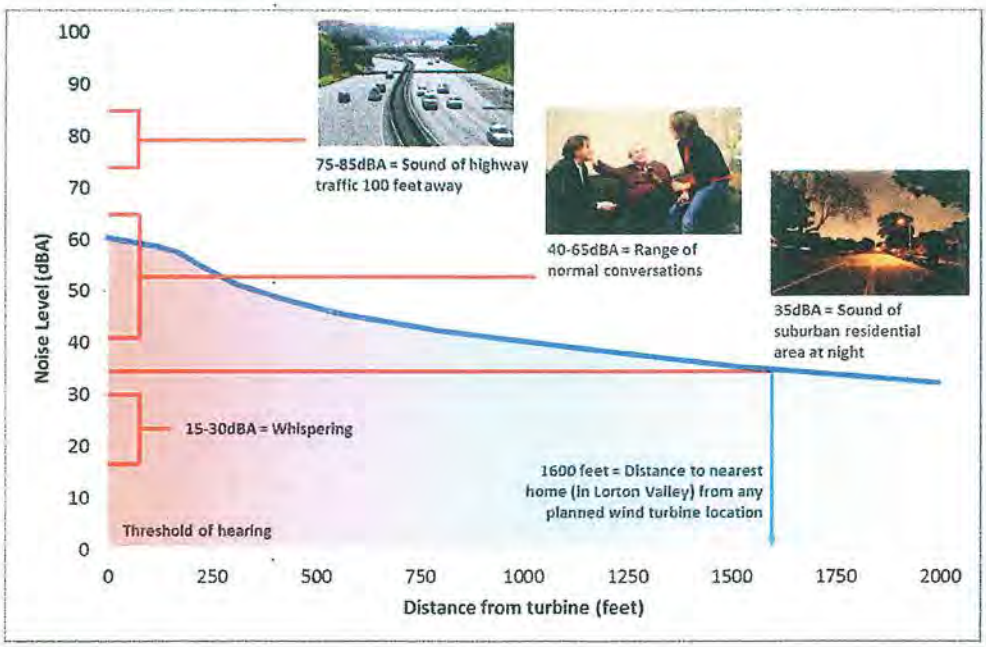
This site is uniquely situated for all four renewable energy technologies being shown in SEA-2, and would be the first such co-location site in the Country. Few, if any, parcels in Fairfax County can create the elevated platform with sufficient height to generate wind speeds, establish large solar arrays and have methane and geothermal properties to create a feasible green energy pilot project with adjacency to (i) single-ownership (County) land and uses, and (ii) options for immediate access to the grid. Wind turbines need moderate but steady winds for producing energy, begin producing as wind speeds reach 5-7 m/s (11-16 mph). The efficiency of wind turbines depends on the amount of energy extracted by the blades (swept area of the rotor) and installation height of rotor. Greater height provides better access to steadier, higher-speed winds. Wind energy is a clean, non-polluting source of energy. Unlike conventional power plants, wind power plants emit no air pollutants or greenhouse gases. It is estimated that a 1MWp wind system would prevent the release of nearly 2 million pounds of carbon dioxide every year for the life of the system (California Energy Commission). This location and proposal create the potential for 3MWp wind energy and 7.5MWp solar energy.

C. Anticipated Impacts/Mitigation

Although wind power plants have little impact on the environment as compared to fossil fuel plants, several concerns need to be addressed when designing a wind facility. Wind power presents three environmental impact consideration: noise, visual, and risk of bird collisions.

Two kinds of ***noises*** are associated with wind turbines: (1) aerodynamic noise from the spinning blades, and (2) mechanical noise from the rotating machinery. Modern wind turbines produce negligible noise above the ambient backdrop of residential communities. The turbine blades produce a sound as they encounter turbulence in the air (similar to the sound made by wind passing through trees), but this noise is masked by the background noise associated with blowing wind. From a distance of over 500 feet, a modern mid-sized turbine is no noisier than a kitchen refrigerator running normally. Geosyntec already performed a preliminary noise impact analysis as part of the initial feasibility study. The results are illustrated in the chart below:

Expected wind turbine noise levels at Lorton Energy Park



At a distance of 1,600 feet from the turbines, the noise (at less than 40dBA) would be only 1/16th that of nearby traffic on I-95 (at about 80dBA) and less than half that of a normal conversation (at about 50dBA). The turbines would not add any noise above the ambient level of suburban residential areas at night.

Visual and aesthetic concerns are the most commonly expressed concerns for the development of wind energy projects. Furnace has redesigned and added to the currently approved landscape plan to provide a more natural screening effect on the north and east slopes of the Landfill. Other proposed landfill design changes would result in the Landfill top elevation increasing from four acres to forty acres to create a platform for the potential of twelve wind turbines and an approximately forty-acre solar farm. The three wind turbines proposed to be installed during Phase 1 will be at the southern end of the operations area and will not be visible to the residents of Lorton Valley, the community closest to the Landfill. The only homes that will be able to view any of these three turbines or the possible future 12 turbines are located at a significant distance from the Landfill, across I-95 on certain high points of land within Lorton Station. On July 25, 2013, illustrative photographs taken from 10 locations surrounding the Landfill, showing existing and projected conditions in 2013, 2019, 2033, 2040 and 2050 (prepared by BC Consultants) were hand-delivered to DPZ, including an aerial index, narrative descriptions and line of sight drawings demonstrating the very minimal, off-site visual impact of the three wind turbines proposed to be installed in Phase 1 and the solar panels and wind turbines potentially to be installed, respectively, in Phase 4 and at the end of Phase 5.

Lights are required for aviation safety on any structure which is higher than 200 feet above the surrounding terrain, and have to follow recommendations from the Federal Aviation Administration (FAA) Advisory Circular AC 70/7460 (2007) for Obstruction Marking and Lighting. The number of lights required depends on the number and layout of the wind turbines

installed. Not all the wind turbines will need to be lighted, however, because the periphery of the installation will be lighted properly and the lights will be not spaced more than a half mile apart. A dual lighting system which consists of red lights for nighttime and high or medium intensity flashing white lights for daytime and twilight is generally required. The red colored flashing lights need to comply with FAA L-864 requirements and have 20-40 flashes per minute (FPM); white lights need to comply with FAA L-864/L-865 requirements, with 40 FPM.

Birds can fly into wind turbines, as they can with other tall structures. Assuming that care is taken to site turbines outside of the main cross-continental migration corridors, the collision rate of birds with turbines is reportedly very low, similar to that for electricity transmission lines. In fact, wind energy's overall impact on birds is extremely low compared to other human-related causes of death. Buildings (particularly with glass facades), communications towers, traffic, and house cats are responsible for far greater numbers of bird deaths per year than wind turbines.

Increasing the top deck area available at the highest elevation of the Landfill will facilitate installation of wind turbines with rotor heights above the surrounding land surface where wind speeds are higher, more constant, and reliable throughout the year, without the need to construct excessively tall turbine towers. A larger top deck will allow installation of a larger number of medium-scale turbines (only 12 are proposed), increasing the total power generation capacity and enabling greater efficiency in the use of interconnection infrastructure. Wind energy is a clean, non-polluting source of energy. Unlike conventional power plants, wind power plants emit no air pollutants or greenhouse gases. It is estimated that a 3MWp wind system such as that proposed at the Landfill would prevent/substitute for the release of nearly 6 million pounds of carbon dioxide every year for the life of the system. That's equivalent to the average annual carbon dioxide emissions from over 1,500 cars.

Energy will be produced in the form of electricity from solar power using PV cells at the Green Energy Park. As stated earlier, Furnace is providing a solar farm on its adjacent, companion site which is the subject of a separate Section 2232 Application, and is creating the potential for solar on this Property with a ten-acre platform in Phase 4 and a forty-acre platform in Phase 5, as depicted on SEA-2 Plat Sheets 9 and 10, respectively. PV systems consist of multiple cells which convert sunlight directly into DC electricity using the photoelectric effect, which in simple terms is the movement (excitement) of electrons caused by interaction between sunlight energy and semiconductor materials. The electrons are collected to form DC electricity. The primary impact of PV cells is reflectivity. As stated above, the current PV cells absorb about 2/3rd of the total incident sunlight and reflect 1/3rd of the sunlight reaching their surface. Most solar panels now are designed with at least one anti-reflective layer and may have multiple layers thereby further reducing reflectivity. The glare from summertime sun at high noon would have the highest potential for impact to the surrounding area. Based on the sun path (east to west and southeast to southwest), topographic elevations, locations, and the southern inclination of the solar arrays, however, the potential for glare on surrounding residents was found to be minimal in Geosyntec's analysis because of its reflecting primarily away from those residents.

PV systems provide one of the most sustainable methods of electricity generation without producing greenhouse gas emissions. Using the "Clean Energy Calculator" on the California Energy Commission "Go Solar California" website, a modest 2MWp solar system that generates about 2 million kWh per year prevents/substitutes for the emission of approximately 2.3 million

pounds of carbon dioxide, 2,500 pounds of sulfur dioxide, and 3,500 pounds of nitrous oxide every year. This is equivalent to an annual reduction in automobile driving of nearly 3 million miles or planting over 180 acres of trees. Operation and maintenance costs for PV systems are minimal due to the absence of moving parts and are estimated to be around 0.5% of the capital investment annually.

D. Conformance with the Comprehensive Plan and other Standards

Page 75 of the Area IV Plan for the "Lower Potomac Planning District" recommends for this Property: *"Sub-unit B4 contains a private debris landfill. To help mitigate any visual impacts upon the surrounding area, buffers should be maintained around the landfill. When the landfill is built-out, it is recommended that the site ultimately be developed with active recreational uses such as a golf course."*

Parsing the text immediately above, until release by DEQ, finalization of the cap and adjustments from settlement will not be complete. This is the absolute earliest possible point of "build-out". And, "untilmately", does not mean "immediately", but at a final point in the future.

Further, the Property has unique characteristics that allow each of the four renewable technologies to be established together in one place which, according to Geosyntec, is unprecedented in the United States. The 40 acres of wind and solar uses in this Section 2232 Application are proposed as "interim" uses to be located on the top elevation of a landfill that's been in existence for more than thirty years. This is one of the few, if only, locations in the County with sufficient height, vacant area and wind currents to sustain efficient wind energy generation. The proposed location adjacent to Interstate 95 offers a unique branding visibility. The proposed locations for wind and solar on this 250-acre Property (south-central portion of the operations area at a 350-foot elevation in Phase 1 and central top portion at 412-foot elevation in Phase 5) will have negligible, if any, visual impacts from nearby residential properties. A significant buffer will remain on the north, east and southern sides of the operations area throughout Phases 1 through 6. The character of these two types of wind and solar facilities is completely consistent with the principal use of a landfill. Finally, the extent of the proposal is limited both in scope and elevation high above adjacent land uses. The fact is that few sites in Fairfax County offer the ability to locate wind turbines. The solar panels would be low to the ground and fixed in location.

These renewable energy features proposed in SEA-2 support policies in the "Environment Element" of the County's Comprehensive Plan which encourage, in Objective 13, Policy a ". . .application of energy conservation . . . in the design and construction of new development and redevelopment projects" and "Use of renewable energy resources". This interim use mirrors the County's closed landfill initiative for a similar interim use (a solar farm) during its post-closure period, which is cited in the Solid Waste Management component of the Comprehensive Plan.

An increase in height is being requested to permit sufficent, energy efficient height for the turbines.

E. Alternative Sites Considered for These Uses

In addition to the above-described considerations, both the site and the requested wind and solar uses are unique. No parcels in Fairfax County can create the 40-acre elevated platform with sufficient height to receive adequate, consistent wind speeds, establish large solar arrays and have methane and geothermal properties to create a feasible green energy pilot project immediately adjacent to the County-owned former penetentiary property and its numerous existing and proposed potential users of the renewable energies generated by this Property. Furnace's proposal for green energy uses provides an immediate and an interim use for this site, after closure and during its State-regulated post-closure period, that is compatible with the limitations of the site until such time a final active recreation use can be implemented. The proposed locations on the Property's large Landfill operations area were selected due to their central locations away from the Property perimeter, their distance from residential views, and their ability to capture maximum wind and solar energies.

Conclusion

The wind and solar electric generating facilities proposed in this Application satisfy the location, character and extent considerations of a Section 2232 Application. This Application presents a unique opportunity for Fairfax County to realize its Green Energy Triangle.

UTILITY SYSTEM MAP

June 2013

Geosyntec consultants

- Wind or Solar Electric Generation[5]
- Solar Electric Generation
- Methane Collection[1]
- Geothermal Infrastructure[2]
- Potential Future Wind Turbine (by others)
- Phase 1 Wind Turbine (by Applicant)[3]

NOTES:

1. Methane Collection area also includes the area within the "Wind or Sol Electric Generation" area.
2. Geothermal Infrastructure piping to be installed with the landfill operations and terminated for future use
3. The initial three (3) wind turbines to be constructed by the Applicant during Phase 1 of the landfill development and then removed after the useful life in accordance with the landfill phasing plans.
4. Potential Solar development options available within Phase 4 of the landfill development.
5. At the conclusion of Phase 5 of development, the area denoted could include 12 turbines or include additional solar development by others.

FAIRFAX COUNTY GREEN ENERGY TRIANGLE

PUBLIC/PRIVATE
WASTE TO ENERGY FACILITY
EXPORTS ELECTRICITY TO GRID

WORKHOUSE ARTS CAMPUS
OFF ELECTRICAL GRID

FAIRFAX WATER

RENEWABLE ENERGY EDUCATION
CENTER AT LORTON ARTS
FOUNDATION (FUNDED BY
CORPORATE PARTNERS)

