PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 3

MAPPING REQUIREMENTS – PHASE II

FEBRUARY 2018

This page intentionally left blank.

2540-PM-BWM0007 6/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised **FEBRUARY 2018**
DEP USE ONLY
Date Received

FORM 3
MAP REQUIREMENTS - PHASE II
MUNICIPAL WASTE AND CONSTRUCTION/DEMOLITION WASTE LANDFILLS

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 3, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Sections 273.133/277.133

Instructions: Provide the following maps in the scales and contours indicated. Before each item listed below, identify the specific map or plan where the information requested can be found.

Scale: 1 inch equals no more than 200 feet with 10 foot maximum contour intervals.

Drawings shall meet the following requirements or contain:

a. The maximum drawing size of 30" X 36".
b. The north arrow designated as magnetic or true.
c. Grid system tied to north arrow and on-site survey monuments.
d. A legend of symbols.
e. Horizontal and vertical scale.
f. A title block which identifies the applicant, municipalities, consultant and dates of all information.
g. Seal and signature of PA registered Professional Engineer on cover sheet of drawings and seal on all subsequent drawings in the set.

SECTION A. SITE IDENTIFIER

Applicant/permittee: **PA WASTE, LLC**

Site Name: **CAMP HOPE RUN LANDFILL**

Facility ID (as issued by DEP): **TBD**

SECTION B. TOPOGRAPHIC MAP

Topographic map of proposed permit and adjacent areas showing the following:

Refer to the accompanying drawing set (under separate cover) for a depiction of the following elements.

1. Boundaries of lands proposed to be affected over the estimated total life of proposed operation and the sequence of landfilling and closure.
2. A change in a component of facility or feature within proposed permit area caused by proposed operation.
3. Buildings, utility corridors and facilities which will be used in operation.
4. The areas of land for which bond will be posted under Chapter 271, Subchapter D.
5. Solid waste storage, processing or unloading areas.
6. Water diversion, collection conveyance, erosion and sedimentation control, treatment, storage and discharge facilities.
7. Location and elevation of permanent physical markers for grid coordinate system.
8. Gas management, collection, and control facilities.
9. Boundaries of construction activities.
10. Barriers, fences and similar structures required by 273.212/277.212.
11. Sedimentation pond, permanent water impoundment, or similar facility.
12. Access roads to site, including slopes, grades and lengths of roads.
13. Monitoring wells.
14. Area for isolating detected radioactive waste.
15. Location of radioactive monitoring equipment.
16. Location of meteorological equipment.

SECTION C. GRID SYSTEMS

Grid coordinate system for proposed permit area. Horizontal control system shall consist of a grid not to exceed 200 feet square sections. A permanent benchmark for horizontal and vertical control shall be shown. Grid system shall be tied to benchmark and baseline. (Two monuments should be placed on the grid to allow an instrument to be set up for horizontal and vertical control.) A minimum of two permanent monuments should be provided with coordinates, elevations, and construction details identified.

SECTION D. PLANS, DESIGNS, CROSS-SECTIONS AND MAPS

Design Items to be included:

Refer to the accompanying drawing set (under separate cover) for a depiction of the following elements.

a. Compaction of solid waste, thickness of lift.
b. Application of daily cover material, intermediate, final cover.
c. Elevation and grade of final cover.
d. Management of surface water in accordance with Chapter 102.
e. Erosion control in accordance with Chapter 102.
f. Schedule of filling.
g. Site preparations.
h. Monitoring devices.
i. Location and limits of areas previously filled, if applicable.
j. Cross sections indicating the interface details between areas previously filled and areas to be filled, where applicable.
k. Limits of construction defined by grid controls.
l. Borrow areas on-site defined by grid controls/or off site.
m. Location of underground and surface mines on-site. (Indicate extent of mining activity)
n. Cross sections shown on the plans shall be referenced to the grid system for horizontal location and permanent benchmark, whenever applicable.
o. Grades required for proper drainage of lifts.
p. The design plans shall include a cross section of the access roads and all weather roads (with associated drainage system) identifying construction materials, slopes, grades, and distances.
q- Cross sections, grades and/or profiles of diversion ditches, capacities and calculations for ditch volume.
r. A construction schedule shall be submitted by the applicant to the Department in a format established by the Department.
s. Gas Management - location of vents, flares, collection lines, recovery systems, design of system components.
t. Layout of leachate collection and detection pipes.
u. Liner system cross-section.
V. Temporary erosion and sedimentation controls.
w. Soil storage area locations.
x. Location of collection and treatment facilities.
y. Cross section of treatment lagoons and proposed collection facilities.
z. Location of discharge points of treated leachate (requires industrial waste permit).
aa. Cross sections of phases or cells.
bb. Typical cross section showing components of landfill design.
cc. Location of scales for weighing.
dd. Area for isolating detected radioactive waste.
ee. Location of radioactive monitoring equipment.
ff. Location of meteorological equipment.

FOR A LIST OF DRAWINGS, PLEASE REFER TO ATTACHMENT 3-1.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 3
ATTACHMENT 3-1
Summary of Phase II Drawings

FEBRUARY 2018

This page intentionally left blank.

PERMIT DRAWING SET

Sheet No.	Drawing No.	Drawing Title
1		Title - Cover Sheet
2	S1	Existing Site Conditions
3	S2	Proposed Development Plan
4	S3	Subgrade Plan
5A	S4A	Top of Protective Cover Grading Plan and Leachate Detection Piping Plan
5B	S4B	Top of Protective Cover Grading Plan and Leachate Collection Piping Plan
5C	S4C	Leachate Collection/Detection Piping Plan (Enlargement)
5D	S4D	Leachate Collection/Detection Piping Plan (Enlargement)
6	S5	Phase S2-1
7	S6	Phase S2-2
8	S7	Phase S2-3
9	S8	Phase S2-4
10	S9	Phase S2-5
11	S10	Phase S2-6
12	S11	Phase S3-1
13	S12	Phase S3-2
14	S13	Phase S3-3
15	S14	Phase S3-4
16	S15	Final Cover Grading and Drainage Plan
17	X1	Cross Section A-A & B-B
18	X2	Cross Section C-C & D-D
19	X3	Cross Section E-E
20	X4	Cross Section F-F
21	X5	Cross Section G-G
22	X6	Cross Section H-H
23	X7	Cross Section J-J
24	X8	Cross Section K-K
25	X9	Cross Section L-L & M-M
26	X10	Perimeter Sections (Sheet 1 of 2)
27	X11	Perimeter Sections (Sheet 2 of 2)
28	L1	Liner System Details

PERMIT DRAWING SET (CONT.)

Sheet No.	Drawing No.	Drawing Title
29	LC1	Leachate Collection and Detection System Details (Sheet 1 of 3)
30	LC2	Leachate Collection and Detection System Details (Sheet 2 of 3)
31	LC3	Leachate Collection and Detection System Details (Sheet 3 of 3)
32	PH1	Leachate Riser Pump House Details
33	LCS1	Leachate Conveyance and Storage Plan
34	LCS2	Leachate Conveyance Plan and Profile (Sheet 1 of 3)
35	LCS3	Leachate Conveyance Plan and Profile (Sheet 2 of 3)
36	LCS4	Leachate Conveyance Plan and Profile (Sheet 3 of 3)
37	LCS5	Leachate Conveyance Details
38	LCS6	Leachate Storage Plan and Section
39	LCS7	Leachate Storage Details (Sheet 1 of 2)
40	LCS8	Leachate Storage Details (Sheet 2 of 2)
41	SP1	Stockpile S1 Grading and Drainage Plan
42	SP2	Stockpile S2 Grading and Drainage Plan
43	EC1	Stormwater Management Plan
44	EC2	Sedimentation Basin 100 Plan Sections and Details
45	EC3	Sedimentation Basin 200 Plan Sections and Details
46	EC4	Sedimentation Basin 300 Plan Sections and Details
47	EC5	Sedimentation Basin 600 Plan Sections and Details
48	EC6	Sedimentation Basin 800 Plan Sections and Details
49	EC7	Sedimentation Basin 900 Plan Sections and Details
50	EC8	Sedimentation Basin 1400 Plan Sections and Details
51	EC9	Stormwater Management Details (Sheet 1 of 3)
52	EC10	Stormwater Management Details (Sheet 2 of 3)
53	EC11	Stormwater Management Details (Sheet 3 of 3)
54	LFG1	Landfill Gas Management Plan
55	LFG2	Landfill Gas Management Details (Sheet 1 of 2)
56	LFG3	Landfill Gas Management Details (Sheet 2 of 2)
57	FC1	Final Cover Details
58	MD1	Miscellaneous Landfill Details
59	E1	Entrance Facilities Plan and Profile
60	A1	AMD Treatment Facility Plan and Details

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14

OPERATION PLAN – PHASE II

FEBRUARY 2018

This page intentionally left blank.

2540-PM-BWM0011 6/2006

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised **FEBRUARY 2018**
DEP USE ONLY
Date Received

FORM 14
OPERATION PLAN - PHASE II

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 14, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets should match the "date prepared/revised" on this page.