ESI METHANE CONNECTION
TO CO-GENERATION PLANT

SOLAR FARM
ELECTRICITY TO GRID
(POSSIBLE WORKHOUSE SUPPLIER)
DEPENDENT ON PRIVATE INVESTMENT

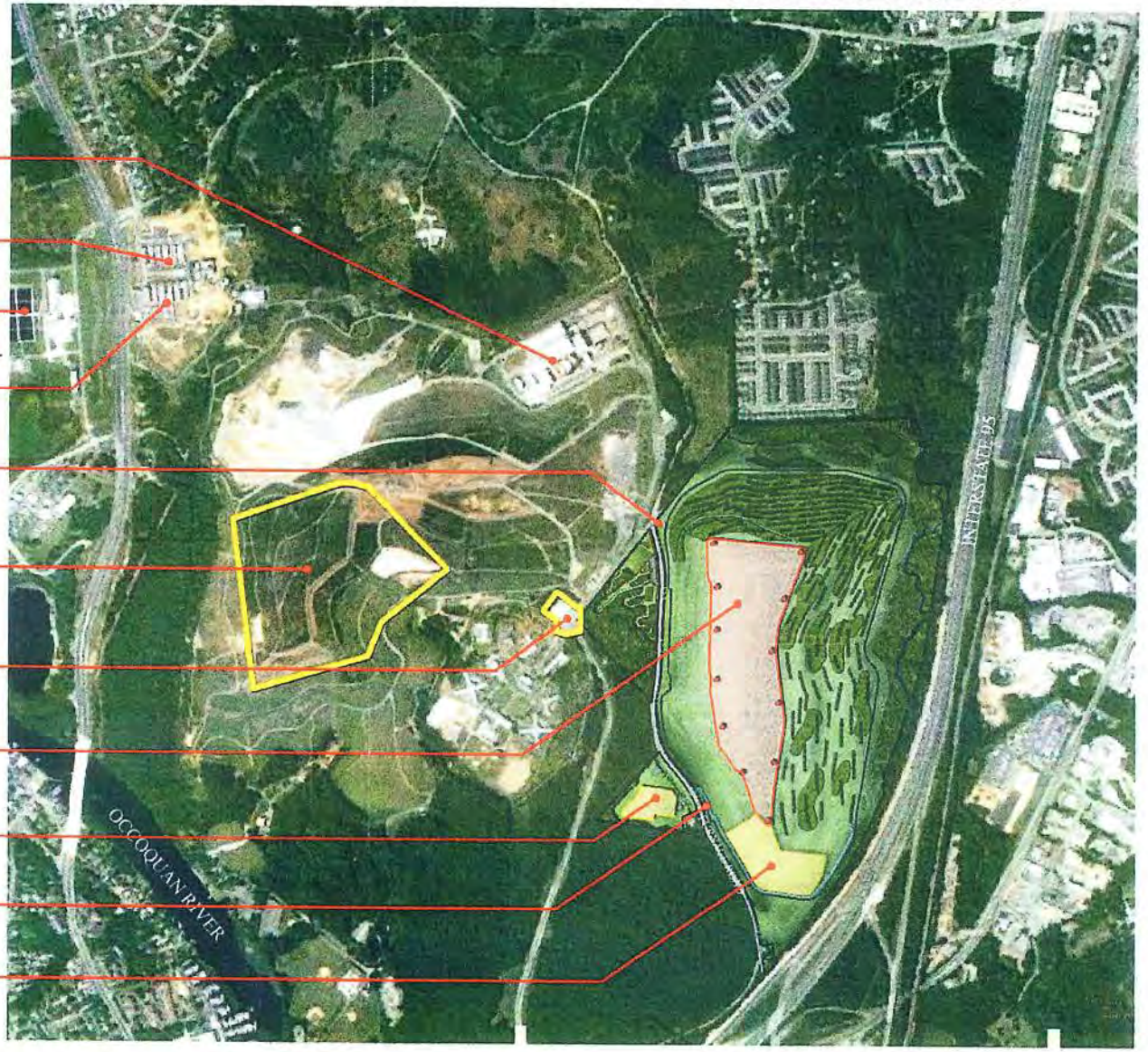
METHANE
CO-GENERATION FACILITY
PUBLIC/DPW/PRIVATE PARTNERSHIP

WIND FARM
(ADDED POTENTIAL FOR SOLAR FARM)
ELECTRICITY TO DISTRIBUTION
POINT FOR GRID

SOLAR PARK
ELECTRICITY
DISTRIBUTION TO GRID

GEOTHERMAL CONNECTION FOR
FUTURE USE ON COUNTY PROPERTY

SOLAR FARM
ELECTRICITY TO DISTRIBUTION
POINT FOR GRID



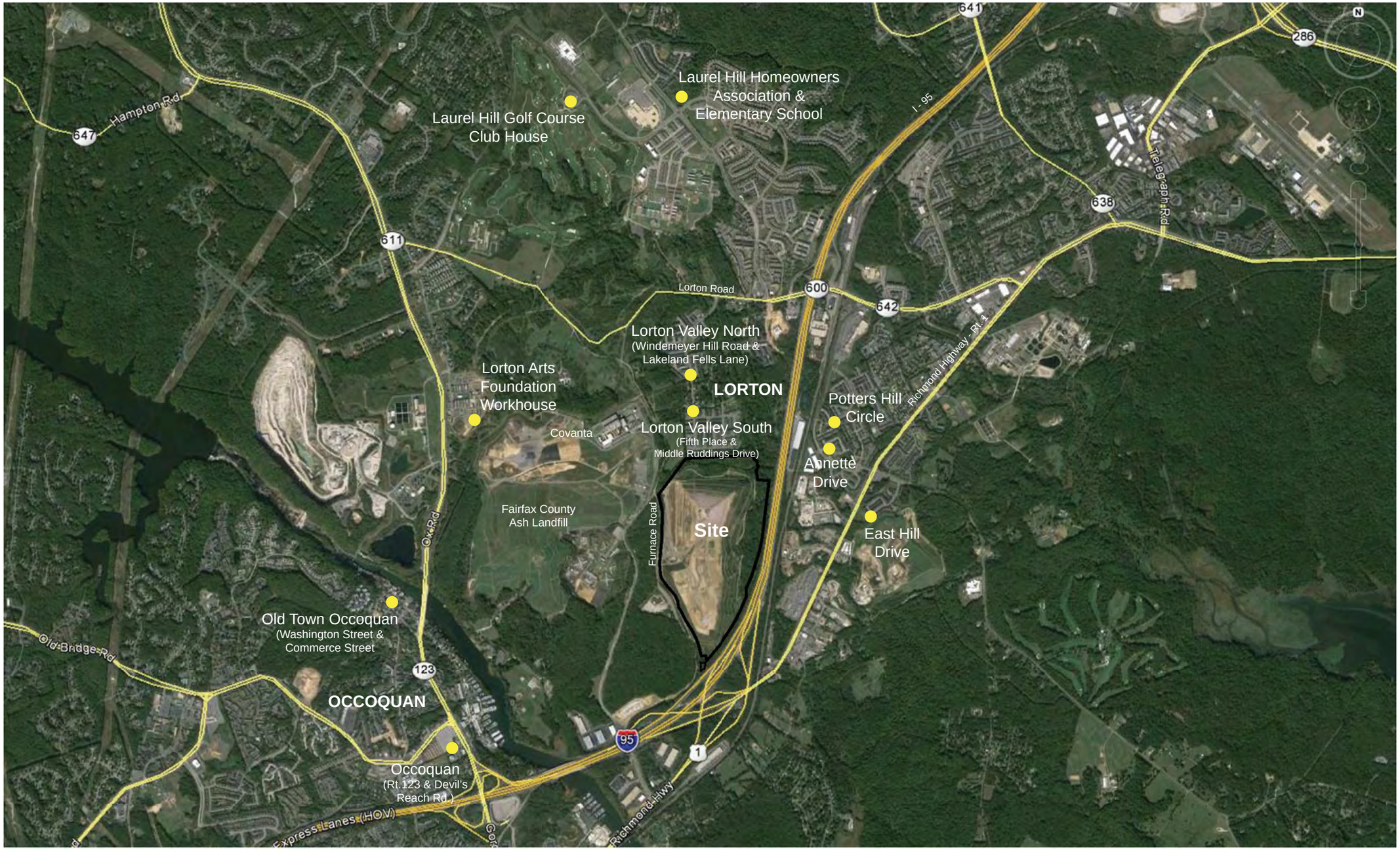
Geosyntec consultants
BC Consultants, Inc.

LORTON GREEN ENERGY PARK

Lorton, Virginia

REVISED JUNE 2013
PROJECT # 05117

PHOTO INDEX MAP



LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Lorton, Virginia

BC Consultants, Inc.

JULY, 2013
PROJECT # 05117.21
05117.21/Indesign/View Vantage Points/Context Map

Lorton Green Energy Park and Debris Landfill Photo Exhibit Narrative

Vantage Point	Year	Landfill Elevation		Wind Turbines	Narrative*
		North	South		
Lorton Valley North	2013	360	330 (Not Visible)	0	View of the existing conditions on the landfill's north slope with the growth of the landscaping previously planted (beginning in 2010). Browning rye grass at upper elevation obscures the wildflowers.
Lorton Valley North	2019	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010). Growth of the landfill's additional north slope landscaping and replacement plantings (beginning in the fall of 2013) and on the 2007 approved landfill expansion (beginning in 2014).
Lorton Valley North	2033	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010) above elevation 250'. Addition of the new landscaping planned with the proposed Special Exception Amendment (SEA) below elevation 250'.
Lorton Valley North	2040	412	412 (Not Visible)	0	View of the continued growth of the existing landscaping below elevation 250' (beginning approximately 2033). Addition of the new landscaping (beginning approximately 2035 through 2040) planned with the proposed SEA and landfill volume.
Lorton Valley North	2050	412	412 (Not Visible)	12 Potential (By Others)	View of the continued growth of the existing landscaping (beginning in 2035 through 2040) with the only visible wind turbines shown. Solar panels not visible.
Lorton Valley South	2013	360	330 (Not Visible)	0	View of the existing conditions on the landfill's north slope with the growth of the landscaping previously planted (beginning in 2010). Browning rye grass at upper elevation obscures the wildflowers.
Lorton Valley South	2019	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010). Growth of the landfill's additional north slope landscaping and replacement plantings (beginning in the fall of 2013) and on the 2007 approved landfill expansion (beginning in 2014).
Lorton Valley South	2033	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010) above elevation 250'. Addition of the new landscaping planned with the proposed SEA below elevation 250'.
Lorton Valley South	2040	412	412 (Not Visible)	0	View of the continued growth of the existing landscaping below elevation 250' (beginning approximately 2033). Addition of the new landscaping (beginning approximately 2035 through 2040) planned with the proposed SEA and landfill volume.
Lorton Valley South	2050	412	412 (Not Visible)	12 Potential (By Others)	View of the continued growth of the existing landscaping (beginning in 2035 through 2040) with the only visible wind turbines shown. Solar panels not visible.
Lorton Station at Potters Hill Circle	2013	360	330 (Not Visible)	0	View of the existing conditions on the landfill's northeast corner with the growth of the landscaping previously planted (beginning in 2010). Browning rye grass at upper elevation obscures wildflowers.

* Continued growth of the off-site vegetation shown.
** Landscaped berm not visible in any of the other above perspectives.

Lorton Station at Potters Hill Circle	2019	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010). Growth of the landfill's additional north and east slope landscaping and replacement plantings (beginning in the fall of 2013) and on the 2007 approved landfill expansion (beginning in 2014).
Lorton Station at Potters Hill Circle	2033	360	380 (Not Visible)	3 (Not Visible)	View of the continued growth of the existing landscaping (beginning in 2010) above elevation 250'. Addition of the new landscaping planned with the proposed SEA below elevation 250'.
Lorton Station at Potters Hill Circle	2040	412	412 (Not Visible)	0	View of the continued growth of the existing landscaping below elevation 250' (beginning approximately 2033). Addition of the new landscaping (beginning approximately 2035 through 2040) planned with the proposed SEA and landfill volume.
Lorton Station at Potters Hill Circle	2050	412	412 (Not Visible)	12 Potential (By Others)	View of the continued growth of the existing landscaping (beginning in 2035 through 2040) with the only visible wind turbines shown. Solar panels not visible.
Lorton Station at Annette Drive	2013	360	330	0	View of the existing conditions on the landfill's northeast corner with the growth of the landscaping previously planted (beginning in 2010). Browning rye grass at upper elevation obscures the wildflowers.
Lorton Station at Annette Drive	2019	360	380	3 (2 Visible)	View of the continued growth of the existing landscaping (beginning in 2010). Growth of the landfill's additional north and east slope landscaping and replacement plantings (beginning in the fall of 2013) and on the 2007 approved landfill expansion (beginning in 2014).
Lorton Station at Annette Drive	2033	360	380	3 (2 Visible)	View of the continued growth of the existing landscaping (beginning in 2010) above elevation 250'. Addition of the new landscaping planned with the proposed SEA below elevation 250'.
Lorton Station at Annette Drive	2040	412	412	0	View of the continued growth of the existing landscaping below elevation 250' (beginning approximately 2033). Addition of the new landscaping (beginning approximately 2035 through 2040) planned with the proposed SEA and landfill volume.
Lorton Station at Annette Drive	2050	412	412	12 Potential (By Others)	View of the continued growth of the existing landscaping (beginning in 2035 through 2040) with the only visible wind turbines shown. Solar panels not visible.
Lorton Station at East Hill Drive	2013	360	330	0	View of the existing conditions on the landfill's eastern slope with the growth of the landscaping previously planted (beginning in 2010). Browing rye grass at upper elevation obscures the wildflowers.
Lorton Station at East Hill Drive	2019	360	380	3 (2 Visible)	View of the continued growth of the existing landscaping (beginning in 2010). Growth of the landfill's additional east slope landscaping and replacement plantings (beginning in the fall of 2013).
Lorton Station at East Hill Drive	2033	360	380	3 (2 Visible)	View of the continued growth of the existing landscaping (beginning in 2010) above elevation 250'. Addition of the landscaped berm (**) planned with the proposed SEA up to elevation 150'. Addition of new landscaping planned with the proposed SEA from elevation 150' up to elevation 250'.

* Continued growth of the off-site vegetation shown.
** Landscaped berm not visible in any of the other above perspectives.

Lorton Station at East Hill Drive	2040	412	412	0	View of the continued growth of the existing landscaping below elevation 250' (beginning approximately 2033). Addition of new the new landscaping (beginning approximately 2035 through 2040) planned with the proposed SEA and landfill volume.
Lorton Station at East Hill Drive	2050	412	412	12 Potential (By Others)	View of the continued growth of the existing landscaping (beginning in 2035 through 2040) with the only visible wind turbines shown. Solar panels not visible.
Lorton Arts Foundation Workhouse	2013	360	330 (Not Visible)	0	View from the south parking lot of the Lorton Arts Foundation Workhouse. Fairfax County Water (Authority) located across Ox Road (Rt. 123) to the west. Fairfax County Ash Landfill visible in the foreground at elevation 290'. Lorton Green Energy Park and Debris Landfill visible in the background at elevation 360'.
Lorton Arts Foundation Workhouse	2042	412 (Not Visible)	412 (Not Visible)	0	View from the south parking lot of the Lorton Arts Foundation Workhouse. Fairfax County Ash Landfill visible in the foreground at capped elevation of 370'. Lorton Green Energy Park and Debris Landfill not visible at capped elevation of 412' due to the northern final fill expansion of the Ash Landfill.
Laurel Hill Golf Course Club House	2013, 2033, 2040	360 to 412	360 to 412	0	View from the Laurel Hill Golf Course club house parking lot. Lorton Green Energy Park and Debris Landfill visible at elevation 360' in 2013 and 2033 and at elevation 412' in 2040.
Laurel Hill Homeowner's Association and Elementary School.	2013, 2040	360 to 412 (Not Visible)	360 to 412 (Not Visible)	0	View from the Laurel Hill Elementary School campus adjacent to Silverbrook Road. Lorton Green Energy Park and Debris Landfill not visible at elevation 360' in 2013 or at elevation 412' in 2040.
Old Town Occoquan	2013, 2040	360 to 412 (Not Visible)	360 to 412 (Not Visible)	0	View from Old Town Occoquan at the intersection of Washington Street and Commerce Street. Lorton Green Energy Park and Debris Landfill not visible at elevation 360' in 2013 or at elevation 412' in 2040.
Occoquan at Rt. 123 and Devil's Reach Road	2013	360 (Not Visible)	330 (Not Visible)	0	View from Occoquan at the intersection of Rt. 123 and Devil's Reach Road. Lorton Green Energy Park and Debris Landfill not visible at elevation 330' looking northeast. Fairfax County Ash Landfill visible at elevation 290' looking north, northeast.
Occoquan at Rt. 123 and Devil's Reach Road	2042	412	412	0	View from Occoquan at the intersection of Rt. 123 and Devil's Reach Road. Lorton Green Energy Park and Debris Landfill visible at capped elevation 412' looking northeast. Fairfax County Ash Landfill with final fill expansion visible at capped elevation 370' looking north, northeast.

* Continued growth of the off-site vegetation shown.
** Landscaped berm not visible in any of the other above perspectives.

LORTON VALLEY NORTH

AT WINDMERE HILL ROAD AND LAKELAND FELLS LANE - 2013 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley North

LORTON VALLEY NORTH

AT WINDMERE HILL ROAD AND LAKELAND FELLS LANE - 2019 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley North

LORTON VALLEY NORTH

AT WINDMERE HILL ROAD AND LAKELAND FELLS LANE - 2033 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley North

LORTON VALLEY NORTH

AT WINDMERE HILL ROAD AND LAKELAND FELLS LANE - 2040 (ELEVATION 412')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley North

LORTON VALLEY NORTH

AT WINDMERE HILL ROAD AND LAKELAND FELLS LANE - 2050 (ELEVATION 412')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley North

LORTON VALLEY SOUTH

AT FIFTH PLACE AND MIDDLE RUDDINGS DRIVE - 2013 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON VALLEY SOUTH

AT FIFTH PLACE AND MIDDLE RUDDINGS DRIVE - 2019 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON VALLEY SOUTH

AT FIFTH PLACE AND MIDDLE RUDDINGS DRIVE - 2033 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON VALLEY SOUTH

AT FIFTH PLACE AND MIDDLE RUDDINGS DRIVE - 2040 (ELEVATION 412')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON VALLEY SOUTH

AT FIFTH PLACE AND MIDDLE RUDDINGS DRIVE - 2050 (ELEVATION 412')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON STATION

AT ANNETTE DRIVE - 2013 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

REVISED NOVEMBER 2013

V:\5117\Plan\Graphics\Indesign\5117 Lorton Valley South

LORTON STATION

AT ANNETTTE DRIVE - 2019 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax,Virginia

BC Consultants, Inc.

PROJECT # 05117.21

REVISED NOVEMBER 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON STATION

AT ANNETTE DRIVE - 2033 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

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LORTON STATION

AT ANNETTE DRIVE - 2050 (ELEVATION 412')

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Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

REVISED NOVEMBER 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton Valley South

LORTON STATION

AT POTTERS HILL CIRCLE - 2013 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton-PottersHill

LORTON STATION

AT POTTERS HILL CIRCLE - 2019 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax, Virginia

BC Consultants, Inc.

PROJECT # 05117.21

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LORTON STATION

AT POTTERS HILL CIRCLE - 2033 (ELEVATION 360')

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LORTON STATION

AT POTTERS HILL CIRCLE - 2040 (ELEVATION 360')

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LORTON STATION

AT POTTERS HILL CIRCLE - 2050 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

REVISED NOVEMBER, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton-PottersHill

LORTON STATION

AT EAST HILL DRIVE - 2013 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

PROJECT # 05117.21

JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton-PottersHill

LORTON STATION

AT EAST HILL DRIVE - 2019 (ELEVATION 360')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

BC Consultants, Inc.

Fairfax, Virginia

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JULY, 2013

V:5117/Plan/Graphics/Indesign/5117 Lorton-PottersHill

LORTON STATION

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AT EASTHILL DRIVE - 2050 (ELEVATION 412')

LORTON GREEN ENERGY PARK & DEBRIS LANDFILL

Fairfax,Virginia

BC Consultants, Inc.

PROJECT # 05117.21

JULY, 2013

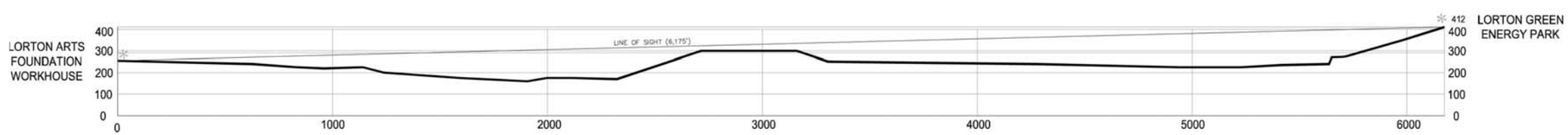
V:5117/Plan/Graphics/Indesign/5117 Lorton-PottersHill

LINE OF SIGHT

FROM THE LORTON ARTS FOUNDATION WORKHOUSE SOUTH

2013 View

VICINITY MAP



LORTON ARTS FOUNDATION WORKHOUSE LINE OF SIGHT - 2013

LORTON GREEN ENERGY PARK

Lorton,Virginia

BC Consultants, Inc.

JULY, 19, 2013

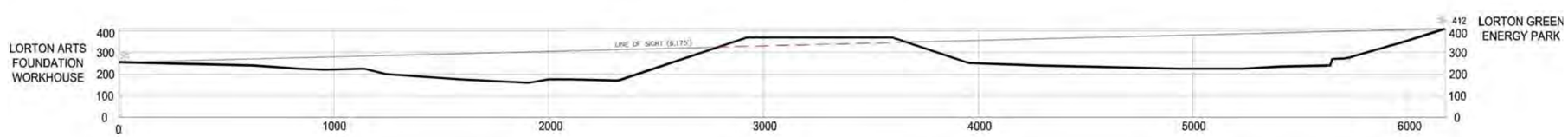
PROJECT # 05117.01

LINE OF SIGHT

FROM THE LORTON ARTS FOUNDATION WORKHOUSE SOUTH

2042 View

VICINITY MAP



LORTON ARTS FOUNDATION WORKHOUSE LINE OF SIGHT - 2042

LORTON GREEN ENERGY PARK

Lorton,Virginia

BC Consultants, Inc.

JULY, 19, 2013

PROJECT # 05117.01

LINE OF SIGHT

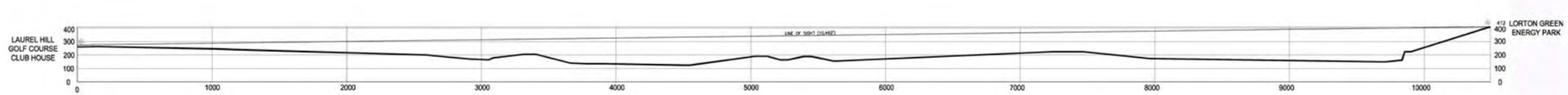
FROM THE LAUREL HILLS GOLF COURSE CLUB HOUSE

2013 View (Elevation 360’)

2033 View (Elevation 360’)

2040 View (Elevation 412’)

VICINITY MAP



LAUREL HILL GOLF COURSE CLUB HOUSE LINE OF SIGHT

LORTON GREEN ENERGY PARK

Lorton,Virginia

BC Consultants, Inc.

JULY, 19, 2013

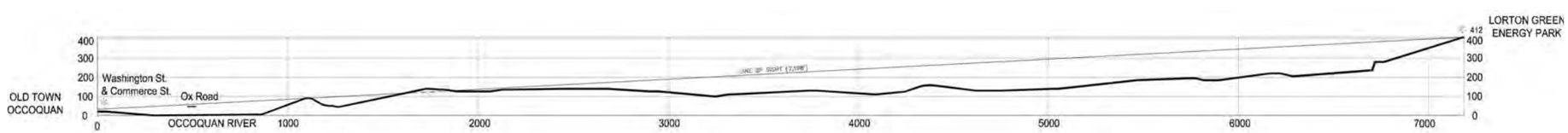
PROJECT # 05117.01

LINE OF SIGHT

FROM OLD TOWN OCCOQUAN

2013 and 2040 View

VICINITY MAP



OLD TOWN OCCOQUAN LINE OF SIGHT

LORTON GREEN ENERGY PARK

Lorton, Virginia

BC Consultants, Inc.

JULY, 19, 2013

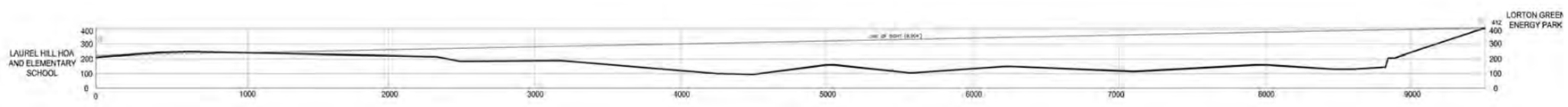
PROJECT # 05117.01

LINE OF SIGHT

FROM THE LAUREL HILL HOMEOWNERS ASSOCIATION AND ELEMENTARY SCHOOL

2013 and 2040 View

VICINITY MAP



LAUREL HILL HOA AND ELEMENTARY SCHOOL LINE OF SIGHT

LORTON GREEN ENERGY PARK

Lorton, Virginia

BC Consultants, Inc.

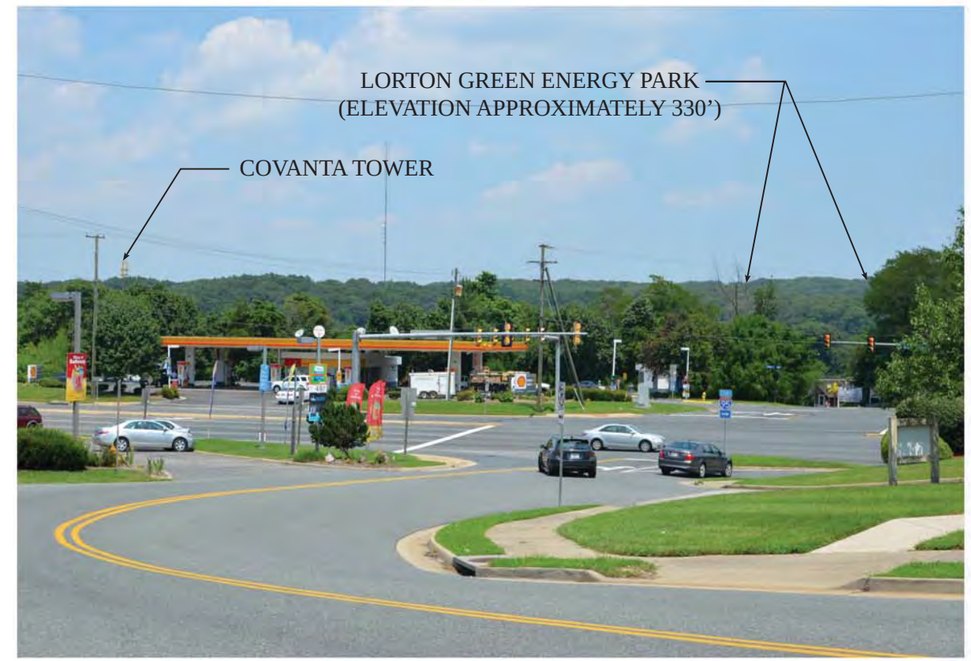
JULY, 19, 2013

PROJECT # 05117.01

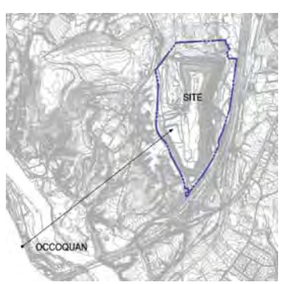
LINE OF SIGHT

FROM OCCOQUAN AT RT. 123 AND DEVIL'S REACH ROAD

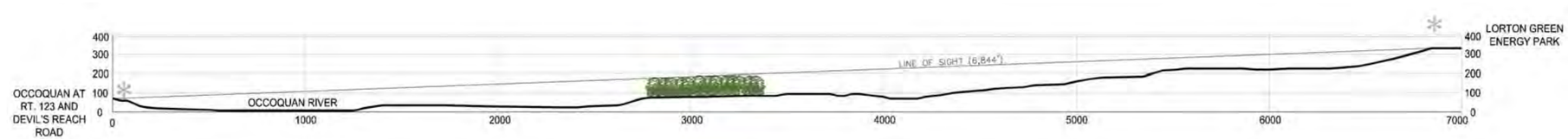
2013 View West



2013 View East



VICINITY MAP



OCCOQUAN AT RT. 123 AND DEVIL'S REACH ROAD LINE OF SIGHT - 2013

LORTON GREEN ENERGY PARK

Lorton, Virginia

BC Consultants, Inc.

JULY, 19, 2013

PROJECT # 05117.01

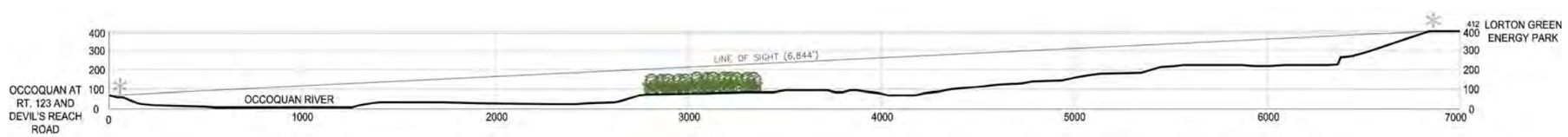
LINE OF SIGHT

FROM OCCOQUAN AT RT. 123 AND DEVIL'S REACH ROAD

2042 View West

2042 View East

VICINITY MAP



OCCOQUAN AT RT. 123 AND DEVIL'S REACH ROAD LINE OF SIGHT - 2042

LORTON GREEN ENERGY PARK

Lorton, Virginia

BC Consultants, Inc.

JULY, 19, 2013

PROJECT # 05117.01

County of Fairfax, Virginia

MEMORANDUM

DATE: 21 November 2013

TO: Debbie Pemberton, Planner, Facilities Planning Branch

FROM: Linda Cornish Blank, Historic Preservation Planner

SUBJECT: 2232-V13-17 & 18; 10000, 10100 & 10200 blocks various Furnace Road; Tax Maps 113-1 ((1)) parcels various and 113-3 ((1)) parcels various, to establish Solar Energy Park for wind turbine and solar panel generating facilities and quasi-public use

Background: The subject parcels are not included within the boundaries of a Fairfax County Historic Overlay District (HOD), are not listed in the Fairfax County Inventory of Historic Sites or the National Register of Historic Places (NR) or documented in the historic structures survey file. There are properties in the immediate vicinity of and/or adjacent to the application property that are within the boundaries of a property treated as a Fairfax County HOD by a Memorandum of Agreement (MOA), listed in the Fairfax County Inventory of Historic Sites and in the NR that would be effected by the installation of the solar panels and wind turbines.

Findings:

1. The DC Workhouse and Reformatory NR Historic District extends across 511 acres in the vicinity of and/or adjacent to the application property.
2. The area that is treated as a Fairfax County HOD by a MOA is also in the vicinity of and/or adjacent to the application property; its boundaries differ somewhat from the NR boundaries.
3. The applicant provided photo simulations indicating that the solar panels and wind turbines would be visible from the Lorton Workhouse Arts Foundation. The arts foundation is located with the boundaries of the NR Historic District and the area treated like a county HOD. This appears to be the only photo simulations that the applicant provided from within the boundaries of the historic district; the extent of the visual effect on the district is not known.
4. The applicant stipulates on page 4 of the Statement of Justification dated November 4, 2013 that the: "Industrial zoning of the Property will remain unchanged. The proposed solar 'electric generating use' is a 'Permitted Use' in the I-6 zoning district . . . ". The DC Workhouse and Reformatory NR Historic District is significant in the area of industry for its association with the industrial and manufacturing operation at the Workhouse and Reformatory. Although, the extent of the visual effect on the historic district is not known, staff does not consider the introduction of solar panels and wind turbines, considered industrial, incompatible with the historic district which is significance in the area of industry.
5. A photo simulation provided by the applicant indicates that the solar panels and wind turbines would not be visible from the intersection of Washington and Commerce Streets

Department of Planning and Zoning
Planning Division
12055 Government Center Parkway, Suite730
Fairfax, Virginia 22035-5509
Phone 703-324-1380
Fax 703-324-3056
www.fairfaxcounty.gov/dpz/

located in the Town of Occoquan. This intersection is within the Occoquan NR Historic District. It is not known if this simulation is representative of views from the entire historic district and therefore it is not known if there is a visual effect on the historic district. Nor if there is an effect, if it would be adverse.

6. The applicant indicated in the application Statement of Justification dated November 4, 2013 that ". . . within 24 months after receipt of all necessary County, Virginia and Federal approvals required to implement the landfill use . . ." If the installation as proposed by the applicant requires federal permitting or licensing it may be considered an undertaking under Section 106 of the National Historic Preservation Act of 1966, as amended.
7. Staff is not aware if the applicant has contacted the Virginia Department of Historic Resources (VDHR) for guidance in determining if review under Section 106 of the National Historic Preservation Act of 1966, as amended, is required.

Recommendations:

1. Because there are two NR Historic Districts in the vicinity, one of which the applicant has documented will be visually effected by the proposed installation, staff recommends the applicant comply with Section 106 of the National Historic Preservation Act of 1966, as amended, as may be necessary. If federal licensing or permitting for the installation of the solar panels and wind turbines is required, this may be considered an undertaking that requires Section 106 review. Applicant should contact the VDHR for guidance.
2. The applicant provide to the Department of Planning and Zoning (DPZ), Planning Division documentation as to whether or not Section 106 review is required in order to be reviewed and included in the staff report for the application. If Section 106 review is required, or has been previously completed, the applicant provide a copy of the completed Section 106 to DPZ, Planning Division in order to be reviewed and included in the staff report for the application.
3. The Town of Occoquan be given the opportunity to comment on this application.

County of Fairfax, Virginia

MEMORANDUM

DATE: November 6, 2013

TO: Mary Ann Tsai, AICP
Zoning Evaluation Division
Department of Planning and Zoning

FROM: Joyce M. Doughty, Assistant Director
Solid Waste Management Program

SUBJECT: ESI/Lorton Landfill Special Exception Application

The Solid Waste Management Program has reviewed the above subject application with regard to the potential benefits to the county of handling construction and demolition debris (CDD) in the county.

From the perspective of the county's solid waste management program, the benefits of continued operation of the landfill in the county are very difficult to quantify. There are two active CDD landfills in Fairfax County and the Lorton Landfill is by far the larger, having accepted 845,000 tons of material in 2012 compared to 24,000 tons accepted at the Rainwater Landfill. The annual report the Lorton Landfill filed with the state indicated that approximately 400,000 tons of the CDD originated in Virginia, but the specific jurisdiction is not required to be obtained/reported.

During FY2013, 44,000 tons of CDD material entered the county's solid waste management system, primarily from residents and small businesses using the county's disposal facilities, but also from county agencies and county sanitary district collections. Of this material, 30,000 tons received at the transfer station were sent to a recycling facility in Manassas, while the remaining 14,000 tons were disposed at the Lorton Landfill.

The Fairfax County Solid Waste Management Program does not regulate the collection, recycling, or disposal of CDD. As such, we have no data on the annual quantity of CDD generated in the county. Previous estimates are no longer of value due to the economic downturn.

In general terms, the benefit of continued operation of the Lorton Landfill would be assured CDD disposal capacity for the next 27 years, offsetting the need for longer transport of up to 400,000 tons per year of material. Should the Lorton Landfill close the Rainwater Landfill in Fairfax County, the Potomac Landfill in Dumfries, and recycling facilities in Manassas could provide some nearby alternatives for some of the material. Additional local recycling facilities, such as the one ESI has currently permitted near the Lorton Landfill, or transfer operations will most likely be needed to facilitate movement of the material and minimize the potential illegal dumping of material.

JMD/mc[G:\Dswdrr\memo\4773.docx]

Department of Public Works and Environmental Services
Solid Waste Management Program
12000 Government Center Parkway, Suite 458
Fairfax, Virginia 22035
Phone: 703-324-5230, TTY: 711, Fax: 703-324-3950
www.fairfaxcounty.gov/dpwes

VIRGINIA ENVIRONMENTAL EXCELLENCE PROGRAM

Virginia Department of Environmental Quality
May 2009

The Landfill Permitting Process in Virginia

Opportunities for Public Comment

FIRST

Local governments make the decision to approve or deny the construction of a new landfill. Before making the decision, local governments take the following steps:

- Publish a public notice with the date, time and place of a public hearing in a local newspaper (and possibly on a website) with a summary of the proposed action, instruction on how to submit written comments and information on where and when citizens can review the application and other documents
- Post rezoning signs on the property if required by local ordinances
- Form a citizens' advisory group if the applicant is a local government or public authority
- Allow all interested persons to attend a public hearing and present their views, which become part of the public record
- Begin the process of amending the local solid waste plan to include the new landfill, if necessary

THEN

After local government approval, the applicant notifies the Virginia Department of Environmental Quality of the intent to establish a landfill. The process to obtain a permit from DEQ for a new sanitary landfill takes place in three steps:

Step 1: Notice of Intent

The applicant sends DEQ a notice of intent letter that must include the following information:

- Statement of use about the proposed landfill with area and site maps
- Disclosure statement – names and addresses of people responsible for managing the landfill
- Local government certification that the landfill location is zoned properly and meets local ordinances
- Findings from the public meeting
- Disposal capacity guarantee for sanitary landfills, which is certification that surrounding localities were able to contract for reserving space in the landfill
- Host agreement between the local government and the applicant, when the applicant is not the local governing body or authority
- Certification that the landfill's facility is consistent with the local solid waste management plan
- Daily travel routes and traffic volumes, daily disposal limit, and the service area if the landfill is locally owned and operated

629 East Main Street ~ Richmond, Virginia 23219
804-698-4000 ~ (toll-free in Virginia) 800-592-5482
www.deq.virginia.gov

Step 2: Siting Evaluation

The applicant submits the first part of the permit application (Part A) so DEQ can determine if the proposed landfill location meets regulatory and technical requirements. Siting criteria are subject to regulatory change. The application must include the following information:

- Map showing the facility and the landfill boundaries (with identification of surrounding areas within 500 feet of the property boundary), including where the waste will be placed; building structures and adjacent properties; base floodplain; existing land uses and zoning; water supply wells, springs, and public and private intakes or water withdrawals; utility lines, pipelines and mines; parks and recreation areas; surface water bodies and wetlands; dams; historic sites, monuments and cemeteries; and wildlife refuges, among other features
- Proof of ownership or legal control of property
- Detailed subsurface evaluation and detailed soil report
- Sources of waste – houses, schools, businesses, etc.
- Traffic Adequacy Report prepared by the Virginia Department of Transportation and an approval letter from VDOT or the county or city, as appropriate
- Report on the potential effect of the landfill on parks, recreational areas, wildlife management areas, critical habitat areas of endangered species, public water supplies, marine resources, wetlands, historic sites, fish and wildlife, water quality and tourism
- Permits from the U.S. Army Corps of Engineers and the DEQ water division if any streams or wetlands are proposed to be filled or disturbed
- Proof of notification to the Federal Aviation Administration if the proposed landfill will be located within five miles of any airport
- Documents showing the landfill will not be destroyed or dismantled by an earthquake if it is located in an earthquake-prone area
- Documents proving that the landfill, disposal unit or leachate storage unit are not located within 100 feet of any river, stream or regularly flowing surface water body; 500 feet of any well spring or other ground water source of drinking water; 200 feet of any house, school, hospital, nursing home or recreational park area; and one mile of an existing public water supply intake or reservoir

Step 3: Design and Operations

If DEQ approves the site chosen for the landfill, then the applicant must submit the second part of the application (Part B) that includes detailed information on how the landfill will be designed and operated. The application must include the following information:

- Documentation to show how the landfill will be operated, including the number of employees; mechanized equipment; daily cover; daily disposal rates; life of the landfill; liner system; and leachate collection, treatment and disposal
- Landfill gas management plan
- Ground water monitoring plan
- Closure and post-closure plan
- Details of the proposed design and construction of the landfill and ancillary support features

If the review proves that the landfill proposal meets the regulatory requirements and is technically sound, DEQ prepares a draft permit. Then DEQ will take the following steps:

- Publish a public notice to receive comments in a local newspaper and on the DEQ website
- Make the draft permit available to local residents
- Hold a public hearing to receive comments after 30 days of public notice
- Receive public comments until 15 days after the public hearing
- Prepare a written response to all public comments received
- Decide to issue or deny the permit

The Virginia Waste Management Act sets the requirements for new landfills. More information is available at www.deq.virginia.gov/regulations/laws.html. Public notices for comment periods and hearings are available on the DEQ website at www.deq.virginia.gov.

prev | next

9VAC20-81-450. Permit application procedures.