General References: Chapters 273 and 277

SECTION A. SITE IDENTIFIER

Applicant/permittee: **PA WASTE, LLC**

Site Name: **CAMP HOPE RUN LANDFILL**

Facility ID (as issued by DEP): **TBD**

SECTION B. TYPE OF FACILITY

☒ Municipal Waste Landfill ☐ Construction/Demolition Waste Landfill

SECTION C. GENERAL OPERATING DESCRIPTION

Based on the required maps and grids for a facility of this type, describe the:

1. Proposed landfill method and procedures that are to be established and followed for the life of the proposed site. Include daily procedures, inspection and monitoring of incoming waste, and daily closing procedures. **SEE ATTACHMENT 14-1, SECTION C**
2. Sequence of landfilling activity, including the proposed filling schedule. **SEE ATTACHMENT 14-1, SECTION C**
3. Type of landfill activity to be conducted at the proposed site. **SEE ATTACHMENT 14-1, SECTION C**
4. Proposed engineering techniques. **SEE ATTACHMENT 14-1, SECTION C**

SECTION D. SPECIFIC FEATURES

Describe the method and schedule for construction, operation, modification, use, maintenance and removal of the following unless their retention is proposed for postclosure land use:

1. Dams, embankments, ditches and other impoundments that are to be located on the proposed site, and adjacent total property owned by the applicant. **SEE ATTACHMENT 14-1, SECTION D**
2. Borrow pits, soil storage and handling areas and structures that are to be located on the proposed site, total property or adequate properties off-site, **SEE ATTACHMENT 14-1, SECTION D**
3. Scales and weigh stations, if required for municipal waste landfills. **SEE ATTACHMENT 14-1, SECTION D**
4. Water and air pollution control facilities that are in any way related to the proposed facility. **SEE ATTACHMENT 14-1, SECTION D**
5. Erosion control facilities to minimize the discharge of sediment from the proposed permitted site, total property, or associated properties off-site. **SEE ATTACHMENT 14-1, SECTION D**
6. Equipment storage, maintenance, and other buildings. **SEE ATTACHMENT 14-1, SECTION D**
7. Access roads that are to be located on the proposed permitted site, total property or associated properties off-site **SEE ATTACHMENT 14-1, SECTION D**.

SECTION E. PERSONNEL TRAINING

Describe training procedures to be conducted for the handling and disposal of special handling waste.

SEE ATTACHMENT 14-1, SECTION E

SECTION F. CONSTRUCTION SCHEDULE

Describe the construction schedule in relation to the grid coordinate system for signs and markers, For a municipal waste landfill, also describe the sequence of operation relating to the grid coordinate system. Explain where uniform permanent physical markers will be placed, how these physical markers will be maintained and of what materials the markers will be constructed. Further, explain how the proposed disposal area perimeter will be distinguished from the perimeter of the total property. What will be written on the required sign, what will it be constructed of, and where will it be located? **SEE ATTACHMENT 14-1, SECTION F**

SECTION G. SITE PREPARATION

Describe the site preparation plan/schedule for disposal of solid waste at the proposed facility. Include the following:

1. Identify the maximum and average daily weight or volume of waste to be accepted at the proposed site, and a detailed justification of these volumes. **SEE ATTACHMENT 14-1, SECTION G**

2. For a municipal waste landfill, describe the method of compliance relating to measurement of waste. If 30,000 or more cubic yards of solid waste is expected to be accepted in a calendar year by this proposed facility for disposal, it must be weighed. The operator of this scale must be a licensed public weighmaster. Explain how the scale will be inspected and maintained to assure accuracy. If the proposed facility is not required to have a scale, explain how the waste will be accurately measured when it is received at the proposed facility. **SEE ATTACHMENT 14-1, SECTION G**

3. For a demolition/construction waste landfill, describe the method of compliance relating to measurement of waste. Explain how this waste type will be accurately measured by weight or volume prior to unloading. **SEE ATTACHMENT 14-1, SECTION G**

SECTION H. WATER QUALITY PROTECTION

Describe a plan that is consistent with basic limitations relating to operating requirements.

1. Has written approval been given by this Department for background groundwater monitoring? ☒ Yes ☐ No
   If yes, what date ______________________________
   If not, explain.
   SEE ATTACHMENT 14-1, SECTION H

2. Has background groundwater monitoring begun? ☒ Yes ☐ No
   If no, what is the expected date __________________
   If yes, when __________________________**SEE ATTACHMENT 14-1, SECTION H**

3. How will the operator prevent unapproved special handling wastes and/or residual wastes from being accepted and disposed of at the site? How will the operator handle and dispose of approved special handling waste(s), and what specific measures will be taken to prevent exposure to landfill personnel, haulers and others? Explain. **SEE ATTACHMENT 14-1, SECTION H**

4. How will the operator prevent hazardous and explosive wastes, and liquids from being accepted and disposed of at the site?
   SEE ATTACHMENT 14-1, SECTION H

5. Is leachate recirculation planned? ☒ Yes ☐ No
   If yes, explain. **SEE ATTACHMENT 14-1, SECTION H**
   What is ultimate disposition of leachate? **SEE ATTACHMENT 14-1, SECTION H**

SECTION I. OPERATING HOURS

Provide the proposed operating hours of the facility. **SEE ATTACHMENT 14-1, SECTION I**

SECTION J. ACCESS PLAN

Describe the Access Road Plan, including designs, cross sections and specifications. Indicate design load limits, and identify maximum anticipated loading to be encountered.

1. Explain how the access roads and parking and maneuvering areas will be designed, constructed and maintained to prevent erosion and sediment to streams or runoff. **SEE ATTACHMENT 14-1, SECTION J**

2. Will streams or waterways be crossed? ☐ Yes ☒ No

   If yes, explain how the requirements of Chapter 105 will be met.

   Has an application been filed for a Chapter 105 permit? ☐ Yes ☒ No

3. Describe the drainage system for temporary and permanent roads and parking and maneuvering areas to be located at the proposed facility. **SEE ATTACHMENT 14-1, SECTION J**

4. Describe the materials to be used on permanent or temporary roads and parking and maneuvering areas at the proposed facility:

   ☒ paved asphalt

   ☒ gravel

   ☐ cinders

   ☐ other equivalent material - explain:

   Will the grade of any access road be greater than 12% ☐ Yes ☒ No

   If yes, explain.

5. Describe the locations, widths and methods of maintenance for <u>all</u> access roads to be located on the proposed permitted facility, and on the entire property. **SEE ATTACHMENT 14-1, SECTION J**

SECTION K. ACCESS CONTROL PLAN

Describe the Access Control Plan, including:

1. Use and locations of fencing and barriers to control access. Include heights, dimensions and construction materials. Fences are required around impoundments, leachate collection and treatment systems and gas processing facilities, if these facilities have not been included within the site fence. **SEE ATTACHMENT 14-1, SECTION K**

2. Site security provisions. **SEE ATTACHMENT 14-1, SECTION K**

3. Describe the facility sign that will be placed at the junction of each access road and public road. **SEE ATTACHMENT 14-1, SECTION K**

SECTION L. NUISANCE MINIMIZATION AND CONTROL PLAN

Describe the Nuisance Control Plan, and include details regarding the methods by which the operator will perform regular, frequent and comprehensive inspections to evaluate the effectiveness of the plan for Vectors, Odors, Noise, Dust, Litter, and Other Public Nuisances. The plan needs to include the following items:

1. An inventory and map of areas at the facility that has the potential to cause nuisances **SEE ATTACHMENT 14-1, SECTION L**

   - Dominate wind direction
   - Hauling, truck staging, and radiation staging areas
   - Leachate and gas management components
   - Disposal areas, intermediate covered areas, anchor trenches, and trash relocation activities
   - Landfill cell construction, fill and capping sequences
   - Landfill siting and position to nearby residences

2. Description of nuisance related monitoring or response activities **SEE ATTACHMENT 14-1, SECTION L**
   - Organization flow chart with each person's duties and responsibilities with regard to this plan
   - Notification list for the facility and respective agencies
   - A description of how the facility will be operated to eliminate off-site nuisances
     a. Monitoring frequency and locations
     b. Inspections for odorous loads
     c. Monitoring and inspections of the landfill's gas/odors controls
     d. Dust suppression
   - A description of internal and external communication and alarms

3. Describe the facilities meteorological monitoring program **SEE ATTACHMENT 14-1, SECTION L**
   - Meteorological weather station location
   - Data to be collected
   - Activities limited by the weather and the facilities threshold

4. Detailed plan for preventative maintenance and nuisance controls **SEE ATTACHMENT 14-1, SECTION L**
   - Description and location of portable/temporary odor controls
   - Preventative nuisance measures used during the facilities construction
   - Description of the nuisance suppression program and the location of any fixed odor controls
   - Procedures for handling nuisance prone waste
   - Dust minimization plan
   - Employee and contractor training
   - Inspection frequency for odor management equipment
   - Emergency equipment

5. Provide specific countermeasures that will be undertaken by the facility in the event of a nuisance for: **SEE ATTACHMENT 14-1, SECTION L**
   - Dust suppression from hauling, waste placement, or processing activities
   - Odors
   - Vectors
   - Landfill gas detection
   - Litter
   - Litter during windy conditions

6. Provide any additional information as requested by the Department, Host Municipality, or Host County. **N/A**

SECTION M. LITTER CONTROL PLAN

Describe the Litter Control Plan, and explain how the operator will prevent litter from blowing or becoming deposited off-site, including:

1. The types, locations and maintenance procedures for litter fences to be used at the proposed facility. **SEE ATTACHMENT 14-1, SECTION M**
2. The frequency of litter pick up and disposal. **SEE ATTACHMENT 14-1, SECTION M**

SECTION N. SALVAGING

Explain if salvaging will occur on-site during hours of operation and non-operation. If yes, describe the methods of control over salvaging, and how salvaging will occur without interfering in the operation of the landfill. Further, describe the methods for on site movement and storage of salvaged materials, as well as off-site storage and transportation of salvaged materials. **SEE ATTACHMENT 14-1, SECTION N**

SECTION O. AIR QUALITY CONTROL

Describe the methods to control dust, and minimize and control air pollution at the proposed facility from exceeding any ambient air quality standards. **SEE ATTACHMENT 14-1, SECTION O**

SECTION P. WASTE PLACEMENT

1. Initial procedures for placement of waste on the liner system. **SEE ATTACHMENT 14-1, SECTION P**
2. An explanation of the location(s) of unloading area(s) at the proposed facility, and methods by which loaded collection vehicles will be directed to unload promptly at these areas. Waste cannot be unloaded where continuous or intermittent contact would occur with the groundwater table. **SEE ATTACHMENT 14-1, SECTION P**
3. Procedures for and the degree of compaction of solid waste. Describe the number and thickness of lifts, and explain how solid waste will be spread and compacted in layers. **SEE ATTACHMENT 14-1, SECTION P**
4. Describe how the working face will be managed, and:
   (i) compacted and covered on a daily basis for municipal waste landfills, and;
   SEE ATTACHMENT 14-1, SECTION P

   (ii) kept to a size which can easily be compacted for Construction/Demolition waste landfills;
   SEE ATTACHMENT 14-1, SECTION P

   (Iii) how water that contacts the working face will be contained, and not combined, with surface water runoff.
   SEE ATTACHMENT 14-1, SECTION P

SECTION Q. DAILY COVER

For a municipal waste landfill, describe the frequency of placement, composition, design requirements, storage duration and location(s), maintenance(including revegetation and erosion/sedimentation controls),and thickness of approved daily cover to be placed on exposed solid waste at the proposed site. Include a quality assurance plan. **SEE ATTACHMENT 14-1, SECTION Q**

SECTION R. INTERMEDIATE COVER

Describe the frequency of placement, composition, design requirements, storage duration and location(s), maintenance, and thickness of approved intermediate cover to be placed on partial or completed lifts at the proposed site. Explain how slopes, not to exceed 50%, will be maintained, covered, compacted, and revegetated to control erosion and sedimentation. Include a quality assurance plan and identify procedures to establish intermediate elevations. **SEE ATTACHMENT 14-1, SECTION R**

SECTION S. FINAL COVER SCHEDULE

Describe the time period that approved final cover will be placed on the proposed site, the methods by which final cover will be placed, and composition and design requirements, including:

1. A cap (comprised of a uniform and compacted one (1) foot layer of clay or synthetic type material, if approved).
   SEE ATTACHMENT 14-1, SECTION S
2. A drainage layer to prevent erosion and transmit flow of surface water.
   SEE ATTACHMENT 14-1, SECTION S
3. A uniform and compacted layer of soil at least two (2) feet in thickness.
   SEE ATTACHMENT 14-1, SECTION S

SECTION T. FINAL COVER CHARACTERIZATION

Describe the characteristics of final cover, including:

1. physical properties of final cover,
   SEE ATTACHMENT 14-1, SECTION T
2. capability of controlling fires,
   SEE ATTACHMENT 14-1, SECTION T
3. load bearing capacity,
   SEE ATTACHMENT 14-1, SECTION T
4. capability of supporting vegetation,
   SEE ATTACHMENT 14-1, SECTION T
5. prevention of nuisances,
   SEE ATTACHMENT 14-1, SECTION T
6. Include a quality assurance plan, and identify procedures to establish final elevation.
   SEE ATTACHMENT 14-1, SECTION T

SECTION U. FINAL CONFIGURATION

Describe the grade of the final slopes of the proposed facility, detailing design, installation, maintenance, slope stability, erosion control, compaction, seeding, revegetation, percolation rates, and surface runoff.

What will the maximum grade of the final surface be? **33 PERCENT**

What will the average grade of the final surface be? **28 PERCENT (EXCLUDING TOP)**

Are terraces to be used on the final surface? ☒ Yes ☐ No

If yes, describe design, construction, grades and maintenance of the terraces.

SEE ATTACHMENT 14-1, SECTION U

Describe the drainage ditches that will be constructed in each horizontal terrace to convey flow of surface water.

SEE ATTACHMENT 14-1, SECTION U

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
ATTACHMENT 14-1
Narrative Responses

FEBRUARY 2018

This page intentionally left blank.

FORM 14 – OPERATION PLAN – PHASE II

NARRATIVE

This Operation Plan has been prepared by Smith Gardner, Inc. (S+G) on behalf of PA Waste, LLC (PA Waste) in support of a Phase II permit application to site a proposed Municipal Solid Waste (MSW) landfill facility referred to as the Camp Hope Run Landfill. PA Waste proposes to construct and operate the landfill in Boggs Township, Clearfield County, Pennsylvania. The proposed facility is situated on a 2,071-acre parcel of property located approximately 6.5 miles southeast of Clearfield, Pennsylvania along the west side of SR 0153.

This plan has been prepared to address the requirements of the Pennsylvania Municipal Waste Management Regulations regarding the operation of municipal waste landfills (i.e., 25 PA Code 273 Subchapter C).

The organization of this Operation Plan is generally consistent with the Pennsylvania Department of the Environment (PADEP) Form 14, Operation Plan - Phase II.

SECTION C. GENERAL OPERATING DESCRIPTION

C.1 Landfilling Method and Procedures

Form 14, Section C.1. requires descriptions of the proposed landfill method and procedures that are to be established and followed for the life of the proposed site. Include daily procedures, inspection and monitoring of incoming waste, and daily closing procedures.

Proposed landfill method: The area landfilling method will be utilized for the Camp Hope Run Landfill.

Daily operating methods and procedures for collection vehicle receipt and unloading, waste and daily cover placement, inspection and monitoring, waste placement, daily cover, intermediate cover, and stormwater management are generally described as follows:

Collection vehicle receipt and unloading: Collection vehicles entering the site with refuse for disposal will be weighed in on the facility's scale at the site entrance. Vehicles will proceed to the working face and unload their refuse. After unloading, and as necessary, vehicles will proceed through the truck wash prior to weighing out and departing the site. If the facility does not have a stored tare weight for the vehicle, the vehicle will return to the entrance area where they are weighed a second time on the facility's scale. Disposal fees will generally be charged according to the weight of refuse disposed. For loads weighing less than a minimal set value, a fee (not based on weight) will be charged. Small loads may be deposited into roll-off containers located adjacent to the facility's scale. On a daily basis, the roll-off containers will be transported to the working face by landfill personnel and properly disposed.

Waste and daily cover placement: At the working face, the refuse will be spread and compacted in approximate 2-foot thick layers. The working face will be advanced, in an approximate 8-foot thick lift. At the end of each working day or at the end of each 24-hour period, whichever is less, the exposed refuse will be covered with daily cover soil or an approved alternate daily cover (ADC). The cover soil will be obtained from on-site stockpiles and/or borrow areas. More specific details regarding daily cover requirements are provided under **Section Q**.

Special handled material within the former Kauffman surface mine areas ("pods") is planned to be disposed as a waste within lined areas of the proposed landfill operation and will not be used as operational cover, and will be covered at the end of each operating day with suitable daily cover, along with the other MSW.

Inspection and Monitoring: Incoming waste will be inspected and monitored to prevent disposal of non-approved waste and hazardous wastes. Landfill personnel will receive training in waste inspection and monitoring according to the plans identified in **Section E**.

Intermediate cover: Intermediate cover, consisting of a 12-inch thickness of compacted soil, will be placed over the following areas: (i) areas that have been filled to final grades; (ii) the tops of completed lifts; and (iii) areas where no additional waste will be placed for 6 months or longer. More specific details regarding intermediate cover requirements are provided under **Section R.**

Stormwater Management: Throughout the filling of the landfill, measures will be taken to facilitate drainage, thus reducing infiltration, and to reduce the amount of stormwater that contacts waste, thus becoming leachate. The surface of the refuse will be maintained at a slope to drain surface water which has contacted waste away from the outside slopes and will be managed as leachate. In cells where waste has not yet been placed over the entire cell floor, berms will be used to separate clean stormwater from leachate. Geosynthetic rain cover (GRC) may also be used to manage stormwater and segregate rainfall from leachate. After waste has been filled above the level of the perimeter berm, stormwater runoff will be directed from the landfill slopes having adequately revegetated intermediate cover into the perimeter drainage channel, which will convey the runoff to sedimentation ponds. Runoff from intermediate cover may only be diverted as stormwater if there are no leachate break-outs and the cover is adequately revegetated. Access roads will be constructed progressively to maintain all-weather access to the working face.