A. Any person who proposes to establish a new solid waste management facility (SWMF) or modify an existing SWMF shall submit a permit application to the department, using the procedures set forth in this section and other pertinent sections of this part.

B. Notice of intent.

1. To initiate the permit application process, any person who proposes to establish a new solid waste management facility (SWMF) or modify an existing SWMF or to modify an existing permit shall file a notice of intent with the director stating the desired permit or permit modification, the precise location of the proposed facility, and the intended use of the facility. The notice shall be in letter form and be accompanied by an area map and a site location map.

2. No application for a new solid waste management facility permit or application for a modification for a noncaptive industrial landfill to expand or increase capacity shall be deemed complete unless it is accompanied by DEQ Form DISC-01 and 02 (Disclosure Statement) for all key personnel.

3. No application for a new solid waste management facility permit or application for a modification for a noncaptive industrial landfill to expand or increase capacity shall be considered complete unless the notice of intent is accompanied by a certification from the governing body of the county, city, or town in which the facility is to be located stating that the location and operation of the facility are consistent with all applicable local ordinances, as well as with the local or regional solid waste management plan (SWMP) approved by the department or has initiated the process of amending the SWMP to include the new or expanded facility or an increase in capacity. No certification shall be required for the application for a modification of an existing permit (not including increase in capacity or expansion) other than for a noncaptive industrial landfill in this subdivision. DEQ Form SW-11-1 (Request for Local Government Certification) is provided for the use of the regulated community. Permit and permit-by-rule applicants shall comply with the statutory requirements for consistency with solid waste management plans as recorded in § 10.1-1408.1 of the Code of Virginia.

4. If the applicant proposes to operate a new sanitary landfill or transfer station, the notice of intent shall include a statement describing the steps taken by the applicant to seek the comments of the residents of the area where the sanitary landfill or transfer station is proposed to be located regarding the siting and operation of the proposed sanitary landfill or transfer station. The public comment steps shall be taken prior to filing with the department the notice of intent.

a. The public comment steps shall include publication of a public notice once a week for two consecutive weeks in a newspaper of general circulation serving the locality where the sanitary landfill or transfer station is proposed to be located and holding at least one public meeting within the locality at a time convenient to the public to identify issues of concern, to facilitate communication, and to establish a dialogue between the applicant and persons who may be affected by the issuance of a permit for the sanitary landfill or transfer station.

b. At a minimum, the public notice shall include:

(1) A statement of the applicant's intent to apply for a permit to operate the proposed sanitary landfill or transfer station;

(2) The proposed sanitary landfill or transfer station site location;

(3) The date, time, and location of the public meeting the applicant will hold; and

(4) The name, address, and telephone number of a person employed by an applicant who can be contacted by interested persons to answer questions or receive comments on siting and operation of the proposed sanitary landfill or transfer station.

c. The first publication of the public notice shall be at least 14 days prior to the public meeting date.

d. In addition, the applicant shall adhere to the applicable requirements of § 10.1-1408.1 B of the Code of Virginia.

5. Disposal capacity guarantee. If the applicant proposes to construct a new sanitary landfill or expand an existing sanitary landfill, a signed statement must be submitted by the applicant guaranteeing that sufficient disposal capacity will be available in the facility to enable localities within the Commonwealth to comply with their solid waste management plans developed pursuant to 9VAC20-130 and certifying that such localities will be allowed to contract for and reserve disposal capacity in the facility. This provision does not apply to permit applications from one or more political subdivisions for new or expanded landfills that will only accept municipal solid waste generated within those jurisdictions or from other jurisdictions under an interjurisdictional agreement.

6. Host agreement. If a host agreement is required, as noted in § 10.1-1408.1 B 7 of the Code of Virginia, it shall contain all the requirements specified in that section of the law.

7. If the application is for a locality owned and operated sanitary landfill, or the expansion of such a landfill, the applicant shall provide information on:

a. The daily travel routes and traffic volumes that correlate with the daily disposal limit;

b. The daily disposal limit; and

c. The service area of the facility.

8. If the application is for a new solid waste management facility or a modification allowing a facility expansion or an increase in capacity, the director shall evaluate whether there is a need for the additional capacity in accordance with § 10.1-1408.1 D 1 of the Code of Virginia. The information in either subdivision 8 a or b of this subsection must be provided with the notice of intent to assist the director with the required investigation and analysis. Based on the information submitted, the owner or operator will demonstrate how the additional capacity will be utilized over the life of the facility.

a. For any solid waste management facility including a sanitary landfill, information demonstrating that there is a need for the additional capacity. Such information shall include the following. If a certain item is not applicable for a facility, it may be indicated so with reasonable justifications.

(1) The anticipated area to be served by the facility;

(2) Similar or related solid waste management facilities that are in the same service area and could impact the proposed facility, and the capacity and service life of those facilities;

of the department's response letter, shall be considered as a new application, unless an alternate timeline has been approved by the department.

3. Upon receipt of a complete Part A application, the department shall conduct a technical review of the submittal. Additional information may be required or the site may be visited before the review is completed. The director shall notify the applicant in writing of approval or disapproval of the Part A application or provide conditions to be made a part of the approval.

4. For sanitary landfills, the director's notification must indicate that the site on which the landfill will be located is suitable for the construction and operation of a landfill. In making this determination, the director will consider the information presented in the site hydrogeologic and geotechnical report (9VAC20-81-460 F), the landfill impact statement (9VAC20-81-460 H 1) and the adequacy of transportation facilities (9VAC20-81-460 G). The director may also consider other factors at his discretion.

5. In case of the approval or conditional approval, the applicant may submit the Part B application provided the required conditions are addressed in the submission.

D. Part B application. The Part B application involves the submission of the detailed engineering design and operating plans for the proposed facility.

1. The applicant, after receiving Part A approval, may submit to the department a Part B application to include the required documentation for the specific solid waste management facility as provided for in 9VAC20-81-470 or 9VAC20-81-480. The Part B application and supporting documentation shall be submitted in three copies and must include the applicable permit fee under the provisions of 9VAC20-90 and the financial assurance documentation as required by 9VAC20-70.

2. The Part B application shall be reviewed for administrative completeness before technical evaluation is initiated. The applicant shall be advised in writing within 30 days whether the application is complete or what additional documentation is required. Subsequent resubmittals of the application, submitted after 18 months from the date of the department's response letter, shall be considered a new application, unless an alternate timeline has been approved by the department. The Part B application will not be evaluated until an administratively complete application is received.

3. The administratively complete application will be coordinated with other state agencies according to the nature of the facility. The comments received shall be considered in the permit review by the department. The application will be evaluated for technical adequacy and regulatory compliance. In the course of this evaluation, the department may require the applicant to provide additional information. At the end of the evaluation, the department will notify the applicant that the application is technically adequate and in regulatory compliance, or that the department intends to deny the application.

4. The procedures addressing the denial are contained in 9VAC20-81-550.

E. Permit issuance.

1. If the application is found to be technically adequate and in full compliance with this chapter, a draft permit shall be developed by the department.

2. Copies of the draft permit will be available for viewing at the applicant's place of business or at the regional office of the department, or both, upon request. A notice announcing the beginning of the public comment period and the availability of the draft permit shall be made in a newspaper with general circulation in the area of the facility. A copy of the notice of availability will be provided to the chief administrative officer of all cities and counties that are contiguous to the host community.

3. If the application is for a new landfill or an increase in landfill capacity (includes expansion), then the department shall hold a public hearing and the notice in subdivision 2 of this subsection will include such information.

4. For any application (other than subdivision 3 of this subsection), the notice shall notify the public of the 30-day public comment period and include the opportunity to request a public hearing. The department shall hold a public hearing on the draft permit whenever the department finds, on the basis of requests, that:

a. There is a significant public interest in the issuance, denial, modification, or revocation of the permit in question;

b. There are substantial, disputed issues relevant to the issuance, denial, modification, or revocation of the permit in question; and

c. The action requested is not, on its face, inconsistent with, or in violation of, these regulations, the Waste Management Act (§ 10.1-1400 et seq. of the Code of Virginia), or federal law or regulations.

5. The department also may hold a public hearing when it is believed that such a hearing might clarify one or more issues involved in a permit decision.

6. If a public hearing is to be held, the department shall convene it 30 days or more after the notice is published in the local newspaper. The public hearing shall be conducted within the local government jurisdiction of the facility. A comment period shall extend for a 15-day period after the conclusion of the public hearing.

7. A decision to permit, to deny a permit, or to modify the draft permit shall be rendered by the director within 90 days of the close of the hearing comment period.

8. The permit applicant and the persons who commented during the public participation period shall be notified in writing of the decision on the draft permit. That decision may include denial of the permit (see also 9VAC20-81-550), issuance of the permit as drafted, or modification of the draft permit and issuance.

9. No permit for a new solid waste management facility nor any modification to a permit allowing a facility expansion or an increase in capacity shall be issued until the director has made a written determination, after an investigation and analysis of the potential human health, environmental, transportation infrastructure, and transportation safety impacts and needs and an evaluation of comments by the host local government, other local governments and interested persons, that (i) the proposed facility, expansion, or increase protects present and future human health and safety and the environment; (ii) there is a need for the additional capacity; (iii) sufficient infrastructure will exist to safely handle the waste flow; (iv) the increase is consistent with locality imposed or state-imposed daily disposal limits; (v) the public interest will be served by the proposed facility's operation or the expansion or increase in capacity of a facility; and (vi) the proposed solid waste management facility, facility expansion, or additional capacity is consistent with regional and local solid waste management plans developed pursuant to § 10.1-1411 of the Code of

Virginia.

10. For nonhazardous industrial solid waste management facilities owned or operated by the generator of the waste managed at the facility, and that accept only waste generated by the facility owner or operator the following determination shall apply in lieu of subdivision 9 of this subsection. No new permit for a nonhazardous industrial solid waste management facility that is owned or operated by the generator of the waste managed at the facility, and that accepts only waste generated by the facility owner or operator, shall be issued until the director has determined, after investigation and evaluation of comments by the local government, that the proposed facility poses no substantial present or potential danger to human health or the environment. The department shall hold a public hearing within the county, city, or town where the facility is to be located prior to the issuance of any such permit for the management of nonhazardous industrial solid waste.

11. Where either subdivision 9 or 10 of this subsection apply, the director may request updated information during the review of the permit application if the information on which the director's determination is based is no longer current. If, based on the analysis of the materials presented in the permit application, the determination required in § 10.1-1408.1 of the Code of Virginia cannot be made, the application will be denied in accordance with 9VAC20-81-560 A 6.

12. Any permit for a new sanitary landfill and any permit modification authorizing expansion of an existing sanitary landfill shall incorporate the conditions required for a disposal capacity guarantee in § 10.1-1408.1 of the Code of Virginia. This provision does not apply to permit applications from one or more political subdivisions that will only accept waste from within those political subdivisions' jurisdiction or municipal solid waste generated within other political subdivisions pursuant to an interjurisdictional agreement.

Statutory Authority

§ 10.1-1402 of the Code of Virginia; 42 USC § 6941 et seq.; 40 CFR Part 258.

Historical Notes

Derived from Virginia Register Volume 27, Issue 12, eff. March 16, 2011.

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prev | next | new search | table of contents | home

prev | next

9VAC20-81-460. Part A permit application.

The following information shall be included in the Part A permit application for all solid waste management facilities unless otherwise specified in this section. All plans and drawings of the Part A application shall be certified by a professional engineer or professional geologist.

A. The Part A permit application consists of a letter stating the type of the facility for which the permit application is made and the certification required in subsection I of this section. The applicant shall submit the completed DEQ Form SW PTA (Part A Permit Application Form) and all required information and attachments as detailed in this section.

B. A key map of the Part A permit application, delineating the general location of the proposed facility, shall be prepared and attached as part of the application. The key map shall be plotted on a seven and one-half minute United States Geological Survey topographical quadrangle. The quadrangle shall be the most recent revision available, shall include the name of the quadrangle and shall delineate a minimum of one mile from the perimeter of the proposed facility boundaries. One or more maps may be utilized where necessary to insure clarity of the information submitted.

C. A vicinity map shall be prepared and attached as part of the application. This vicinity map shall have a minimum scale of one inch equals 200 feet (1" = 200') and shall delineate an area of 500 feet from the perimeter of the property line of the proposed facility. A vicinity map may be prepared with a reduced scale if it does not fit in a sheet with the required minimum scale and multiple sheets may be used to meet the requirement of minimum scale. The vicinity maps may be an enlargement of a United States Geological Survey topographical quadrangle or a recent aerial photograph. Notes may be provided in the map if one or more of the following are not present within the delineated area. The vicinity map shall depict the following:

1. All homes, buildings, or structures including the layout of the buildings that will compose the proposed facility;

2. The surveyed boundaries for the property boundary, facility boundary, and waste management boundary, and the acreages within these boundaries;

3. The limits of the actual disposal operations within the boundaries of the proposed facility;

4. Lots and blocks taken from the tax map for the site of the proposed facility and all contiguous properties;

5. The base floodplain, where it passes through the map area; or, otherwise, a note indicating the expected flood occurrence period for the area;

6. Existing land uses and zoning classification;

7. All water supply wells, springs or intakes, both public and private;

8. All utility lines, pipelines or land-based facilities (including mines and wells); and

9. All parks, recreation areas, surface water bodies, dams, historic areas, wetlands areas, monument areas, cemeteries, wildlife refuges, unique natural areas, or similar features.

D. Any applicant must demonstrate legal control over the site for the permit life.

E. For solid waste disposal facilities regulated under Part III (9VAC20-81-100 et seq.), site hydrogeologic and geotechnical reports by professional geologist or professional engineer.

1. The site investigation for a proposed landfill facility shall provide information regarding the geotechnical and hydrogeologic conditions at the site to allow a reasonable determination of the usefulness of the site for development as a landfill. The geotechnical exploration efforts shall be designed to provide information regarding the availability and suitability of onsite soils for use in the various construction phases of the landfill including liner, cover, drainage material, and cap. The hydrogeologic information shall be sufficient to determine the characteristics of the uppermost aquifer underlying the facility. Subsurface investigation programs conducted shall meet the minimum specifications here.

a. Borings shall be located to identify the uppermost aquifer within the proposed facility boundary, determine the ability to perform groundwater monitoring at the site, and provide data for the evaluation of the physical properties of soils and soil availability. Borings completed for the proposed facility shall be sufficient in number and depth to identify the thickness of the uppermost aquifer and the presence of any significant underlying impermeable zone in the waste management boundary. Impermeable zone shall not be fully penetrated within the anticipated fill areas, whenever possible. The number of borings shall be at a minimum in accordance with Table 5.1 as follows:

Table 5.1

Waste Management Boundary Acreage	Total Number of Borings
Less than 10	4
10 - 49	8
50 - 99	14
100 - 200	20
More than 200	24 + 1 boring for each additional 10 acres

b. The department reserves the right to require additional borings in areas in which the number of borings required by Table 5.1 is not sufficient to describe the geologic formations and groundwater flow patterns below the proposed solid waste disposal facility.

c. In highly uniform geological formations, the number of borings may be reduced, as approved by the department.

d. The borings shall employ a grid pattern, wherever possible, such that there is, at a minimum, one boring in each major geomorphic feature. The borings pattern shall enable the development of detailed cross sections through the proposed landfill site.

e. Subsurface data obtained by borings shall be collected by standard soil sampling techniques. Diamond bit coring, air rotary drilling, or other appropriate methods, or a combination of methods shall be used as appropriate to characterize competent bedrock. The borings shall be logged from the surface to the lowest elevation (base grade) or to bedrock, whichever is shallower, according to standard practices and procedures. In addition, the borings required by Table 5.1 shall be performed on a continuous basis for the first 20 feet below the lowest elevation of the solid waste disposal facility or to the bed rock. Additional samples as determined by the professional geologist or professional engineer shall be collected at five-foot intervals thereafter.

f. Excavations, test pits, and geophysical methods may be employed to supplement the soil boring investigation.

g. At a minimum, four of the borings shall be converted to water level observations wells, well nests, piezometers, or piezometer nests to allow determination of the rate and direction of groundwater flow across the site. All groundwater monitoring points or water level measurement points shall be designed to allow proper abandonment by backfilling with an impermeable material. The total number of wells or well nests shall be based on the complexity of the geology of the site.

h. Field analyses shall be performed in representative borings to determine the in situ hydraulic conductivity of the uppermost aquifer.

i. All borings not to be utilized as permanent monitoring wells, and wells within the active solid waste disposal area, shall be sealed and excavations and test pits shall be backfilled and properly compacted to prevent possible paths of leachate migration. Boring sealing procedures shall be documented in the hydrogeologic report.