Permanent markers: Permanent markers will be installed at selected locations around the perimeter of the waste disposal cells. These markers will be used to eventually control the daily operations of the landfill as well as serving a function of secondary references for the construction activities.

C.2 Filling Sequence and Schedule

The sequence of landfilling and the proposed filling schedule are described as follows:

Filling sequence: The proposed filling sequence is illustrated on the design in phases on Drawings S5 through S14.

Filling operations with respect to stormwater management, access roads, and filling schedule are described as follows:

Stormwater Management: While waste in a particular cell is below the top of the perimeter berm, to the extent possible, stormwater will be prevented from contacting protective cover which has not yet received waste through the use of GRC's or similar, approved methods. Stormwater collected on the GRC's will be directed (through gravity or pumping) from the cell into the perimeter drainage channel or other ditches leading to the on-site sedimentation basins. Once the waste in a cell is higher than the top of the perimeter berm, stormwater will be diverted from the slopes at final grade having final intermediate cover using surface water channels/ditches and/or culverts as depicted on the design drawings. Stormwater conveyance structures will be continually added as the elevation of the fill progresses upward.

Access Roads: Initially, the existing access road will be utilized. The access road will be rerouted as filling progresses. The details of access road progression, as well as its cross-section, are illustrated on the design drawings.

Filling Schedule: It is estimated that proposed cells will be filled over a period of years. The estimated filling time and closure capping for each cell is presented in **EXHIBIT 14-1.3**.

C.3 Type of Landfill Activity

Camp Hope Run Landfill is proposing to accept MSW, construction and demolition waste, and select residual waste streams. PA Waste may apply to PADEP for approval to accept other materials including, but not limited to, sewage sludge, ash, generic residual waste, and special handling waste streams.

In addition, PA Waste proposes operating a recycling drop off center. The recycling drop off center will accept certain recyclables as determined by Boggs Township and the recycling market which may, at different times, include, but not be limited to aluminum cans, bimetal cans, HDPE and PET plastic containers, clear glass, and colored glass. In addition, scrap metal including copper, white goods, and steel will be recycled.

C.4 Proposed Engineering Techniques

The following engineering controls will be used during filling of the Camp Hope Run Landfill to provide close correspondence between the design drawings and the actual constructed configuration of the cell and associated waste areas:

- annual topographic aerial or ground surveys; and
- periodic topographic ground survey updates.

C.5 Equipment

The following equipment is anticipated for use at the facility. The actual equipment list may vary from this.

Quantity	Equipment Type	Example Make/Model
1 (minimum)	Trash Compactor	Caterpillar 836 Compactor
2	Bull Dozer	Caterpillar D6H-LGP Dozer or Caterpillar D8 Dozer
1	Front End Loader	Caterpillar 973 Tracked Loader
2	Off Road Dump Truck	Caterpillar 730 Articulated Truck
1 (minimum)	Excavator	Caterpillar 318C Excavator
1	Water Truck	Varies
1	Crusher	Telsmith Hydra - Jaw Crusher

Off-road trucks will be used to transport soil from borrow areas to the working face and/or stockpile areas. Compactors and dozers will be used to spread and compact waste. The dozers will also be used to place cover material at the working face or the stockpile area. The dozer is used to perform clearing, grubbing and road grading.

Daily operations require the full-time use of a compactor, dozers, tracked loader, off road trucks, excavator, and water truck. Operations will be staffed with operators, administrative, and support personnel at a level adequate to operate the facility. It is anticipated that about 20 personnel will be required. Temporary and part-time personnel will be used as needed.

Additional compactors and bulldozers will be added to the site's equipment as a function of waste types/daily tonnage received and hours of operation to adequately place, compact, and cover the waste in accordance with 25 PA Code § 273.216 (unloading and compaction), § 273.232 (daily cover), and § 273.233 (intermediate cover). At the site's currently requested maximum daily tonnage (5,000 TPD) this would result in three (3) compactors and three (3) dozers being required.

SECTION D. SPECIFIC FEATURES

D.1 Dams, Embankments, Ditches, and Impoundments

A general description of the dams, embankments, and impoundments are presented below. The methods and schedules for construction will be detailed in construction specifications. Operation, modification, use, maintenance and removal are discussed where appropriate.

D.1.1 Dams

There are no existing or proposed dams associated with the Camp Hope Run Landfill. Embankments will be constructed to create impoundments used for storm water management detention basins. Embankments are discussed in **Section D.1.2.**

D.1.2 Embankments

The proposed embankments are referred to as berms. Intermediate and inter-cell berms will be used within and between landfill cells primarily to contain waste. A perimeter berm is proposed around the landfill boundary. The perimeter berm provides a physical location/platform for landfill operations and will include the liner system limits/waste boundary, the liner system anchor trench, perimeter access roads, drainage channels, leachate collection/conveyance systems, gas collection and control system, and other infrastructure.

D.1.3 Ditches

Ditches and channels, will be provided as shown on the design drawings for stormwater management and erosion and sediment control. Ditches and channels constructed on areas not yet at final grade will be temporary and will be eventually removed or filled over during operations. Channels constructed on areas at final grade will remain in place permanently.

D.1.4 Impoundments

There are seven (7) proposed detention and/or retention basins for erosion/sediment and stormwater control around the landfill and stockpile areas. These detention/retention basins will be constructed, operated, and maintained throughout the life of the landfill development. The sequence of detention/retention basin development is indicated in the design drawings, along with the inclusion of major temporary sedimentation and stormwater features. Permanent features are indicated on the final cover plans. Provisions for long term operations and maintenance are provided in the closure plans.

D.2 Borrow Areas, Soil Storage, Handling Areas and Structures

D.2.1 Borrow Areas

Borrow soil will be obtained by excavating to proposed subbase grades within proposed disposal cells. The borrow areas will eventually become lined disposal cells. The erosion and sedimentation control plan reflects the handling of sediments from these disturbed areas.

D.2.2 Soil Storage and Handling Areas

Soil handling areas will be at the stockpile area, the active borrow (excavation) area(s) and the active landfill face. Any soil taken from a borrow areas that is not taken straight to the active face, will be taken to the stockpile areas, which will be designated by the landfill manager for each stage of construction consistent with the design drawings. Separate stockpile areas may be established for the topsoil, daily and intermediate cover, and unusable components of the excavated material. Two (2) stockpiles will remain after the closure and post-closure periods (Stockpiles S1 and S2). Stockpiles will be graded and restored with vegetation according to the design drawings, specifications, and closure plans.

D.2.3 Structures

No soil-related structures are planned for this site other than perimeter berms supporting the landfill, basin features, and stockpiles.

D.3 Scales and Weigh Stations

The facility as proposed will include a scale house and two (2) scales. The scale house and at least one (1) scale will be constructed prior to the start of operations. Trucks will be weighed upon entering and, if needed, again when they leave. Incoming waste will be monitored and inspected in conjunction with weighing in. Computer software will be utilized for documentation and record keeping. The scales will be maintained and operated and weigh masters will be licensed in accordance with applicable rules and regulations. The scale house and scales will be removed upon landfill closure.

D.4 Water and Air Pollution Control Facilities

D.4.1 Water Pollution Control

The water pollution control facilities at the Camp Hope Run Landfill will consist of a leachate collection and conveyance system, and leachate storage tanks. An industrial (leachate) wastewater treatment plant (IWTP), permitted, designed and constructed by PA Waste, will be located on the northern portion of the PA Waste property. The collected leachate will be discharged by gravity and pumping from constructed landfill cells to a series of manholes and piping that extend around the perimeter of the disposal area. Leachate collected from the perimeter system will be directed to and stored in enclosed tanks for treatment. The leachate will be pumped to the on-site IWTP for treatment and subsequent discharge.

It is anticipated that the on-site IWTP will discharge treated effluent to Clearfield Creek under a National Pollutant Discharge Elimination System (NPDES) Permit under a separate application. The treatment process and plant design are described generally in **Form 25** of this application.

The leachate collection system will be constructed sequentially through the phases of landfill development. Leachate storage tanks and the leachate treatment facility will be constructed prior to beginning operations. The leachate collection system will be operated and maintained throughout the operational and final closure periods and into the post-closure period.

Surface water controls will also include sedimentation basins that concurrently serve as stormwater control basins, to prevent and reduce siltation and erosion of receiving streams.

D.4.2 Air Pollution Control

The air pollution control facilities will consist of an active gas collection and control system. The system will consist of numerous gas extraction wells, gas collection/conveyance piping, condensate management system, blowers, and at least one (1) flare. PA Waste may decide to contract gas collection and control with a separate firm to collect the landfill gas for reuse by an industrial user.

The gas collection and control system will be constructed, operated, and maintained incrementally throughout the progression of landfill development in accordance with applicable regulations.

Details of the proposed gas management system are presented in **Form K** and related attachments, and on the design drawings.