2. The geotechnical and hydrogeologic reports shall at least include the following principal sections:

a. Field procedures. Boring records and analyses from properly spaced borings in the facility portion of the site. Final boring logs shall be submitted for each boring, recording soils or rock conditions encountered. Each log shall include the type of drilling and sampling equipment, date the boring was started, date the boring was finished, a soil or rock description in accordance with the United Soil Classification System or the Rock Quality Designation, the method of sampling, the depth of sample collection, the water levels encountered, and the Standard Penetration Test blow counts, if applicable. Boring locations and elevations shall be surveyed with a precision of 0.01 foot. At least one surveyed point shall be indelibly marked by the surveyor on each well. All depths of soil and rock as described within the boring log shall be corrected to National Geodetic Vertical Datum, if available.

b. Geotechnical interpretations and report including complete engineering description of the soil units underlying the site.

(1) Soil unit descriptions shall include estimates of soil unit thickness, continuity across the site, and genesis. Laboratory determination of the soil unit's physical properties shall be discussed.

(2) Soil units that are proposed for use as a drainage layer, impermeable cap, or impermeable liner material shall be supported by laboratory determinations of the remolded permeability. Remolded hydraulic conductivity tests require a Proctor compaction test (ASTM D698) soil classification liquid limit, plastic limit, particle size distribution, specific gravity, percent compaction of the test sample, remolded density and remolded moisture content, and the percent saturation of the test sample. Proctor compaction test data and hydraulic conductivity test sample data shall be plotted on standard moisture-density test graphs.

(3) The geotechnical report shall provide an estimate of the available volume of materials suitable for use as liner, cap, and drainage layer. It shall also discuss the anticipated uses of the onsite materials, if known.

c. Hydrogeologic report.

(1) The report shall include water table elevations, direction, and calculated rate of groundwater flow and similar information on the hydrogeology of the site. All raw data shall be submitted with calculations.

(2) The report shall contain a discussion of field test procedures and results, laboratory determinations made on

undisturbed samples, recharge areas, discharge areas, adjacent or areal usage, and typical radii of influence of pumping wells.

(3) The report shall also contain a discussion of the regional geologic setting, the site geology, and a cataloging and description of the uppermost aquifer from the site investigation and from referenced literature. The geologic description shall include a discussion of the prevalence and orientation of fractures, faults, and other structural discontinuities, and presence of any other significant geologic features. The aquifer description shall address homogeneity, horizontal and vertical extent, isotropy, the potential for groundwater remediation, if required, and the factors influencing the proper placement of a groundwater monitoring network.

(4) The report shall include a geologic map of the site prepared from one of the following sources as available, in order of preference:

(a) Site specific mapping prepared from data collected during the site investigation;

(b) Published geologic mapping at a scale of 1:24,000 or larger;

(c) Published regional geologic mapping at a scale of 1:250,000 or larger; or

(d) Other published mapping.

(5) At least two generally orthogonal, detailed site specific cross sections, which shall describe the geologic formations identified by the geologic maps prepared in accordance with subdivision 2 c (4) of this subsection at a scale that clearly illustrates the geologic formations, shall be included in the hydrogeologic report. Cross sections shall show the geologic units, approximate construction of existing landfill cells base grades, water table, surficial features, and bedrock along the line of the cross section. Cross section locations shall be shown on an overall facility map.

(6) Potentiometric surface maps for the uppermost aquifer that define the groundwater conditions encountered below the proposed solid waste disposal facility area based upon stabilized groundwater elevations. Potentiometric surface maps shall be prepared for each set of groundwater elevation data available. The applicant shall include a discussion of the effects of site modifications, seasonal variations in precipitation, and existing and future land uses of the site on the potentiometric surface.

(7) If a geological map or report from either the Department of Mines, Minerals, and Energy or the U.S. Geological Survey is published, it shall be included.

F. For solid waste management facilities regulated under Part IV (9VAC20-81-300 et seq.) of this chapter:

1. A cataloging and description of aquifers, geological features or any similar characteristic of the site that might affect the operation of the facility or be affected by that operation.

2. If a geological map or report from either the Department of Mines, Minerals, and Energy or the U.S. Geological Survey is published, it shall be included.

G. For a new sanitary landfill or for an increase in daily disposal limit, an adequacy report prepared by the Virginia Department of Transportation or other responsible agency. As required under § 10.1-1408.4 A 1 of the Code of Virginia, the report will address the adequacy of transportation facilities that will be available to serve the landfill, including daily travel

routes and traffic volumes that correlate with the daily disposal limit, road congestion, and highway safety. The department may determine an adequacy report is not required for small increases in the daily disposal limit.

H. For a new sanitary landfill or an expansion of an existing sanitary landfill or an increase in capacity by expanding an existing facility vertically upward, a Landfill Impact Statement (LIS).

1. A report must be provided to the department that addresses the potential impact of the landfill on parks, recreational areas, wildlife management areas, critical habitat areas of endangered species as designated by applicable local, state, or federal agencies, public water supplies, marine resources, wetlands, historic sites, fish and wildlife, water quality, and tourism. This report shall comply with the statutory requirements for siting landfills in the vicinity of public water supplies or wetlands as set forth in §§ 10.1-1408.4 and 10.1-1408.5 of the Code of Virginia.

2. The report will include a discussion of the landfill configuration and how the facility design addresses any impacts identified in the report required under subdivision 1 of this subsection.

3. The report will identify all of the areas identified under subdivision 1 of this subsection that are within five miles of the facility.

I. For a new facility or an expansion of an existing facility, or an increase in capacity by expanding an existing facility vertically upward, a signed statement by the applicant that he has sent written notice to all adjacent property owners or occupants that he intends to develop a SWMF or expand laterally or vertically upward of an existing facility on the site, a copy of the notice and the names and addresses of those to whom the notices were sent.

J. The total capacity of the solid waste management facility.

K. One or more of the following indicating that the public interest would be served by a new facility or a facility expansion, which includes:

1. Cost effective waste management for the public within the service area comparing the costs of a new facility or facility expansion to waste transfer, or other disposal options;

2. The facility provides protection of human health and safety and the environment;

3. The facility provides alternatives to disposal including reuse or reclamation;

4. The facility allows for the increased recycling opportunities for solid waste;

5. The facility provides for energy recovery or the subsequent use of solid waste, or both, thereby reducing the quantity of solid waste disposed;

6. The facility will support the waste management needs expressed by the host community; or

7. Any additional factors that indicate that the public interest would be served by the facility.

Statutory Authority

§ 10.1-1402 of the Code of Virginia; 42 USC § 6941 et seq.; 40 CFR Part 258.

Historical Notes

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prev | next

9VAC20-81-470. Part B permit application for solid waste disposal facilities.

Part B permit application requirements for all solid waste disposal facilities regulated under Part III (9VAC20-81-100 et seq.) are contained in this section. The Part B applications shall include the following requirements and documentation:

A. Plans submitted as part of the Part B application shall include the following:

1. Design plans. Design plans shall be certified by a professional engineer and shall consist of, at least, the following:

a. A title sheet indicating the project title, who prepared the plans, the person for whom the plans were prepared, a table of contents, and a location map showing the location of the site and the area to be served.

b. An existing site conditions plans sheet indicating site conditions prior to development.

c. A base grade plan sheet indicating site base grades or the appearance of the site if it were excavated in its entirety to the base elevation, before installation of any engineering modifications or the beginning of any filing.

d. An engineering modification plan sheet indicating the appearance of the site after installation of engineering modifications. More than one plan sheet may be required for complicated sites. This plan is required only for those sites with engineering modifications.

e. A final site topography plan sheet indicating the appearance of the site, and final contours of the site at closing including the details necessary to prepare the site for long-term care.

f. A series of phasing plan sheets showing the progression of site development through time. At a minimum, a separate plan shall be provided for initial site preparations and for each subsequent major phase or new area where substantial site preparation must be performed. Each such plan shall include a list of construction items and quantities necessary to prepare the phase indicated.

g. A site monitoring plan showing the location of all devices for the monitoring of leachate production, groundwater quality, and gas production and venting. This plan shall include a table indicating the parameters to be monitored for the frequency of monitoring before and during site development. The groundwater monitoring plan shall include information as applicable under 9VAC20-81-250 or 9VAC20-81-260.

h. A series of site cross-sections shall be drawn perpendicular and parallel to the site base line at a maximum distance of 500 feet between cross-sections and at points of grade break and important construction features. The location of the cross-sections shall be shown on the plan sheets and the section labeled using the site grid system. Where applicable, each cross-section shall show existing, proposed base and final grades; soil borings and monitoring wells that the section passes through or is adjacent to; soil types, bedrock and water table; leachate control, collection, and monitoring systems; limits of filling for each major waste type; drainage control structures; access roads and ramps on the site perimeter and within the active fill area; the filling sequence or phases; and other site features.

i. Detailed drawings and typical sections for drainage control structures, access roads, fencing, leachate and gas control systems, and monitoring devices, buildings, signs, and other construction details.

j. Plan sheets shall include:

(1) A survey grid with base lines and bench marks to be used for field control.

(2) Limits of filling for each major waste type or fill area.

(3) All drainage patterns and surface water drainage control structures both within the actual fill area and at the site perimeter. Such structures may include berms, ditches, sedimentation basins, pumps, sumps, culverts, pipes, inlets, velocity breaks, sodding, erosion matting, or other methods of erosion control.

(4) Ground surface contours at the time represented by the drawing. Spot elevations shall be indicated for key features.

(5) Areas to be cleared and grubbed and stripped of topsoil.

(6) Borrow areas for liner materials, gas venting materials, berms, roadway construction, daily cover, and final cover.

(7) All soil stockpiles including daily and final cover, topsoil, liner materials, gas venting materials, and other excavation.

(8) Access roads and traffic flow patterns to and within the active fill area.

(9) All temporary and permanent fencing.

(10) The methods of screening such as berms, vegetation, or special fencing.

(11) Leachate collection, control, storage, and treatment systems that may include pipes, manholes, trenches, berms, collection sumps, storage units, pumps, risers, liners, and liner splices.

(12) Gas, leachate, and groundwater monitoring devices and systems.

(13) Severe weather solid waste disposal areas.

(14) Support buildings, scale, utilities, gates, and signs.

(15) Special waste handling areas.

(16) Construction notes and references to details.

(17) Other site features.

2. Closure plan. A detailed closure plan be prepared and submitted. Such a plan shall be prepared in two parts, one reflecting those measures to be accomplished at the midpoint of the permit period, and the other when the useful life of the landfill is reached. The plan shall show how the facility will be closed to meet the requirements of 9VAC20-81-160 and 9VAC20-81-170. The plan shall include the procedures to be followed in closing the site, sequence of closure, time schedules, final plans of completion of closure to include final contours, and long-term care plan sheets showing the site at the completion of closing and indicating those items anticipated to be performed during the period of long-term care for the site. The plans shall include a table listing the items and the anticipated schedule for monitoring and maintenance. In many instances this information can be presented on the final site topography sheet.

3. Postclosure plan. A postclosure care plan containing long-term care information including a discussion of the procedures to be utilized for the inspection and maintenance of: run-off control structures; settlement; erosion damage; gas and leachate control facilities; monitoring for gas, leachate, and groundwater; and other long-term care

needs.

B. A design report shall be submitted, which shall include supplemental discussions and design calculations, to facilitate department review and provide supplemental information including the following information:

1. The design report shall identify the project title; engineering consultants; site owner, permittee and operator; proposed permitted acreage; hours of operation; wastes to be accepted; site life; design capacity; and the daily disposal limit. It shall also identify any variances desired by the applicant.

2. A discussion of the basis for the design of the major features of the site, such as traffic routing, base grade and relationships to subsurface conditions, anticipated waste types and characteristics, phases development, liner design, leachate management system design, facility monitoring, and similar design features shall be provided. A list of the conditions of site development as stated in the department determination of site feasibility and the measures taken to meet the conditions shall be included. A discussion of all calculations, such as refuse-cover balance computations, stockpile sizing estimates, estimate of site life, and run-off and leachate volume estimates shall be included. The calculations shall be summarized with the detailed equations presented in an appendix.

3. Specifications, including detailed instructions to the site operator for all aspects of site construction.

a. Initial site preparations including specifications for clearing and grubbing, topsoil stripping, other excavations, berm construction, drainage control structures, leachate collection system, access roads and entrance, screening, fencing, groundwater monitoring, and other special design features.

b. A plan for initial site preparation including a discussion of the field measurements, photographs to be taken, sampling and testing procedures to be utilized to verify that the in-field conditions encountered were the same as those defined in the feasibility report, and to document that the site was constructed according to the engineering plans and specifications submitted for department approval.

C. Financial assurance documentation. When required by the Financial Assurance Regulations of Solid Waste Disposal, Transfer, and Treatment Facilities (9VAC20-70), the applicant shall provide the completed documentation to demonstrate compliance with those regulations; proof of financial responsibility must be for the entity identified in accordance with 9VAC20-81-450 B 10.

D. DEQ Form SW PTB (Part B Permit Application Form). The applicant shall submit a completed DEQ Form SW PTB.

Statutory Authority

§ 10.1-1402 of the Code of Virginia; 42 USC § 6941 et seq.; 40 CFR Part 258.

Historical Notes

Derived from Virginia Register Volume 27, Issue 12, eff. March 16, 2011; amended, Virginia Register Volume 27, Issue 22, eff. August 3, 2011.

FAIRFAX COUNTY PARK AUTHORITY

M E M O R A N D U M

TO: Barbara Berlin, AICP, Director
Zoning Evaluation Division
Department of Planning and Zoning

FROM: David Bowden, Director
Planning and Development Division

DATE: September 18, 2013

SUBJECT: SEA 80-L-061-02
10001, 10201, 10209, 10215 & 10219 Furnace Road (Furnace Associates, Inc.)
Tax Map Numbers: 113-1 ((1)) 5(pt.), 7, 8; 113-3 ((1)) 1, 2, 4

BACKGROUND

The Park Authority staff has reviewed the revised proposed Development Plan dated September 11, 2013 for the above referenced application. The applicant is seeking a special exception amendment for a 249.8 acre site zoned R1 and located in the Lower Potomac Planning District to:

- Establish green electric generation facilities in conjunction with ongoing landfill activities.
- Extend the useful life of the existing construction debris landfill until December 31, 2040.
- Remove the requirement that the property be dedicated to the Park Authority.
- Construct an observation area on top of the landfill. Tours of the observation area will be conducted via shuttle (parking at solar farm property - no on-site parking at the debris landfill) until the landfill is released from post-closure monitoring by the Department of Environmental Quality (DEQ). At this point, public access to the property will cease.
- Provide private active recreation uses on the property beginning in 2060 (following the closure of the debris landfilling operation and required post-closure monitoring period).

As part of the revised application, and in response to the Park Authority's review of the May 14, 2013, application, the applicant is no longer proposing to dedicate a 17 acre parcel, with amenities, to the Park Authority. Instead, the revised application states: "the Applicant will commit to an additional $3.2 million contribution as requested in the Park Authority memorandum dated August 1, 2013, for the development of athletic facilities within the Lorton area."

COMPREHENSIVE PLAN GUIDANCE

The County Comprehensive Plan includes both general and specific guidance regarding parks and resources. The Policy Plan describes the need to mitigate adverse impacts to park and recreation facilities caused by growth and development; it also offers a variety of ways to offset those impacts, including contributions, land dedication, development of facilities, and others (Parks and Recreation, Objective 6, p. 8). Resource protection is addressed in multiple objectives, focusing on protection, preservation, and sustainability of resources (Parks and Recreation Objectives 2 and 5, p.5-7).

ANALYSIS AND RECOMMENDATIONS

Natural Resources Impact:
The applicant's property is not adjacent to property owned by the Park Authority, however the Park Authority owns and operates Mason Neck West Park approximately 2,000 feet downstream from the applicant's property and receives stormwater from the property via Giles Run. As a downstream property owner, the Park Authority strongly recommends the applicant detain and treat stormwater runoff to the highest possible standard to preserve water quality and to protect the environmental health of parkland and the Giles Run watershed.

The applicant should select locally-common native plants for their landscaping and restoration efforts for this project, as evidenced by the seed mix provided in the application. The same guidelines should apply for the shrub and tree planting plan. The proposed vegetation should contain locally-common native species suitable to a landfill environment and be planted in accordance with DEQ regulations to prevent penetration of the cap and subsequent groundwater contamination.

The Park Authority strongly recommends that the applicant control non-native, invasive vegetation onsite, both in planted areas and in natural areas. The applicant should establish a vegetative management plan that would not only control invasive species, but promote the establishment of native meadow species, and define the species and types of woody vegetation that are beneficial or harmful on the stabilized landfill surface to promote long-term stability, benefit wildlife and be aesthetically pleasing and recreationally beneficial.

The Park Authority recommends that all planted species be native to Fairfax County to reduce the spread of invasive species and protect the environmental health of parkland, due to the proximity of the Park Authority property. A list of invasive plant species for the state of Virginia can be found at the Virginia Department of Conservation & Recreation Division of Natural Heritage (DNH) website at http://www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf. For a list of native plant species, see the section on the DNH website titled Native Plants for Conservation, Restoration, and Landscaping at:
http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml

Finally, this site has been discussed as a future birding destination. The proposed height of the twelve wind turbines (180 ft.) may have detrimental impact on migrating birds. The applicant should coordinate with state and local regulatory authorities to assess the environmental impacts of the proposed wind farm to birds.

Cultural Resources Impact:
Prior to any ground disturbance for utility lines, detention ponds, storage areas, access roads, etc. in the undisturbed areas on the northern or eastern edges of the property, the Park Authority recommends that the proposed disturbed areas, less the current meander channel of Giles Run, be subjected to a tight interval (30-foot intervals between shovel tests) Phase I archeological survey, using a scope of work approved by the Cultural Resource Management and Protection Section. If any archeological resources are found by the phase I survey and are determined to be potentially significant and cannot be avoided then a Phase II significance assessment should be performed. If necessary, a Phase III data recovery should be performed in accordance with a scope approved by the Cultural Resource Management and Protection Section. A phase III scope should provide for public interpretation of the results. Draft and final archeological reports produced as a result of Phase I, II or III studies should be submitted for approval to the Cultural Resource Management & Protection Section of the Park Authority.

Proposed Financial Commitment
The current Special Exception requires dedication of a developed park on the previous location of the landfill after completion of post closure monitoring activities by the DEQ. The May 14, 2013, application committed the applicant to dedicate 17 acres to the Park Authority with on-site improvements including a rectangle field, trails with exercise stations, a picnic area, dog park, zip line, and a multi-purpose open space area. The Park Authority recommended that in lieu of the proposed park: "the applicant instead commit to contribute the monetary value of the land and improvements, including the value of any road improvements that would be necessary to develop the site, to create, design and/or construct recreation facilities in the South County/Lorton vicinity as determined the Park Authority Board." The revised application commits the applicant to a $3.2 million contribution to the development of athletic facilities in the Lorton area.

The Park Authority recommends that the applicant contribute $3.2 million in lieu of the 17- acre park dedication as the Park Authority has numerous recreation projects at Laurel Hill Park and the greater South County area that could be funded, at the discretion of the Park Authority Board, by this contribution. The Park Authority would additionally recommend that the contribution be made to the Park Authority before January 1, 2019, as this date represents the outside date that all landfill activities would cease under the current Special Exception. To the extent that any additional funds are directed to the Park Authority as a result of this application, the Park Authority would accept and use these funds to develop additional recreational opportunities at Laurel Hill Park and the South County area.

SUMMARY OF RECOMMENDATIONS

This section summarizes the recommendations included in the preceding analysis section. The analysis identified the following major issues:

- The applicant commit $3.2 million to site, design and/or construct recreation facilities in the South County/Lorton vicinity as determined the Park Authority Board.

- The applicant provides the contribution to the Park Authority before January 1, 2019 to facilitate the development of recreational facilities to serve the community within a reasonable timeframe consistent with community expectations established during the previous Special Exception process.

- To the extent that any additional funds are directed to the Park Authority as a result of this application, the Park Authority would accept and use these funds to develop additional recreational opportunities at Laurel Hill Park and the South County area.

- Proposed re-vegetation should contain locally-common native species suitable to a landfill environment and be planted in accordance with DEQ regulations to prevent penetration of the cap and subsequent groundwater contamination. A list of invasive plant species for the state of Virginia can be found at the Virginia Department of Conservation & Recreation Division of Natural Heritage (DNH) website at http://www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf. For a list of native plant species, see the section on the DNH website titled Native Plants for Conservation, Restoration, and Landscaping at: http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml

- Non-native, invasive vegetation should be controlled onsite, both in planted areas and in natural areas. A vegetative management plan should be established that controls invasive species, and promotes the establishment of native meadow species, defining the species and types of woody vegetation that are beneficial or harmful on the stabilized landfill surface to promote long-term stability, benefit wildlife and be aesthetically pleasing.

- Detain and treat stormwater runoff to the highest possible standard to preserve water quality and to protect the environmental health of parkland and the Giles Run watershed.

- The applicant should coordinate with state and local regulatory authorities to assess the environmental impacts of the proposed wind farm to birds.

- Prior to any ground disturbance for utility lines, detention ponds, storage areas, access roads, etc. in the undisturbed areas on the northern or eastern edges of the property, proposed disturbed areas, less the current meander channel of Giles Run, should be subjected to a tight interval Phase I archeological survey, using a scope of work approved by the Cultural Resource Management and Protection Section. If any archeological resources are found by the phase I survey and are determined to be potentially significant

and cannot be avoided then a Phase II significance assessment should be performed. If necessary, a Phase III data recovery should be performed in accordance with a scope approved by the Cultural Resource Management and Protection Section.

Please note the Park Authority would like to review and comment on development conditions related to park and recreation issues. We request that draft and final development conditions be submitted to the assigned reviewer noted below for review and comment prior to completion of the staff report and prior to final Board of Supervisors approval.

FCPA Reviewer: Brian Williams
DPZ Coordinator: Mary Ann Tsai

Copy: Cindy Walsh, Director, Resource Management Division
Julie Cline, Manager, Land Acquisition and Management Branch
Sandy Stallman, Manager, Park Planning Branch
Chron Binder
File Copy

County of Fairfax, Virginia

DATE: June 27, 2013

TO: Mary Ann Tsai, Staff Coordinator
Zoning Evaluation Division
Department of Planning and Zoning

FROM: Kevin R. Wastler, EH Supervisor KRW
Technical Review and Information Resources Section
Fairfax County Health Department

SUBJECT: Special Exception Plat Analysis

REFERENCE: Application No. SEA 80-LV-061-02 (Furnace Associates, Inc)

After reviewing the application, we have only one comment to be considered. Health Department records indicate that the property located at 10209 Furnace Rd which is part of this application is served by an onsite sewage disposal system as well as a private well water supply. The septic and well are not to be affected by the expanded operation of the proposed expandsion of the landfill.

Fairfax County Health Department
Division of Environmental Health
Technical Review and Information Resources
10777 Main Street, Suite 102, Fairfax, VA 22030
Phone: 703-246-2510 TTY: 711 Fax: 703-278-8156
www.fairfaxcounty.gov/hd

County of Fairfax, Virginia

MEMORANDUM

DATE: August 2, 2013

TO: Barbara Berlin, Director
Zoning Evaluation Division

FROM: Chuck Cohenour
Senior Zoning Inspector
Zoning Inspections Branch

SUBJECT: Compliance Inspection SE 80-L/V-061

REFERENCE: Expansion of Operation
Furnace Road Associates, Inc.
10001, 10201, 10209, 10215, 10219 and 10229 Furnace Road
Lorton, Virginia 22079
Tax Map Ref.: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004
Zoning District: R-1
Mail Log Assignment: 2013-MV-0131

On July 19, 2013, an inspection of 10001 Furnace Road, Tax Map Ref. Number 113-1 ((01)) 0005, was conducted to determine if the established use on that parcel was in compliance with the Developmental Conditions of Special Exception SE 80-L/V-061.

Conclusion

The property is in compliance with the Developmental Conditions of Special Exception SE 80-L/V-061. "*" indicates that the Developmental Condition was subject to this inspection.

Summary

***Condition 3:**

A copy of the Special Permit and the Non-Residential Use Permit A-0204-97 was posted at the business office of the scale house.

Condition 4:

Furnace Road Associates, Inc. has submitted an application for an amendment to the current Special Exception and the application is being processed.

Department of Planning and Zoning
Zoning Administration Division
Zoning Inspections Branch
12055 Government Center Parkway, Suite 829
Fairfax, Virginia 22035-5508
Phone 703-324-4300 FAX 703-324-1343
www.fairfaxcounty.gov/dpz/

Condition 5:

This development condition is the bailiwick of the Geotechnical Review Board (GRB) and not within the scope of this inspection.

Condition 6:

This development condition is the bailiwick of the Geotechnical Review Board (GRB) and the Fire and Rescue Department and/or the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

Condition 7:

This development condition is outside the scope of this inspection.

Condition 8:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

Condition 9:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

Condition 10:

This development condition is outside the scope of this inspection.

Condition 11:

This development condition is outside the scope of this inspection.

Condition 12:

This development condition is outside the scope of this inspection.

Condition 13:

This development condition is outside the scope of this inspection.

***Condition 14:**

At the time of this inspection, no evidence was observed that gave the indication of any materials begin or having been burned.

Condition 15:

This development condition is outside the scope of this inspection.

***Condition 16:**

The tire wash system is in place and was operable. At the time of this inspection, the site was dusty and the tire wash was not necessary. The travel portion between the tire wash rack and the scale house was paved.

Condition 17:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

Condition 18:

This development condition is outside the scope of this inspection.

Condition 19:

This development condition is outside the scope of this inspection.

Condition 20:

This development condition is outside the scope of this inspection.

Condition 21:

This development condition has been met and is in compliance.

Condition 22:

This development condition is outside the scope of this inspection.

Condition 23:

This development condition is outside the scope of this inspection.

Condition 24:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and Department of Environmental Quality (DEQ) and not within the scope of this inspection.

Condition 25:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

***Condition 26:**

The Emergency Contingency Plan, containing a list of landfill contacts was on site and was reviewed during this inspection. Those contacts were listed along with contact telephone numbers. I was advised that the plan had been updated on July 1, 2013 with copies begin forwarded to the Lorton Fire Department and the Public Safety Telecommunications Operations Center.

Condition 27:

This development condition is outside the scope of this inspection.

Condition 28:

This development condition is outside the scope of this inspection.

Condition 29:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

***Condition 30:**

This development condition could not be examined due to the extent of the landfill and the terrain.

Condition 31:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and not within the scope of this inspection.

Condition 32:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

***Condition 33:**

The undisturbed buffer of trees along the northern boundary was observed.

Condition 34:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

***Condition 35:**

Sound Level readings were taken at the scale house (during operations) 66 dB (1), at the entrance on Furnace Road 62 dB (2); on Furnace Road adjacent to the tire wash 53 dB (3) Furnace Road near the northern corner of the site 49 dB (4); at the intersection Whitehaven Court and Fifth Place 46 dB (5) and in the cul-de-sec near 8400 Whitehaven Court 47 dB (6). (Figure 1)

Condition 36:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

Condition 37:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

Condition 38:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

Condition 39:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

Condition 40:

This development condition is outside the scope of this inspection.

Condition 41:

This development condition is the bailiwick of the Department of Public Works and Environmental Services (DPWES) and the Urban Forest Management (UFM) and is not within the scope of this inspection.

Condition 42:

This development condition is outside the scope of this inspection.

Condition 43:

This development condition is outside the scope of this inspection.

***Condition 44:**

Truck traffic on southbound Furnace Road cannot turn left into this landfill due to the construction of the entrance. Only northbound truck traffic can negotiate the entrance. The operators of the landfill have posted a letter on the entrance side of the scale house advising those using the landfill of the traffic restrictions on Lorton Road. A copy of this letter is distributed to users two times permit year. A copy of that letter is attached to this report.

Condition 45:

This development condition is outside the scope of this inspection.

***Condition 46:**

Truck traffic on southbound Furnace Road cannot turn left into this landfill due to the construction design of the entrance. A determination as to if the turn land is in accordance with VDOT or FCDOT standards would be outside the scope of this inspection.

***Condition 47:**

Truck traffic on northbound Furnace Road has a right turn lane into the landfill. A determination if the turn lane is in accordance with VDOT or FCDOT standards would be outside the scope of this inspection.

***Condition 48:**

No other entrance into the landfill was observed.

***Condition 49:**

This development condition has been met and is in compliance as the landfill has one full time water truck actively laying down water to control the dust. Due to the size of the site, it is questionable that one full time water truck can sufficiently control the dust during dry conditions.

***Condition 50:**

The landfill exit is designed not to allow truck traffic to turn right onto northbound Furnace Road. If a vehicle is less than 9 feet in height, it can turn right and exit the landfill northbound on Furnace Road.

Condition 51:

This development condition is outside the scope of this inspection.

Condition 52:

This development condition is the bailiwick of the Fairfax County Park Authority (FCPA) and is not within the scope of this inspection.

Condition 53:

This development condition is outside the scope of this inspection.

Condition 54:

This development condition has been met and is in compliance.

Condition 55:

This development condition is the bailiwick of the Fairfax County Park Authority (FCPA) and is not within the scope of this inspection.

Condition 56:

This development condition is the bailiwick of the Fairfax County Health Department and is not within the scope of this inspection.

Fairfax County DTA Report
Traffic Advisory Letter
Photographs: June 26, 2013 and July 19, 2013

Figure 1 – location where sound readings were obtained

July 1, 2013

Dear Valued Customer:

Our Special Exception Permit with Fairfax County requires us to notify you of certain traffic restrictions pertaining to the use of Lorton Road. In short, our permit condition limits the acceptable travel ways for those using our facility and requires the avoidance of any route that passes in the vicinity of Lorton School. Specifically the permit condition reads as follows:

> ***Truck traffic to and from the site (Lorton Landfill) from the east, north and south shall be required to use only that portion of Furnace Road between U.S. Route #1 of I-95. Truck traffic entering the site from the west via Route #123 shall use the section of Furnace Road between the site entrance and Route #123. Truck traffic entering the site from any direction shall avoid Lorton Road in the vicinity of Lorton School.***

We thank you for your cooperation in meeting this requirement. Please insure that your truck routes comply with this requirement. If you have any questions regarding this, or any other matter, please do not hesitate to call me at (703) 690-1525. Again, thank you for your assistance in reducing truck traffic on Lorton Road.

Sincerely,

Larry Bayne
Facility Manager

Date: June 26, 2013

Time: 10:52 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: June 26, 2013 **Time:** 10:52 a.m. **Address:** 10001 Furnace Road, et al

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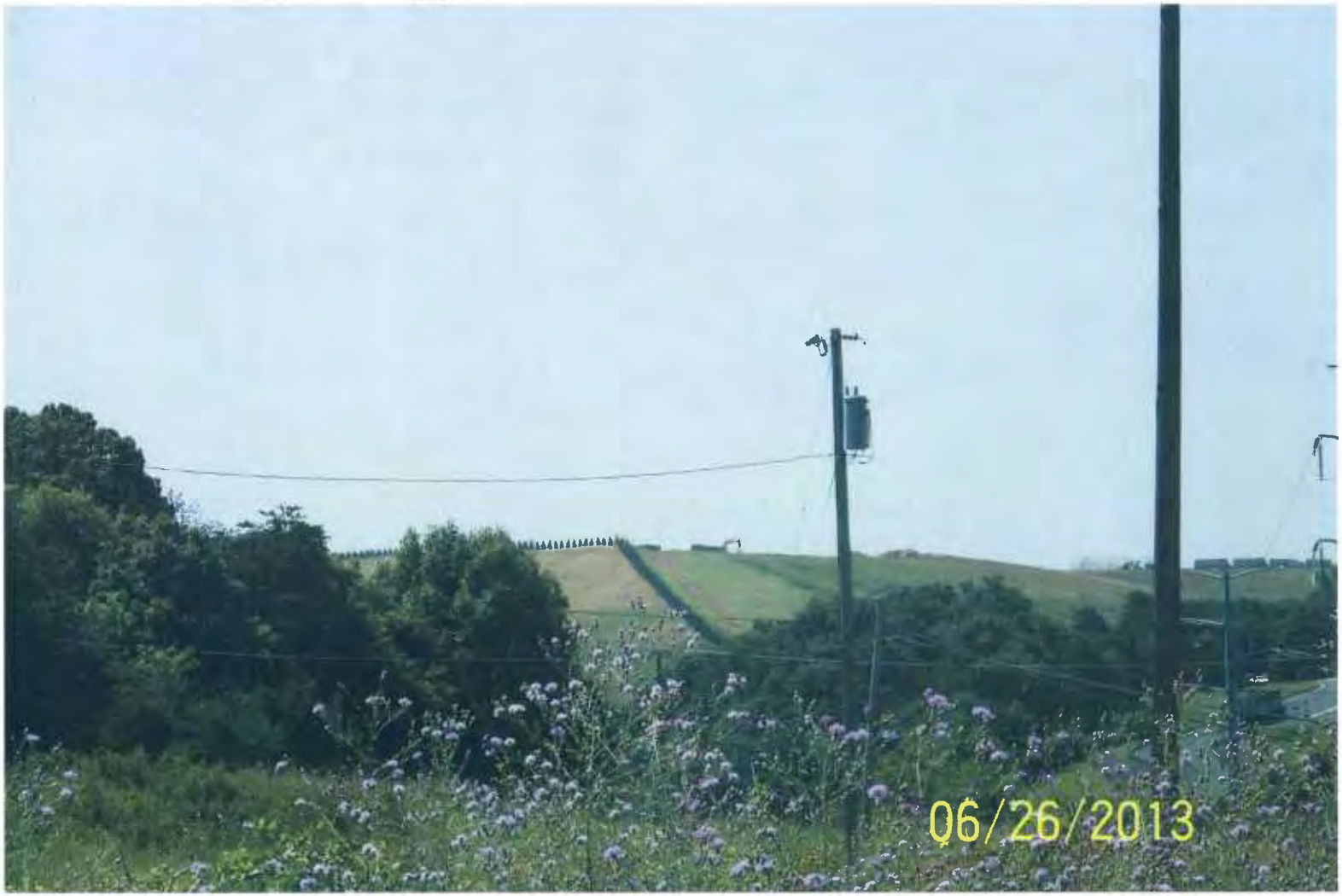
Photographer: Charles A. Cohenour



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Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: June 26, 2013

Time: 10:52 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013 **Time:** 11:00 a.m. **Address:** 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004 **Zoning:** R-1 Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

Date: July 19, 2013

Time: 11:00 a.m.