D.5 Erosion Control Facilities

The erosion and sediment control plan for the proposed landfill development is presented in **Form I** and related attachments and on the design drawings. Temporary erosion and sedimentation controls, such as sediment traps, silt fence, mulching, and diversions, will be installed at the beginning of each construction phase and throughout phased landfill development. Permanent erosion control facilities, such as detention/sedimentation basins, ditches, and other conveyances will be developed throughout landfill construction and operated and maintained throughout the operational, final closure, and post-closure periods.

D.6 Equipment Storage, Maintenance, and Other Buildings

The following storage areas will be provided and/or buildings constructed in conjunction with or prior to starting landfill operations. Storage areas and buildings will be operated, maintained, and modified as needed during the lifetime of the proposed facility. Locations of the buildings are indicated on the design drawings. The proposed storage areas and buildings include:

- Landfill Office and Equipment Maintenance Building - A single structure is planned to serve as the landfill offices and equipment maintenance building;

- Equipment Storage – Outdoor equipment storage areas will be provided as needed throughout landfill operations and will typically be located near or within the active cell, the borrow area, stockpile area, or maintenance building;

- Scale House; and

- Guard Shack/Gate House;

D.7 Access Roads

The proposed major access roads are shown on the design drawings. The proposed access roads will be built in a phased manner to provide ingress and egress to and from the particular cell that is being filled. Once the landfilling activities have been completed, the main access roads will remain in place for post-closure monitoring needs.

SECTION E. PERSONNEL TRAINING

PA Waste personnel will be trained in the inspection and monitoring of incoming waste and in the handling and disposal of special handling waste. Training for inspection and monitoring of incoming waste will include instruction in the identification of unacceptable wastes and will be conducted in accordance with the Waste Acceptance Plan provided in **EXHIBIT 14-1.1**. Training for handling of disposal of special handling waste will be conducted in accordance with the Handling Procedures for Special Handling Wastes and Residual Wastes presented in **EXHIBIT 14-1.2**.

SECTION F. CONSTRUCTION SCHEDULE

The following topics are addressed in this section: (i) survey control, markers, and signs; and (ii) construction schedule and sequence of operations.

Survey Control, Markers, and Signs

There will be a minimum of three (3) permanent physical survey control monuments (benchmarks) located on the landfill property within close proximity to the waste disposal. Permanent survey control monuments will consist of a standard surveyor's monument disc cast in concrete. During the construction phase of each particular cell, a survey crew will go to the work site as needed to stake out the various construction perimeters and control points. The survey crew will return to the site as needed to re-establish the control points if/when they are damaged or lost. Once construction of a cell has been completed, temporary markers will be placed every 200 feet along the perimeter berm. Temporary markers will be 1-inch square, wooden, stakes or equivalent. The stakes will be generally visible to equipment operators at the active face to provide location reference points. The temporary markers, in addition to the perimeter berm itself, will serve to distinguish the disposal area perimeter from the property line. Maintenance of permanent survey control markers and temporary markers will be performed by the site engineer The survey control monuments planned to be located at the Camp Hope Run Landfill are tabulated below.

SURVEY CONTROL MONUMENT SUMMARY

BENCHMARK ID	DESCRIPTION	COORDINATE DATA		
		NORTHING	EASTING	ELEVATION
BM-1	CONCRETE MONUMENT – TO BE ESTABLISHED	277972.14	1793521.81	1768.45
BM-2	CONCRETE MONUMENT – TO BE ESTABLISHED	281698.55	1786161.24	1717.10
BM-3	CONCRETE MONUMENT – TO BE ESTABLISHED	278288.28	1788858.29	1628.00
BM-4	CONCRETE MONUMENT – TO BE ESTABLISHED	1790180.22	1790180.22	1662.00

Signs identifying the site name, address, phone number, operating hours, and permit number will be placed at the site entrance. The signs will be constructed of a durable, weather-resistant material.

Construction Schedule and Sequence of Operations

The general construction schedule and sequence of operations will be as follows.

- In each year that construction will occur, the construction will begin as early in the year as weather permits (usually April).

- Construct Cells S2-1 through S2-5 followed by S3-1 through S3-3 in sequence, as each cell is needed to provide additional disposal capacity.

- Construct final cover in stages as sufficient areas of inactive disposal areas reach final grades.

At the time that this application is being submitted (February 2018), the following sequence and timing of landfill operations is anticipated. The actual timing of the various stages of development will vary depending on waste tonnage and operational considerations.

1. Construction will begin in the westernmost limits of the S2 area (Cell S2-1) and generally proceed in an easterly direction. As these areas are constructed, operational cover material will be obtained from both the S2 and S3 areas. Since the S2 base grades have been designed to avoid zones that are potentially acid forming, no provisions are needed to manage the excavated materials. Surplus material that is permanently stored in on-site stockpiles will have alkaline addition, as a precautionary measure.
2. Concurrently with the start of construction, existing AMD treatment in the southwest portion of the site will be upgraded, as they are currently not functioning as designed.
3. Use of the re-excavated mine spoil from the S3 area will progressively expose the base of the mining operation (i.e. floor of the Lower Kittanning Coal), which approximates "subgrade" in this area of the site. This subgrade will receive a structural fill overlay such that the liner subbase elevations are not only above previously "special handled materials", or "pods" within the mine spoil will be treated as a waste and be disposed within lined landfill areas, whereas non-pod overburden mine spoil that is not considered potentially acid-forming will be used for construction, landfill operation, or stockpiled in one of the two planned (permanent) soil/rock areas.
4. As S3 Area overburden materials are excavated (to be completed by the end of the 10th year of site operations), and the existing South Highwall is exposed, the proposed AMD Highwall Intercept Drain (AMDHID) will be installed in phases to direct any discharge through the South Highwall to the on-site AMD Treatment Area. Similarly, direct runoff and discharge from the S3 Area excavation will be contained through earthen berms within the exposed S3 Area and directed toward the AMD Treatment Area in the Southwest portion of the site.
5. It is anticipated that by the time the S2 Area is completely developed, cell construction will begin in the S3 Area. Similar to Area S2 operations, mine spoil from S3 that is not considered acid-forming will be used in constructing and operating in the S3 Area.
6. As cell development proceeds, soil/rock that is not be used for either construction or landfill operation will be permanently stockpiled on site at one or more of the two (2) identified stockpile areas.
7. The proposed landfill cell sequence and lifetime summary are provided in a table and a corresponding construction schedule is provided for reference in **EXHIBIT 14-1.3.** It is noted that the estimated lifetimes shown are based on assumed average daily weights of waste received

and in-place waste densities. Actual site life may vary if the actual daily unit weights and waste densities are different from those assumed.

SECTION G. SITE PREPARATION

The site preparation plan and schedule for solid waste disposal are illustrated in the cell sequence and lifetime summary table are cell construction and operations schedule provided in **EXHIBIT 14-1.3**.

G.1 Waste Acceptance Rates

The anticipated maximum and average daily waste acceptance rates are:

- Maximum Daily Weight: 5,000 tons; and
- Average Daily Weight: 5,000 tons.

G.2/G.3 Waste Measurement Compliance

The site will have scales, which will be in compliance with the Measures Act of 1965. There will be licensed weigh masters at the site and back up licensed weigh masters on call. The scale will be inspected once per year, as required.

SECTION H. WATER QUALITY PROTECTION

H.1/H.2 A groundwater monitoring system for the site was previously approved by the DEP and included as part of the surface mine permit issued for the Site in 1993, which was renewed in 1998, and remained active until about 2003. This monitoring system included an extensive groundwater monitoring well system installed in multiple aquifers at the site. These monitoring wells, as installed, meet monitoring well installation requirements contained in the municipal waste regulations Section 273.283. This existing, approved groundwater monitoring well system was expanded in 2005, with the redevelopment of the existing well system and the addition of approximately 15 new wells. Background groundwater monitoring of the system started in March of 2005. During the installation of the new monitoring wells the DEP Waste Management geologist visited the site on June 1, 2006 to review the groundwater monitoring system plan and well locations. Groundwater samples from this monitoring well system have been collected quarterly and are submitted in **Form 8** of this application. The groundwater monitoring system will be described in **Form 18** as part of this permit application following review and approval by the Department.

H.3/H.4 Waste Acceptance

Unapproved special handling wastes and/or residual wastes will be prevented from being accepted by conducting operations consistent with the Waste Acceptance Plan provided in **EXHIBIT 14-1.1** and the Handling Procedures for Special Handling Wastes and Residual Wastes presented in **EXHIBIT 14-1.2**. Approved special handling waste will be handled in accordance with the procedures defined in the Handling Procedures for Special Handling Wastes and Residual Wastes. Landfill personnel, haulers, and others will be protected from approved special handling wastes by following the proposed special handling procedures. The operator will prevent hazardous and explosive wastes, and liquids from being accepted and disposed of at the site by following the procedures outlined in the Waste Acceptance Plan provided in **EXHIBIT 14-1.1**.

H.5 Leachate Recirculation

The Camp Hope Run Landfill plans to recirculate leachate within the active areas of the landfill. Refer to **Form 25, ATTACHMENT 25-1** for a description of the proposed leachate recirculation plan.

SECTION I. OPERATING HOURS

Under normal operating conditions the site proposed site will receive waste and be open to the public during the following times:

6:00 a.m. to 4:00 p.m.	**Monday through Friday**
7:00 a.m. to 3:00 p.m.	**Saturday**
Closed	**Sunday**

However, the Site may operate 24 hours per day, 7 days a week to include waste disposal support activities, construction, maintenance, monitoring, operation of landfill environmental management and control systems, and other associated support activities.

SECTION J. ACCESS PLAN

Locations and construction details of proposed access roads are provided on the design drawings. The access roads will be designed to accommodate 80,000 pound loaded refuse transfer trailers. Maximum anticipated loading are approximately 115,000 pounds for fully assembled compaction equipment. However, a load of this magnitude would be infrequent. Details regarding access plans are described as follows.

Access roads, parking areas, and maneuvering areas will be designed with erosion and sediment control measures (i.e. channels, check dams, sediment basins, silt fences, etc.) in accordance with Pennsylvania erosion and sediment control design standards to minimize erosion and sedimentation.

1. There are no stream crossings anticipated.

2. Drainage systems for temporary and permanent roads, parking areas, and maneuvering areas will include, but not be limited to, temporary drainage ditches, permanent drainage ditches, check dams, silt traps, silt fence, and detention/sedimentation basins. Detailed design of the drainage system at each phase in the sequence of landfill development is provided in **Form I** and the design drawings.

3. Permanent access roads and parking areas around the offices will be paved (asphalt). Temporary roads may be either paved asphalt or gravel. There will be no grades greater than 8%.

4. Access roads providing two-way travel will have a minimum width of 22 ft. The method of maintenance for access roads will be periodic repairs using on-site equipment and materials as needed to maintain safe and reliable operating conditions.

5. Utility companies (PA Electric and Columbia Gas Transmission) will continue to have full access to their respective rights-of-way while on PA Waste property, per existing utility easements/agreements.

SECTION K. ACCESS CONTROL PLAN

The access control plan is described as follows.

1. Due to the location of this facility, it is not necessary to completely encompass the site with a fence. Site access will be controlled by a combination of chain link fencing, locked gates, and inaccessible terrain/topography barriers. Six-foot chain-link fence and gates with barbed wire will be installed at the entrance.

2. There is only one gated entrance to the site.

3. Site security will be provided during operations hours by controlled access through the guard shack and/or scalehouse. Site security will be provided after operations hours by security personnel and/or surveillance cameras, as needed.

4. Signs identifying the site name, address, phone number, operating hours, and permit number will be placed at the site entrance. The signs will be constructed of a durable, weather-resistant materials.

Refer to **Exhibit 14-1.4** for a plan location of these controls.

SECTION L. NUISANCE MINIMIZATION AND CONTROL PLAN

1. **An inventory and map of areas at the facility that have the potential to cause nuisances**

   Areas/site features that have the potential to cause nuisances include the following:

   1. LFG from uncontrolled sources within the waste limits;
   2. Uncontrolled leachate from within the waste limits;
   3. Unstabilized soil stockpiles; and
   4. Access roads.

   Refer to **Exhibit 14-1.5** for a plan location of these areas of the site.

- **Dominant wind direction:** The dominant wind direction at the site is from the West - Southwest Refer to **Exhibit 14-1.5**.
- **Hauling, truck staging, and radiation staging areas:** Refer to **Exhibit 14-1.5**.
- **Leachate and gas management components:** Refer to **Exhibit 14-1.5.**
- **Disposal areas, intermediate covered areas, anchor trenches, and trash relocation activities:** Refer to **Exhibit 14-1.5**. No waste relocation activities are planned or anticipated.
- **Landfill cell construction, fill and capping sequences:** Refer to **Exhibit 14-1.5**.
- **Landfill siting and position to nearby residences:** Refer to **Exhibit 14-1.5**.

2. **Description of nuisance related monitoring or response activities**

- **Organization flow chart with each person's duties and responsibilities with regard to this plan:** Refer to **Exhibit 14-1.6**. General duties and responsibilities with regard to the Nuisance Minimization and Control Plan (NMACP) for the site management personnel is summarized below.

Site (Landfill) Manager – The site manager will be notified of all nuisance reports and is ultimately responsible for all monitoring, operational, and prevention/countermeasure implementation at the facility. The landfill manager will encourage all landfill personnel to report any safety hazards, public nuisances, or anything that may pose a threat to public health and environment. He will maintain a log of all reports and any complaints from residents and/or the DEP relative to nuisances. It is the landfill manager's responsibility to take measures to eliminate the nuisance.

Operations Manager – The Operations Manager will be the primary contact for all nuisance monitoring and preventative/countermeasure implementation. Preventative and countermeasure activities associated with the landfill's active face and other operational areas will be directly managed by the Operations Manager and will be performed by site labor/operators/staff as directed by the Operations Manager. All information will be reported directly to the Site Manager.

Compliance Coordinator – The site Compliance Coordinator will be responsible for directly supervising all nuisance monitoring and reporting to the Site Manager.

Maintenance Supervisor – The Maintenance Supervisor will be responsible for nuisance preventative/countermeasure implementation outside of the landfill operational areas and will report directly to the Compliance Coordinator and Operations Manager.

- **Notification list for the facility and respective agencies:**

Landfill Administrative Office:	To Be Determined
Landfill Scalehouse:	To Be Determined
Clearfield Police Department (Local)	814-765-7819
Clearfield Fire Department (Local)	814-765-4861
PA DEP	717-783-2300
PA DEP (North-Central Emergency Number)	570-327-3636

- **A description of how the facility will be operated to eliminate off-site nuisances**

In general, the landfill facility will be operated to prevent conditions that may be harmful to the public health or the environment. The conditions to be controlled include: litter, vectors, odors, dust, noise, landfill gas detections, and unsightliness. The litter control plan calls for the policing of the landfill areas and access roads for litter and debris and the use of litter control fencing. The Landfill Manager will implement the nuisance control plan and follow the guidelines as stated herein. Employee's training will include all aspects of the litter and nuisance control plan. Proper operational procedures and placement of daily or alternate (ADC), intermediate, and final cover according to approved Department thickness will minimize the attraction and breeding of vectors. Inspections by the landfill manager and observations by landfill personnel will determine if additional corrective action is required to control vectors. If deemed necessary, a licensed extermination services will be contracted to curb any vector problem.

A. Monitoring frequency and locations

Refer to **Exhibit 14-1.7, Table 14.1** which summarizes monitoring frequency and locations.

B. Inspections for odorous loads

Refer to **Exhibit 14-1.7, Table 14.1** which summarizes inspections.

C. **Monitoring and inspections of the landfill's gas/odors controls:**

Monitoring of the site's LFG collection and control system is described in **Form K** of this application.

D. **Dust suppression**

Dust suppressants will only be used if all other methods are ineffective.
Refer to **Exhibit 14-1.7, Table 14.1.**

E. **A description of internal and external communication and alarms**

Internal communications at the site will consist of two-way radios or cell phones. External communication will include land-based telephone systems and cell phones.

3. **Describe the facilities meteorological monitoring program:**

Meteorological weather station location

The weather station is located atop an approximately 30-foot high, approved weather station tower. The weather station tower is located at a latitude of 40 55' 47" North (N40.9298) and a longitude of 78 23' 07" West (W78.3852). Refer to **Exhibit 14-1.6**. This location was selected to provide weather data that is relevant to site operating conditions and representative of the entire site. The location also minimizes the interference between weather station and future site operations.

Data to be collected

The Camp Hope Run weather station measures and records wind speed and direction. The station is equipped with a RS-232 bi-directional interface port that allows for onsite data retrieval via a direct connection to a laptop computer (PC). The weather station operates on eight (8) D-Cell alkaline batteries, capable of powering the station up to 2-3 months. The eight (8) D-cell battery pack will be changed every two (2) months, or as necessary. Data is retrieved by a PC equipped with appropriate weather data software corresponding the weather station requirements (Microsoft Access format). Data will be stored daily and will be retrieved and processed on a monthly basis. The weather station device, data logger and power supply is housed in a fabricated enclosure that provides protection from dust, water, sunlight, extreme temperature, and other environmental hazards that may adversely affect the weather station performance or accuracy. Hourly data observations will be used to develop daily and monthly statistics such as average and standard deviation for wind speed and wind direction using methods suggested in the EPA Meteorological Monitoring Guidance for Regulatory Modeling Applications or equivalent meteorological calculation methods. Statistics and raw hourly data will be maintained for use in additional modeling that may be necessary.

Activities limited by the weather and the facilities threshold:

Landfilling operations could potentially be temporarily suspended due to inclement weather. The particular weather conditions thresholds will vary depending on the activities taking place at the site.

4. **Detailed plan for preventative maintenance and nuisance controls:**

Refer to **Exhibit 14-1.7, Table 14.1** which summarizes preventative maintenance and nuisance controls.

- **Description and location of portable/temporary odor controls**

  Refer to **Exhibit 14-1.7, Table 14.1** which summarizes odor controls.