Address: 10001 Furnace Road, et al

Tax Map: 113-1 ((01)) 0005, 113-1 ((01)) 0007, 113-1 ((01)) 0008, 113-3 ((01)) 0001, 113-3 ((01)) 0002 and 113-3 ((01)) 0004

Zoning: R-1

Compliance with Special Exception

Photographer: Charles A. Cohenour

All Inspections

Print Date: 01/31/2014

Project Name: OVERLOOK RIDGE 001883-SP-002-3 Plan Number: 001883-SP -002 S&E Date: 01/30/2014

Inspector: Martin Klema PS: ☐ RP: ☐ BH: ☐ Area: 1

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
01/20/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
02/04/2010	JAS	GN			Site	Minor site plan inspection. Problems encountered. Project monitoring. Reviewing plans. Superintendent meeting
02/12/2010	JAS	SE			Site	Sediment traps inspected. Super Silt Fence inspected
02/26/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
03/12/2010	JAS	SE			Site	Sediment traps inspected. Silt Fence inspected. Super Silt Fence inspected. Temp. Stabilization inspected
03/24/2010	JAS	AS			Site	Air temperature checked. Alternate paving. Sealing Joints. Shoulder stabilization (pavement) inspection
03/24/2010	JAS	SE			site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
04/02/2010	JAS	AS			Site	Air temperature checked. Checked for proper crown
04/02/2010	JAS	SE			Site	Sediment traps inspected. Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
04/16/2010	JAS	AS			Site	Inspecting Overlay. Shoulder stabilization (pavement) inspection
04/16/2010	JAS	SE			Site	Sediment traps inspected. Seed and mulch all denuded areas. Silt Fence inspected. Super Silt Fence inspected
04/27/2010	JAS	SE			Site	Sediment traps inspected. Seed and mulch all denuded areas. Silt Fence inspected. Stabilization needed. Super Silt Fence inspected. Temp. Stabilization inspected
05/07/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
05/21/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
06/07/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
06/18/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
06/29/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
07/09/2010	JAS	SE			Site	Sediment traps inspected. Seed and mulch all denuded areas. Silt fence inspected. Stabilization needed. Stockpile inspection. Super silt fence inspected

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
07/23/2010	JAS	SE			Site	Construction Entrance installed per County requirements. Sediment traps inspected. Silt fence inspected. Super silt fence inspected
08/06/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
08/19/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
08/27/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
09/13/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
09/24/2010	JAS	SE			Site	Sediment traps inspected. Silt fence installed per approved plan.. Super silt fence inspected
10/01/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
10/15/2010	JAS	SE			Site	Construction Entrance installed per County requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved plan.. Super silt fence inspected
10/26/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
11/08/2010	JAS	SE			Site	Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved plan.. Super silt fence inspected
11/22/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved plan.. Super silt fence inspected
11/30/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved plan.
12/03/2010	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
12/14/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
12/27/2010	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
01/11/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved grading plan
01/28/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
02/03/2011	JAS	SE			Site	Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
02/15/2011	JAS	SE			Site	Construction Entrance installed per County requirements. Sediment traps inspected. Seed and mulch all denuded areas. Silt fence installed per approved grading plan. Stabilization needed. Super silt fence installed per approved grading plan
02/23/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
03/01/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
03/15/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
03/22/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. . Seed and mulch all denuded areas. Silt fence installed per approved grading plan
04/08/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
04/19/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
05/06/2011	JAS	SE			Site	Construction Entrance installed per County requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan
05/12/2011	JAS	SE			Site	Construction Entrance installed per County requirements. Sediment traps inspected. Silt fence installed per approved grading plan. Stabilization needed. Super silt fence installed per approved grading plan
05/17/2011	JAS	SIS				
05/18/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
05/23/2011	JAS	SE			Site	Conservation awards inspection.
06/01/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
06/07/2011	JAS	SE			Site	Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan. Checking site for EPA.
06/23/2011	JAS	SE			Site	Construction Entrance installed per County requirements but not in compliance. Talked to site super. to stop the flusher truck from going North in the South bound lane while sweeping.
06/24/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
07/01/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
07/15/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
07/29/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
08/12/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
09/08/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
09/13/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Seed and mulch all denuded areas.. Stabilization needed
09/21/2011	JAS	AT				All lines past still need water tight easement lock down castings.
09/23/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
09/27/2011	JAS	FA				All castings inspected. Faxed Field Approval to Leon Lyles @ (703) 803-3297. Watertight castings are installed
10/03/2011	JAS	TV				Access to manholes in easement require off-road equipment. Access to manholes is not a problem. All easement castings are locked. All lines to TV have been Field Approved. Faxed TV request to Mickey Pettry @ (703) 250-7632
10/07/2011	JAS	SE			Site	Project completed, letter 18 sent to Supervisor for his review.Required E&S inspection made. Sediment traps inspected. Silt fence installed per approved grading plan
10/11/2011	JAS	GN			Site	Checked on sanitary sewer complaint wiil met today 10-12-11 @ the Treatment Plant with Larry Baynes to discuss the issue.
10/12/2011	JAS	CO				Met with developer. Met with H/O association. Problems encountered. Oder complaint from Sanitary Sewer.
10/21/2011	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
11/02/2011	JAS	SS			Site	Took photo of M/H C for futuer tie in. from I-95 Lateral Plug.
11/02/2011	JAS	SE			Site	Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
11/04/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
11/18/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
12/02/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
12/16/2011	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
12/27/2011	JAS	SE			Site	Construction Entrance installed per County requirements. Required E&S Inspection made after heavy rain event. . Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
01/06/2012	JAS	TV				Faxed TV request to Mickey Pettry @ (703) 250-7632. Access to manholes in easement require off-road equipment. Access to manholes is not a problem. All easement castings are locked. All manhole openings are exposed
01/13/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
01/24/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
01/25/2012	JAS	GN			S. W.M.	Reviewing plans T.V. report with Mickey Pettrey, Paul Farrel,Ed Ballard.
02/14/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
02/24/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
03/07/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
03/19/2012	JAS	SE			Site	Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
03/21/2012	JAS	TV				Access to manholes is not a problem. All easement castings are locked. All lines to TV have been Field Approved. All manhole openings are exposed. Faxed TV request to Mickey Pettry @ (703) 250-7632. Please RUSH as requested. Re-TV corrected sewer lines
03/28/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
04/06/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
04/19/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
05/03/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
05/15/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
05/24/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event.
06/11/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Super silt fence installed per approved grading plan
06/25/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
07/05/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
07/18/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
08/02/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
08/09/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
08/13/2012	JAS	SS			Site	As-built inspection. Faxed Mickey Pettry San.Sewer As-built final approval letter @ (703) 250-7632
08/20/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event.
08/29/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan
09/11/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
09/24/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
10/09/2012	JAS	SE			Site	Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
10/19/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
10/31/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event.
11/14/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
11/20/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected
11/28/2012	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
12/06/2012	JAS	SE			Site	Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
12/18/2012	JAS	SE			Site	Construction Entrance installed per County requirements. Required E&S Inspection made after heavy rain event. . Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
01/02/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
01/14/2013	JAS	SE			Site	Construction Entrance installed per County requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
01/22/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
02/05/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event.
02/19/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
03/01/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event.
03/12/2013	JAS	SE			Site	Construction Entrance installed per County requirements. Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. . Sediment traps inspected
03/15/2013	JAS	GN			Office	Reviewing plans with Martin Risen & Ed Ballard on the Phaseing of this site for Conservation plantings and Public use.
03/26/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. Sediment traps inspected
03/27/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event.
04/09/2013	JAS	GN			Site	Problems encountered. Project monitoring. Reviewing plans. Superintendent meeting Met with County Staff to discuss the Landfill out of compliance proffer issues.
04/09/2013	JAS	SE			Site	Contractor not following E&S narrative per approved plan. Seed and mulch all denuded areas. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
04/24/2013	JAS	SE			Site	Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan, still working on 10/30 issued fom last week.
05/07/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
05/20/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
06/06/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
06/10/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements. Required E&S Inspection made after heavy rain event. Sediment traps inspected. Silt fence installed per approved grading plan. Super silt fence installed per approved grading plan
07/01/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
07/19/2013	JAS	SE			Site	Entire site is permanently stablized no issues found. E&S inspection made per DCR requirements
08/08/2013	MEK	SE			site	inspected site with PM, advised to clean all SB dewatering devises and trash racks, provide access to structures and outfalls for inspection, stabilize all eroded ditchlines along acces rd on perimeter of site. No SB design details found in the approved plan, reseach required as to how each got built??
08/15/2013	MEK	SE			site	Crews working on re-grading and stabilization of dithlines along access rd, weed eating all pond structures and outfalls noww completed, Advised site forman that no further warnings are to be given for dust control, next occurance will be a violation. Also advise foreman of the following: install dewatering device on pond 1, outfall banks are vertical and suspect inadequate outfall channel; pond 2, clean out sediment; pond 3, remove fabric from dewatering device; pond 4, remove fabric from dewateriing device. pond 5, no visible dewatering device-rectify; pond 6, remove cp at dewatering device and provide holes in device for low flow drainage; pond 7 2yr weir clogged, possible sediment clean out required no visible dewatering device.
08/27/2013	MEK	SE			site perimeter	access rd ditchs no re-stabilized with matting and seed, some sprouting. Crew cleanig out pond 8, 3-4 ft sediment. Awaiting Engineer revisiooon for sediment basins. Advised site foreman to remove concrete and dbris from outfall at SB 9 must use rip rap stone per plan. Filter fabric on dewatering devices of other SB'd has been removed and unclogged and draining clear water off as it should.
09/09/2013	MEK	SE			site	all sediment basins have been cleaned out. Awaiting plan revision from Design engineer for calcs on all sed basins. Advised site manager that all outfalls are to be armored with rip rap per plan design.
09/23/2013	MEK	SE			site	controls OK, awaiting plan rev on Sed basins

All Inspections

Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
10/07/2013	MEK	SE	Violation Released	11/08/2013	site perimeter basins	Have not received the required plan revision for the existing sediment basins design and construction details. Sediment Basin 9 has free flowing sediment laden runoff passing directly through structure & down stream, no dewatering device attached per VESCH std. 3.14. Dewatering device on sed basin 5 is leaking and therefore defective not providing any filtering. Repair dewatering device immediately.
10/15/2013	MEK	VS	Extended	11/08/2013		Engineer advised that crew is onsite working on violation corrections. Due to several days of rain work could not be completed as scheduled. OK to extend til 18th
10/17/2013	MEK	EI			site	Met landscaper and LA and project Eng. Reviewed UFM punchlist from fridays inspection. Contractor advised that plant materials are coming in next week and additional crews will be added to complete work. It was agreed that herbicide would not be used around trees and that the weed eaters will not get closer than 12" to trees and srhubs with the balance being done by hand. It was agreed that the developer could decide wether plastic tubing on all trees, for deer protection, would be used or if it madde more financial sense to just replace damaged trees as they occur. Report sent to UFM.
10/17/2013	MEK	SE			site pond 5	Crews onsite dewatering and repiaring leaking dewatering device. Pumps discharging into filter bags, no issues.
10/18/2013	MEK	VS	Extended	11/08/2013		Per yesterday ES inspection, crews working on pond 5 dewater device, awaiting Engineers calcs and detail for pond 9 dewatering device and all SB plan revision drawings.
10/18/2013	MEK	SE			pond 5	RCP pipr from head wall was found to have settled causing leaking joint, advised site manager and contractor to adjust pipe for line and grade and install concreet collar. Work to be complieted Monday on this pond
10/31/2013	MEK	EI			NE side	site meeting with UFM and developer and contractor, inspect progress and quality of required plantings.Creww has increased to 14, advised on pruning and mulching requirements and advised to correct deficiencies of same through out
10/31/2013	MEK	SE			site	maintenance incomplaince, awaiting plan rev submission for corrections to SB's through out site
11/05/2013	MEK	VS	Violation Released	11/08/2013		Required plan revision submitted today, only dewatering device on pond 9 remains outstanding.
11/15/2013	MEK	SE			site ponds	SB 9 has been retrofitted though it appears dewateriing device invert in is at wrong elevation, site meeting scheduled for next week to review. Also it appears several SB's will require dewatering and sediment removal based on revised plan elevations. Supt has been advised to survey to verify and proceed as required.

All Inspections

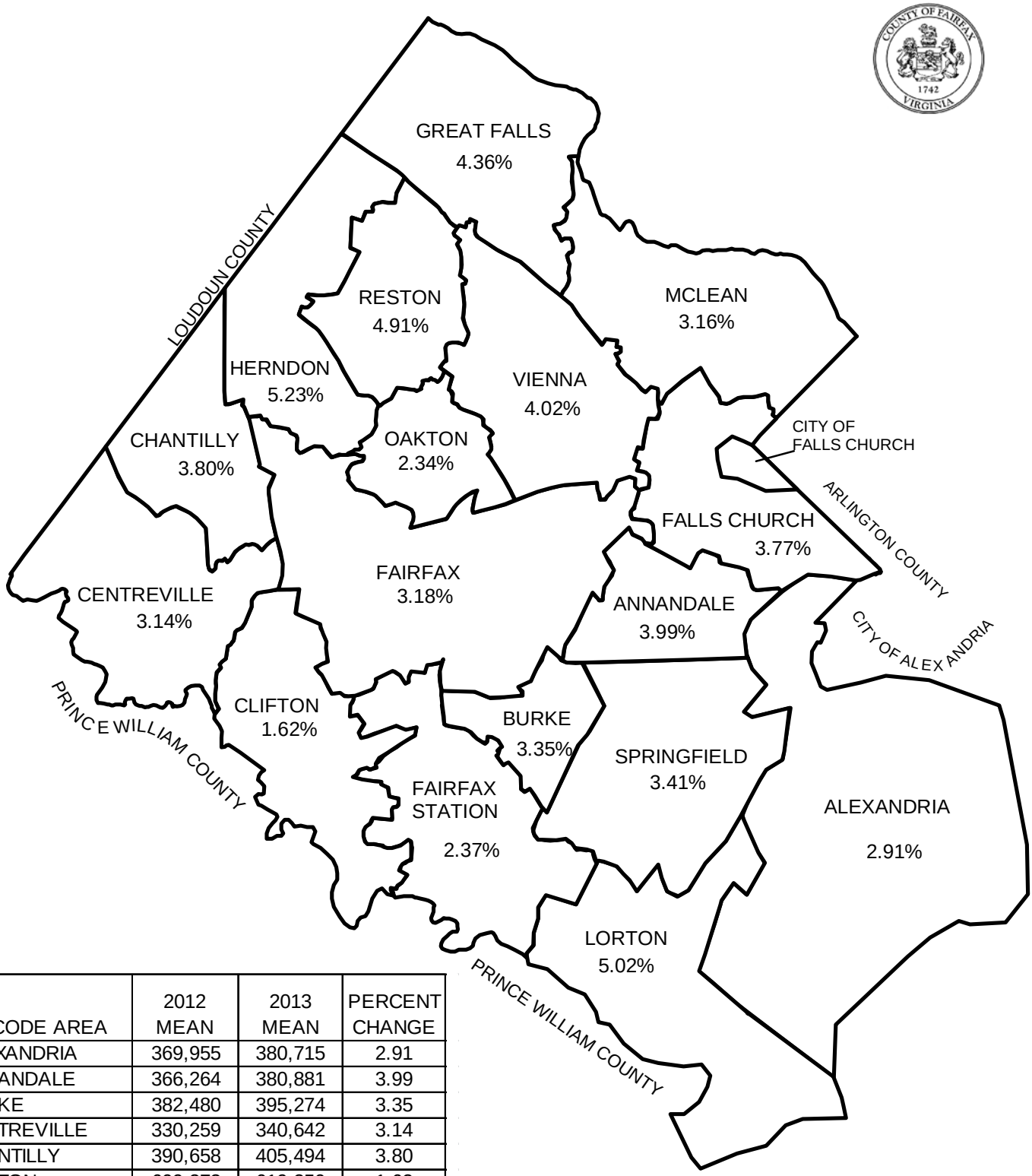
Print Date: 01/31/2014

Inspection Date	Initials	Type	Viol Status	Viol Clear By	Work Location	Remark
11/18/2013	MEK	SE			site	Dewatering device has been corrrected per revised plan reqs on SB9, unworked slopes are being re-graded in prep for stabilization, others have been hydro seeded.
12/02/2013	MEK	SE			site ponds	sediment basins functioning, Supt scheduling sediment removal pending survey results.
12/16/2013	MEK	EI			site	plantings continue throughout, advised developer to provide replacements along furnace rd
12/16/2013	MEK	SE			site	controls in compliance, developer working on surveying SB's for possible sediment removal
12/19/2013	MEK	PR				Review post pack and cctv, punch work required as follows: 951-950 Re-clean line, remove and replace pipe 11.3' multiple defects, sag, remove sediment and remove and replace rip rap at outfall 950. Rectify low compaction results/ reports. Report sent to developer with post pack return.
12/23/2013	MEK	SE			site	advise site manager to stabilize all areas disturbed by recent lanscaping efforts. Provide TFD's DD's to promote possitive flow to riprap channels, several areas noticed in todays rain event flowing down slopes and not channels, also regrade terraces to flow to channels as well.
01/16/2014	MEK	SE			site	Sediment basins in compliance
01/30/2014	MEK	SE			site	sed basins frozen, no offsite issues found, controls OK

Total Records: 149

APPENDIX 14

FAIRFAX COUNTY



ZIP CODE AREA	2012 MEAN	2013 MEAN	PERCENT CHANGE
ALEXANDRIA	369,955	380,715	2.91
ANNANDALE	366,264	380,881	3.99
BURKE	382,480	395,274	3.35
CENTREVILLE	330,259	340,642	3.14
CHANTILLY	390,658	405,494	3.80
CLIFTON	609,373	619,250	1.62
FAIRFAX	418,712	432,009	3.18
FAIRFAX STATION	587,881	601,818	2.37
FALLS CHURCH	369,629	383,559	3.77
GREAT FALLS	930,477	971,014	4.36
HERNDON	406,751	428,013	5.23
LORTON	332,476	349,150	5.02
McLEAN	762,002	786,105	3.16
OAKTON	624,911	639,551	2.34
RESTON	362,028	379,812	4.91
SPRINGFIELD	361,529	373,874	3.41
VIENNA	586,948	610,521	4.02

2013 ASSESSMENT YEAR
RESIDENTIAL ANALYSIS BY ZIP CODE AREA

Vacant and Improved Residential Property
(Equalization Only)

NOTE: THE MEAN IS THE AVERAGE VALUE.
IT IS USED HERE AS A REPRESENTATIVE NUMBER.