- **Preventative nuisance measures used during the facilities construction:**

  Some examples of preventative nuisance measures used during construction are road watering, stockpile and slope revegetation, equipment mufflers, on-site speed limits, and increased control devices. Refer to **Exhibit 14-1.7, Table 14.1**.

- **Description of the nuisance suppression program and the location of any fixed odor controls**

  Refer to **Exhibit 14-1.7, Table 14.1** which the NMACP. There are currently no plans for fixed odor controls other than the active LFG Collection & Control System.

- **Procedures for handling nuisance prone waste**

  Nuisance-prone waste will be managed according to its specific characteristics. Tarps will be used as needed to minimize litter and blowing debris. Immediate cover soil placement will be implemented for malodorous waste loads or an area will be prepared in the active workface prior to delivery of the waste to the active area. Waste that does not meet the site solids criteria will be rejected. Refer to **Form R** for additional details.

- **Dust minimization Plan:**

  The Operational Plan calls for daily control of mud and dust on the access and landfill roads. The paved portions of the access roads will be routinely cleaned during the day with a sweeper vehicle. A water tank truck will apply water and, if required, Department-approved dust suppressants to the landfill roads to minimize fugitive dust generation. A section of the access road will be large size aggregate and will be used by trucks discharging at the facility, thus reducing the tracking of mud and other debris from the landfill. A speed limit will be imposed on all vehicles on the site. The revegetation of the landfill slopes will minimize dust generation during windy weather. Refer to **Form G(A)** for additional information related to fugitive dust expectations. Refer to **Exhibit 14-1.7, Table 14.1** which summarizes dust minimization and controls.

- **Employee and contractor training**

  Employee and contractor training will include all aspects of the nuisance control plan.

- **Inspection frequency for odor management equipment**

  Refer to **Exhibit 14-1.7, Table 14.1** which summarizes odor minimization and controls.

- **Emergency equipment:**

  Refer to **Form L** for a list of emergency equipment to be provided at the site.

5. **Provide specific countermeasures that will be undertaken by the facility in the event of a nuisance for:**

Dust suppression from hauling, waste placement, or processing activities
Water truck, sweeper, road washing, and dust suppressants are all countermeasures that will be used to prevent dust suppression. Refer to **Exhibit 14-1.7, Table 14.1**.

Odors
Countermeasures that will be used by the facility to prevent odor are cover placement, LFG flares, and odor neutralizers. Refer to **Exhibit 14-1.7, Table 14.1**.

Vectors
Countermeasures to reduce the potential presence of birds and vectors, the landfill will contract with the USDA's Animal Damage Control to conduct periodic surveys of the birds and other similar vectors in the vicinity of the landfill in order to make recommendations for the control of wildlife. By using the USDA'S Survey as a guideline, the site will implement the following steps to further control the birds listed in the survey. Refer to **Exhibit 14-1.7, Table 14.1**.

Landfill gas detection

Areas with LFG detection exceeding the prescribed minimums will immediately follow the steps identified in **Form K**. Refer to **Exhibit 14-1.7, Table 14.1**.

Litter
Refer to Section M below. Also, refer to **Exhibit 14-1.7, Table 14.1**.

Litter during windy conditions
Refer to Section M below. Also, refer to **Exhibit 14-1.7, Table 14.1**.

SECTION M. LITTER CONTROL PLAN

Barriers sufficient to control blowing litter will be positioned downwind from the working face. Barriers will be constructed of mesh, snow fencing or other material. Fixed or mobile litter fencing for these areas will consist of poles surrounding the active cells (generally placed along the downwind side(s) of the working face(s)) to a height of about 15 to 20 feet above grade. Adjustments to this plan (i.e. operational changes, fencing materials and dimensions) will be made based on actual site conditions at the time of the operations to prevent blowing litter from leaving the site. At least weekly, litter will be collected from the fences and other areas in accordance with 25 Pa. Code §273.220. Litter will be collected from the site boundary, roadways, tree lined barriers and other site areas as needed.

The working face will be kept to the smallest size practical to assist in minimizing litter. A compacted waste lift thickness of 8 feet at an initial in-place waste density of 0.5 tons per cubic yard would result in a single active face of about 1 acre in area (about 200' square or other combinations of length and width that result in a 1-acre area). Multiple working faces would be smaller than this, but would have a combined total area of about 1 acre.

SECTION N.   SALVAGING

Salvaging of materials will not be allowed or conducted unless controlled by the operator to prevent interference with prompt and sanitary operations and is conducted so as to prevent a health hazard or nuisance in accordance with 25 PA Code § 273.331.

1. Salvaging operations will occur at the working face as the waste is unloaded. Only site personnel or other properly trained subcontractors will be allowed to work in this area. Materials will be pulled out after they are discharged from the hauling vehicles and initially spread, prior to compaction.

2. Materials planned to be salvaged may include, but are not limited to, wood, tires, concrete, wallboard, metals, and other materials which can be otherwise recycled or reused.

3. Salvaging operations will be conducted at the operator’s sole discretion and may not occur routinely.

4. Salvaged materials will be stored either on the lined area in contained, discrete areas or will be transported and placed into on-site storage containers/boxes located within the facility. Salvaged materials will be prevented from blowing or otherwise moving out of the storage area. Containers will be such that they can be easily handled, will prevent insects and rodents from infesting the contents, will not leak and will effectively contain the materials between collections. Containers will be appropriately labeled as to the general name of the contents (“METAL WASTE”, “WOOD WASTE”, etc.).

5. Unless approved otherwise by the Department, materials will be stored up to one year on site before being removed.

6. As materials accumulate, they will be transported off-site, as markets allow and are practical.

7. Equipment to be used will include a tracked loader, backhoe, and off-road truck, as needed.

8. As needed, measures will be taken to prevent and minimize vectors. If vectors become present, they will be promptly exterminated.

SECTION O.   AIR QUALITY CONTROL

Air quality will be controlled by an active gas management system, which is described in **Form K** and its attachments, and by dust control measures. Dust will be controlled by applying water to access road surfaces and by periodically sweeping paved access routes using site equipment. Burning will be prevented by not accepting any hot loads, by keeping all wastes covered and by inspection to monitor for and prevent fires.

SECTION P.   WASTE PLACEMENT

Procedures and explanations for initial waste placement, waste unloading, waste compaction, surface water management, and working face management are described as follows.

Initial lift: Initial placement of waste on the liner system for the first 8-foot lift will incorporate “Select Waste”; that is, waste not containing any items which could penetrate or puncture the protective cover/underlying geotextile and primary liner and will include primarily bagged, household waste. Any potentially damaging waste will be removed by spotters during this phase of the operation. The compactor will not be run until at least an 8-foot thickness of waste has been spread and inspected. These practices have been demonstrated to adequately protect the liner system during waste placement operations. Prior to waste placement, no pedestrians or vehicles will be permitted on the liner system or protective cover material following certification and department approval of the cell. Weather is not expected to impact the liner due to the free-draining nature and hydraulic capacity of the protective cover material.

Stormwater Management: Prior to the entire cell floor being covered with the first lift of waste, the upgradient portion of the cell, including sideslopes which have not yet received (incremental) protective cover material, may be covered with geosynthetic rain cover (GRC). Stormwater collected on top of the GRC will be directed (by gravity or pumped) from the cell into the perimeter channel or other appropriate site stormwater structures for proper management. At the discretion of landfill personnel, GRCs will be placed over areas of intermediate cover soils (except on final or intermediate areas that slope to the outer, final slopes) and on exposed protective cover/leachate collection material. The expected maximum duration of use at a particular location is approximately three (3) years.

Waste Unloading: The unloading area will be at the toe or crest of the working face in the particular cell area being filled. Signs or attendants will direct vehicles to the unloading area.

Waste Placement and Compaction: Lifts of approximately 8-ft in thickness will be constructed by spreading refuse in approximate 2-ft thick layers. Multiple passes by the landfill compactor will provide compaction.

Working Face: The size of the working face will be limited to no less than the minimum width necessary to accommodate the incoming vehicular loads. Generally speaking, a daily 8-ft thick cell would be no less than 200 ft wide. Water that comes into direct contact with the working face will flow into the refuse and then through the leachate collection system, from where it will be removed and treated. A schematic detail of a typical cell and work face is presented in the Phase II Design Drawings.

Cover Soil Placement: Daily cover will be placed as generally described in **Section Q**. Intermediate cover will consist of a compact and uniform cover of at least 1-foot of soil on the working face and on the top and side slopes of the cells and will be placed as described in **Section R**.

<u>SECTION Q. DAILY COVER</u>

A uniform cover of the approved daily cover material will be placed on exposed solid waste at the end of every working day, or at the end of every 24 hours, whichever interval is less. The daily cover will come from the borrow areas on site and will meet the following performance standards:

- Prevent vectors, odors, blowing litter, and other nuisances;
- Cover solid waste after it is placed without change in its properties and without regard to weather;
- Be capable of allowing loaded vehicles to successfully maneuver over it after placement;
- Be capable of controlling fires; and

- Be consistent with the waste acceptance plan for the facility.

A 5-day supply of cover material will be maintained in close proximity to the work area at all times.