Property owners are cautioned against assuming that any percentages reported here have been applied to any individual assessment. The percentages are only shown as a measure of the change in mean value for a large group of properties from one year to the next.

GLOSSARY

This Glossary is provided to assist the public in understanding
the staff evaluation and analysis of development proposals.
It should not be construed as representing legal definitions.
Refer to the Fairfax County Zoning Ordinance, Comprehensive Plan
or Public Facilities Manual for additional information.

ABANDONMENT: Refers to road or street abandonment, an action taken by the Board of Supervisors, usually through the public hearing process, to abolish the public's right-of-passage over a road or road right-of way. Upon abandonment, the right-of-way automatically reverts to the underlying fee owners. If the fee to the owner is unknown, Virginia law presumes that fee to the roadbed rests with the adjacent property owners if there is no evidence to the contrary.

ACCESSORY DWELLING UNIT (OR APARTMENT): A secondary dwelling unit established in conjunction with and clearly subordinate to a single family detached dwelling unit. An accessory dwelling unit may be allowed if a special permit is granted by the Board of Zoning Appeals (BZA). Refer to Sect. 8-918 of the Zoning Ordinance.

AFFORDABLE DWELLING UNIT (ADU) DEVELOPMENT: Residential development to assist in the provision of affordable housing for persons of low and moderate income in accordance with the affordable dwelling unit program and in accordance with Zoning Ordinance regulations. Residential development which provides affordable dwelling units may result in a density bonus (see below) permitting the construction of additional housing units. See Part 8 of Article 2 of the Zoning Ordinance.

AGRICULTURAL AND FORESTAL DISTRICTS: A land use classification created under Chapter 114 or 115 of the Fairfax County Code for the purpose of qualifying landowners who wish to retain their property for agricultural or forestal use for use/value taxation pursuant to Chapter 58 of the Fairfax County Code.

BARRIER: A wall, fence, earthen berm, or plant materials which may be used to provide a physical separation between land uses. Refer to Article 13 of the Zoning Ordinance for specific barrier requirements.

BEST MANAGEMENT PRACTICES (BMPs): Stormwater management techniques or land use practices that are determined to be the most effective, practicable means of preventing and/or reducing the amount of pollution generated by nonpoint sources in order to improve water quality.

BUFFER: Graduated mix of land uses, building heights or intensities designed to mitigate potential conflicts between different types or intensities of land uses; may also provide for a transition between uses. A landscaped buffer may be an area of open, undeveloped land and may include a combination of fences, walls, berms, open space and/or landscape plantings. A buffer is not necessarily coincident with transitional screening.

CHESAPEAKE BAY PRESERVATION ORDINANCE: Regulations which the State has mandated must be adopted to protect the Chesapeake Bay and its tributaries. These regulations must be incorporated into the comprehensive plans, zoning ordinances and subdivision ordinances of the affected localities. Refer to Chesapeake Bay Preservation Act, Va. Code Section 10.1-2100 et seq and VR 173-02-01, Chesapeake Bay Preservation Area Designation and Management Regulations.

CLUSTER DEVELOPMENT: Residential development in which the lots are clustered on a portion of a site so that significant environmental/historical/cultural resources may be preserved or recreational amenities provided. While smaller lot sizes are permitted in a cluster subdivision to preserve open space, the overall density cannot exceed that permitted by the applicable zoning district. See Sect. 2-421 and Sect. 9-615 of the Zoning Ordinance.

COUNTY 2232 REVIEW PROCESS: A public hearing process pursuant to Sect. 15.2-2232 (Formerly Sect. 15.1-456) of the Virginia Code which is used to determine if a proposed public facility not shown on the adopted Comprehensive Plan is in substantial accord with the plan. Specifically, this process is used to determine if the general or approximate location, character and extent of a proposed facility is in substantial accord with the Plan.

dBA: The momentary magnitude of sound weighted to approximate the sensitivity of the human ear to certain frequencies; the dBA value describes a sound at a given instant, a maximum sound level or a steady state value. See also Ldn.

DENSITY: Number of dwelling units (du) divided by the gross acreage (ac) of a site being developed in residential use; or, the number of dwelling units per acre (du/ac) except in the PRC District when density refers to the number of persons per acre.

DENSITY BONUS: An increase in the density otherwise allowed in a given zoning district which may be granted under specific provisions of the Zoning Ordinance when a developer provides excess open space, recreation facilities, or affordable dwelling units (ADUs), etc.

DEVELOPMENT CONDITIONS: Terms or conditions imposed on a development by the Board of Supervisors (BOS) or the Board of Zoning Appeals (BZA) in connection with approval of a special exception, special permit or variance application or rezoning application in a "P" district. Conditions may be imposed to mitigate adverse impacts associated with a development as well as secure compliance with the Zoning Ordinance and/or conformance with the Comprehensive Plan. For example, development conditions may regulate hours of operation, number of employees, height of buildings, and intensity of development.

DEVELOPMENT PLAN: A graphic representation which depicts the nature and character of the development proposed for a specific land area: information such as topography, location and size of proposed structures, location of streets trails, utilities, and storm drainage are generally included on a development plan. A development plan is s submission requirement for rezoning to the PRC District. A GENERALIZED DEVELOPMENT PLAN (GDP) is a submission requirement for a rezoning application for all conventional zoning districts other than a P District. A development plan submitted in connection with a special exception (SE) or special permit (SP) is generally referred to as an SE or SP plat. A CONCEPTUAL DEVELOPMENT PLAN (CDP) is a submission requirement when filing a rezoning application for a P District other than the PRC District; a CDP characterizes in a general way the planned development of the site. A FINAL DEVELOPMENT PLAN (FDP) is a submission requirement following the approval of a conceptual development plan and rezoning application for a P District other than the PRC District; an FDP further details the planned development of the site. See Article 16 of the Zoning Ordinance.

EASEMENT: A right to or interest in property owned by another for a specific and limited purpose. Examples: access easement, utility easement, construction easement, etc. Easements may be for public or private purposes.

ENVIRONMENTAL QUALITY CORRIDORS (EQCs): An open space system designed to link and preserve natural resource areas, provide passive recreation and protect wildlife habitat. The system includes stream valleys, steep slopes and wetlands. For a complete definition of EQCs, refer to the Environmental section of the Policy Plan for Fairfax County contained in Vol. 1 of the Comprehensive Plan.

ERODIBLE SOILS: Soils that wash away easily, especially under conditions where stormwater runoff is inadequately controlled. Silt and sediment are washed into nearby streams, thereby degrading water quality.

FLOODPLAIN: Those land areas in and adjacent to streams and watercourses subject to periodic flooding; usually associated with environmental quality corridors. The 100 year floodplain drains 70 acres or more of land and has a one percent chance of flood occurrence in any given year.

FLOOR AREA RATIO (FAR): An expression of the amount of development intensity (typically, non-residential uses) on a specific parcel of land. FAR is determined by dividing the total square footage of gross floor area of buildings on a site by the total square footage of the site itself.

FUNCTIONAL CLASSIFICATION: A system for classifying roads in terms of the character of service that individual facilities are providing or are intended to provide, ranging from travel mobility to land access. Roadway system functional classification elements include Freeways or Expressways which are limited access highways, Other Principal (or Major) Arterials, Minor Arterials, Collector Streets, and Local Streets. Principal arterials are designed to accommodate travel; access to adjacent properties is discouraged. Minor arterials are designed to serve both through traffic and local trips. Collector roads and streets link local streets and properties with the arterial network. Local streets provide access to adjacent properties.

GEOTECHNICAL REVIEW: An engineering study of the geology and soils of a site which is submitted to determine the suitability of a site for development and recommends construction techniques designed to overcome development on problem soils, e.g., marine clay soils.

HYDROCARBON RUNOFF: Petroleum products, such as motor oil, gasoline or transmission fluid deposited by motor vehicles which are carried into the local storm sewer system with the stormwater runoff, and ultimately, into receiving streams; a major source of non-point source pollution. An oil-grit separator is a common hydrocarbon runoff reduction method.

IMPERVIOUS SURFACE: Any land area covered by buildings or paved with a hard surface such that water cannot seep through the surface into the ground.

INFILL: Development on vacant or underutilized sites within an area which is already mostly developed in an established development pattern or neighborhood.

INTENSITY: The magnitude of development usually measured in such terms as density, floor area ratio, building height, percentage of impervious surface, traffic generation, etc. Intensity is also based on a comparison of the development proposal against environmental constraints or other conditions which determine the carrying capacity of a specific land area to accommodate development without adverse impacts.

Ldn: Day night average sound level. It is the twenty-four hour average sound level expressed in A-weighted decibels; the measurement assigns a "penalty" to night time noise to account for night time sensitivity. Ldn represents the total noise environment which varies over time and correlates with the effects of noise on the public health, safety and welfare.

LEVEL OF SERVICE (LOS): An estimate of the effectiveness of a roadway to carry traffic, usually under anticipated peak traffic conditions. Level of Service efficiency is generally characterized by the letters A through F, with LOS-A describing free flow traffic conditions and LOS-F describing jammed or grid-lock conditions.

MARINE CLAY SOILS: Soils that occur in widespread areas of the County generally east of Interstate 95. Because of the abundance of shrink-swell clays in these soils, they tend to be highly unstable. Many areas of slope failure are evident on natural slopes. Construction on these soils may initiate or accelerate slope movement or slope failure. The shrink-swell soils can cause movement in structures, even in areas of flat topography, from dry to wet seasons resulting in cracked foundations, etc. Also known as slippage soils.

OPEN SPACE: That portion of a site which generally is not covered by buildings, streets, or parking areas. Open space is intended to provide light and air; open space may be function as a buffer between land uses or for scenic, environmental, or recreational purposes.

OPEN SPACE EASEMENT: An easement usually granted to the Board of Supervisors which preserves a tract of land in open space for some public benefit in perpetuity or for a specified period of time. Open space easements may be accepted by the Board of Supervisors, upon request of the land owner, after evaluation under criteria established by the Board. See Open Space Land Act, Code of Virginia, Sections 10.1-1700, et seq.

P DISTRICT: A "P" district refers to land that is planned and/or developed as a Planned Development Housing (PDH) District, a Planned Development Commercial (PDC) District or a Planned Residential Community (PRC) District. The PDH, PDC and PRC Zoning Districts are established to encourage innovative and creative design for land development; to provide ample and efficient use of open space; to promote a balance in the mix of land uses, housing types, and intensity of development; and to allow maximum flexibility in order to achieve excellence in physical, social and economic planning and development of a site. Refer to Articles 6 and 16 of the Zoning Ordinance.

PROFFER: A written condition, which, when offered voluntarily by a property owner and accepted by the Board of Supervisors in a rezoning action, becomes a legally binding condition which is in addition to the zoning district regulations applicable to a specific property. Proffers are submitted and signed by an owner prior to the Board of Supervisors public hearing on a rezoning application and run with the land. Once accepted by the Board, proffers may be modified only by a proffered condition amendment (PCA) application or other zoning action of the Board and the hearing process required for a rezoning application applies. See Sect. 15.2-2303 (formerly 15.1-491) of the Code of Virginia.

PUBLIC FACILITIES MANUAL (PFM): A technical text approved by the Board of Supervisors containing guidelines and standards which govern the design and construction of site improvements incorporating applicable Federal, State and County Codes, specific standards of the Virginia Department of Transportation and the County's Department of Public Works and Environmental Services.

RESOURCE MANAGEMENT AREA (RMA): That component of the Chesapeake Bay Preservation Area comprised of lands that, if improperly used or developed, have a potential for causing significant water quality degradation or for diminishing the functional value of the Resource Protection Area. See Fairfax County Code, Ch. 118, Chesapeake Bay Preservation Ordinance.

RESOURCE PROTECTION AREA (RPA): That component of the Chesapeake Bay Preservation Area comprised of lands at or near the shoreline or water's edge that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation of the quality of state waters. In their natural condition, these lands provide for the removal, reduction or assimilation of sediments from runoff entering the Bay and its tributaries, and minimize the adverse effects of human activities on state waters and aquatic resources. New development is generally discouraged in an RPA. See Fairfax County Code, Ch. 118, Chesapeake Bay Preservation Ordinance.

SITE PLAN: A detailed engineering plan, to scale, depicting the development of a parcel of land and containing all information required by Article 17 of the Zoning Ordinance. Generally, submission of a site plan to DPWES for review and approval is required for all residential, commercial and industrial development except for development of single family detached dwellings. The site plan is required to assure that development complies with the Zoning Ordinance.

SPECIAL EXCEPTION (SE) / SPECIAL PERMIT (SP): Uses, which by their nature, can have an undue impact upon or can be incompatible with other land uses and therefore need a site specific review. After review, such uses may be allowed to locate within given designated zoning districts if appropriate and only under special controls, limitations, and regulations. A special exception is subject to public hearings by the Planning Commission and Board of Supervisors with approval by the Board of Supervisors; a special permit requires a public hearing and approval by the Board of Zoning Appeals. Unlike proffers which are voluntary, the Board of Supervisors or BZA may impose reasonable conditions to assure, for example, compatibility and safety. See Article 8, Special Permits and Article 9, Special Exceptions, of the Zoning Ordinance.

STORMWATER MANAGEMENT: Engineering practices that are incorporated into the design of a development in order to mitigate or abate adverse water quantity and water quality impacts resulting from development. Stormwater management systems are designed to slow down or retain runoff to re-create, as nearly as possible, the pre-development flow conditions.

SUBDIVISION PLAT: The engineering plan for a subdivision of land submitted to DPWES for review and approved pursuant to Chapter 101 of the County Code.

TRANSPORTATION DEMAND MANAGEMENT (TDM): Actions taken to reduce single occupant vehicle automobile trips or actions taken to manage or reduce overall transportation demand in a particular area.

TRANSPORTATION SYSTEM MANAGEMENT (TSM) PROGRAMS: This term is used to describe a full spectrum of actions that may be applied to improve the overall efficiency of the transportation network. TSM programs usually consist of low-cost alternatives to major capital expenditures, and may include parking management measures, ridesharing programs, flexible or staggared work hours, transit promotion or operational improvements to the existing roadway system. TSM includes Transportation Demand Management (TDM) measures as well as H.O.V. use and other strategies associated with the operation of the street and transit systems.

URBAN DESIGN: An aspect of urban or suburban planning that focuses on creating a desirable environment in which to live, work and play. A well-designed urban or suburban environment demonstrates the four generally accepted principles of design: clearly identifiable function for the area; easily understood order; distinctive identity; and visual appeal.

VACATION: Refers to vacation of street or road as an action taken by the Board of Supervisors in order to abolish the public's right-of-passage over a road or road right-of-way dedicated by a plat of subdivision. Upon vacation, title to the road right-of-way transfers by operation of law to the owner(s) of the adjacent properties within the subdivision from whence the road/road right-of-way originated.

VARIANCE: An application to the Board of Zoning Appeals which seeks relief from a specific zoning regulation such as lot width, building height, or minimum yard requirements, among others. A variance may only be granted by the Board of Zoning Appeals through the public hearing process and upon a finding by the BZA that the variance application meets the required Standards for a Variance set forth in Sect. 18-404 of the Zoning Ordinance.

WETLANDS: Land characterized by wetness for a portion of the growing season. Wetlands are generally delineated on the basis of physical characteristics such as soil properties indicative of wetness, the presence of vegetation with an affinity for water, and the presence or evidence of surface wetness or soil saturation. Wetland environments provide water quality improvement benefits and are ecologically valuable. Development activity in wetlands is subject to permitting processes administered by the U.S. Army Corps of Engineers

TIDAL WETLANDS: Vegetated and nonvegetated wetlands as defined in Chapter 116 Wetlands Ordinance of the Fairfax County Code: includes tidal shores and tidally influenced embayments, creeks, and tributaries to the Occoquan and Potomac Rivers. Development activity in tidal wetlands may require approval from the Fairfax County Wetlands Board.

Abbreviations Commonly Used in Staff Reports

A&F	Agricultural & Forestal District
ADU	Affordable Dwelling Unit
ARB	Architectural Review Board
BMP	Best Management Practices
BOS	Board of Supervisors
BZA	Board of Zoning Appeals
COG	Council of Governments
CBC	Community Business Center
CDP	Conceptual Development Plan
CRD	Commercial Revitalization District
DOT	Department of Transportation
DP	Development Plan
DPWES	Department of Public Works and Environmental Services
DPZ	Department of Planning and Zoning
DU/AC	Dwelling Units Per Acre
EQC	Environmental Quality Corridor
FAR	Floor Area Ratio
FDP	Final Development Plan
GDP	Generalized Development Plan
GFA	Gross Floor Area
HC	Highway Corridor Overlay District
HCD	Housing and Community Development
LOS	Level of Service
Non-RUP	Non-Residential Use Permit
OSDS	Office of Site Development Services, DPWES
PCA	Proffered Condition Amendment
PD	Planning Division
PDC	Planned Development Commercial
PDH	Planned Development Housing
PFM	Public Facilities Manual
PRC	Planned Residential Community
RC	Residential-Conservation
RE	Residential Estate
RMA	Resource Management Area
RPA	Resource Protection Area
RUP	Residential Use Permit
RZ	Rezoning
SE	Special Exception
SEA	Special Exception Amendment
SP	Special Permit
TDM	Transportation Demand Management
TMA	Transportation Management Association
TSA	Transit Station Area
TSM	Transportation System Management
UP & DD	Utilities Planning and Design Division, DPWES
VC	Variance
VDOT	Virginia Dept. of Transportation
VPD	Vehicles Per Day
VPH	Vehicles per Hour
WMATA	Washington Metropolitan Area Transit Authority
WS	Water Supply Protection Overlay District
ZAD	Zoning Administration Division, DPZ
ZED	Zoning Evaluation Division, DPZ
ZPRB	Zoning Permit Review Branch