Intermediate slopes constructed during daily landfill operations will not exceed 50% (2H:IV).

Erosion and sedimentation control for disturbed areas will be accomplished via the sedimentation basins, perimeter channel, drainage channels, and other temporary erosion and sediment control measures incorporated in the design.

Daily cover material will have maximum particle size less than 6 inches. This will be achieved on site through the selective use of weathered and/or processed material to limit the amount of over-sized material. As needed, additional processing (crushing, screening) will be employed.

At the time of this application we anticipate seeking PADEP approval for alternative daily cover materials including tarps, foundry sand, and POSI-SHELL, or similar cementatious materials. Additional alternate cover materials may be proposed for Department review and approval.

Quality assurance will be conducted in accordance with requirements of the Quality Assurance Plan for soil materials described in **Form J**.

SECTION R. INTERMEDIATE COVER

Intermediate cover will be placed within seven (7) days of waste disposal on any partial lifts where the operator intends to not place any additional waste for the next six (6) months, any partial or completed lifts that have attained final permitted elevations for that particular portion of the facility, or any completed lifts. Intermediate cover soil must satisfy the following performance standards:

- Prevent vectors, odors, blowing litter, and other nuisances;
- Cover solid waste after it is placed without change in its properties and without regard to weather;
- Be capable of allowing loaded vehicles to successfully maneuver over it after placement;
- Be capable of controlling fires;
- Control infiltration and erosion and sedimentation;
- Support vegetative cover; and
- Be consistent with the waste acceptance plan for the facility.

If soil or soil-like material is used as intermediate cover, it shall be at least 12 inches in thickness and uniformly graded.

A 5-day supply of intermediate cover material will be maintained on the site. Erosion and sedimentation control for areas being excavated for the intermediate cover will be accomplished by the detention/sedimentation basins and drainage ditches as defined in the design drawings. Intermediate slopes will not have slopes greater than 50% (2H:1V).

GRC's will be used on top of intermediate soil cover only where it is necessary to temporarily store runoff (on top of the GRC) and/or prevent infiltration prior to pumping into the on-site stormwater control features.

Intermediate cover material will have maximum particle size less than 6 inches. This will be achieved on site through the selective use of only weathered and/or processed material to limit the potential for over-sized material. As needed, additional processing (screening, crushing, etc.) may need to be employed, in the event that current methods (rake) prove ineffective in limiting over-sized material.

Quality assurance will be conducted in accordance with requirements of the Quality Assurance Plan for soils provided in **Form J**.

SECTION S. FINAL COVER SCHEDULE

The schedule for placement of final cover and capping of the site is summarized in **EXHIBIT 14-1.3**. In general, areas will be capped as final grades are achieved to limit the maximum open area at any one time.

- A (minimum) 40-mil thick textured LLDPE geomembrane cap will be incorporated into the final cover design. Capping will be performed in phases as presented on the sequence (phasing) plans.

- A drainage layer capable of transmitting flow and preventing erosion of the soil layer will be placed over the top of the geomembrane. A geocomposite drainage layer consisting of an HDPE geonet with a nonwoven geotextile heat-bonded to each side will be used.

- A uniform soil layer, two (2) feet in thickness will be placed over the drainage layer. Compaction will be slight to promote the establishment of vegetation.

The design requirements for the 2-foot-thick soil portion of the final cover shall be as follows:

- It will fall within the USDA, Soil Conservation Service textural classes of sandy loam, loam, sandy clay loam, silty clay loam, loamy sand and silt loam.

- At least 40% by weight of the fragments in the soil will be capable of passing through a 2 mm, No. 10 mesh sieve.

The final cover soil will not include rock fragments that are greater than 6 inches in diameter.

The final landfill slopes have been designed to be stable and to shed water without developing erosion and sedimentation problems. The final slopes will have an inclination of 3 horizontal to 1 vertical (3H: 1V) and will have terraces every 25 vertical feet. Terraces will be 15-feet wide, have a minimum slope of 3 percent along the flow line and a back slope of between 5 and 7% perpendicular to the flow line. Each terrace will convey runoff to down-chute drainage channels leading to sedimentation basins.

DEMONSTRATION OF EQUIVALENCY TO INCLUDE BACKSLOPES OF 6.7% AS COMPARED TO 5%

Per §273.234(f): The grade of final slopes shall be designed, installed, and maintained to:

1. Ensure permanent slope stability;

2. Control erosion due to rapid water velocity and other factors;
3. Allow Compaction, seeding and revegetation of cover material placed on the slopes; and
4. Ensure minimal percolation of precipitation and surface runoff into the disposal areas.

Each of these is addressed separately below:

1. Ensure permanent slope stability.
   The stability analyses performed for the site design (**Exhibit 24-8.1)**, included bench backslopes and determined that the final slopes are stable under the conditions and assumptions included in the analysis. Additionally, as presented in calculations, the final cover slopes on 3H:1V are stable and therefore the 7% backslopes on the benches, being substantially flatter than 3H:1V final slopes, particularly over a 15-foot width, are stable. Therefore, it is concluded that the backslopes between 5% and 7% are stable.

2. Control erosion due to rapid water velocity and other factors
   The difference between a 15H:1V (6.7%) and 20H:1V (5%) slope over a bench width of 15 feet is, by inspection, insufficient to create additional surfacewater acceleration to cause any additional erosion due to surfacewater velocity. Therefore the slightly steeper bench backslopes will equally control erosion as compared to the regulatory 5% bench slope.

3. Allow Compaction, seeding and revegetation of cover material placed on the slopes;
   The difference between a 15H:1V and 20H:1V slope over a bench width of 15 feet (a slope change of less than 2%) is, by inspection, insufficient to create difficulties in compaction, seeding and revegetation as compared to the regulatory 5% back slope. Therefore the slightly steeper benches can be equally compacted and revegetated as compared to the regulatory 5% bench slope.

4. Ensure minimal percolation of precipitation and surface runoff into the disposal areas.
   The increased backslope of 7% (about 2% more than the regulatory 5%) will be slightly better at minimizing percolation of precipitation and will provide improved surface runoff due to the slightly increased slope as compared to the regulatory 5% backslope. Therefore the increased slope will ensure minimal percolation of precipitation and surface runoff into the disposal areas.

SECTION T. FINAL COVER CHARACTERIZATION

Characteristics of the final cover are described in **Section S** above. Land surveying will be used to establish final elevations.

SECTION U. FINAL CONFIGURATION

The final landfill configuration including terraces and drainage ditches is described in **Section S** above.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.1
Waste Acceptance Plan

FEBRUARY 2018

This page intentionally left blank.

1. Waste Acceptance Plan

The objective of this Waste Acceptance Plan is to provide guidance to landfill personnel in screening wastes and preventing disposal of hazardous, liquid, explosive, or other waste which the Camp Hope Run landfill is not permitted to receive. This plan is not intended to replace **Form R** (Waste Analysis and Classification Plan) but is to be used by Site Personnel once waste is delivered to the site.

In operating the Camp Hope Run Landfill, every employee has the responsibility of carefully and properly managing wastes. Part of this responsibility is to properly dispose of wastes in a manner that will protect public health/safety and the environment. Employees must be very aware of the special nature of this business and be committed to professional waste management.

Every employee must be constantly alert to prevent hazardous, liquid, explosive, or other unapproved waste from being disposed of at the Camp Hope Run Landfill and certain that special wastes are specifically approved for disposal at the site. Each employee must be able to recognize and identify any questionable waste that arrives at the landfill, and to respond properly.

2. Definitions

a. *Hazardous Waste* - Garbage, refuse or sludge from an industrial or other waste water treatment plant; sludge from a water supply treatment plant or air pollution control facility; and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from municipal, commercial, industrial, institutional, mining, or agricultural operations, and from community activities; or a combination of the above. The term does not include coal refuse as defined in the Coal Refuse Disposal Control Act (52 P.S. SS 30.51-30.101). The term does not include treatment sludges from coal mine drainage treatment plants, disposal of which is being carried on under and in compliance with a valid permit issued under the Clean Streams Laws (35 P.S. SS 691.1-691-1001). The term does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act (33 U.S.C.A. SS 2011-2284). The term includes any material which because of its quantity, concentration or physical, chemical or infectious characteristics may do one of the following:

   (i) Cause or significantly contribute to an increase in morbidity in either an individual or the total population; and

   (ii) Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

b. *Residual Waste* - Garbage, refuse, other discarded material or other waste, including solid, liquid, semi-solid or contained gaseous materials resulting from industrial, mining or agricultural water supply treatment facility, waste water treatment facility or air pollution control facility, if it is not hazardous. The term does not include coal refuse as defined in the Coal Refuse Disposal Control Act (52 P.S. SS 30.51-30.66). The term does not include treatment sludges from coal mine drainage treatment plants, disposal of which is being carried on under and in compliance with a valid permit issued under The Clean Streams Law (35 P.S. SS691.1-691.001).

c. *Special Handling Waste* - Municipal waste that requires the application of special storage, collection, transportation, processing or disposal techniques due to the quantity of material generated or its unique physical, chemical or biological characteristics. The term includes sewage sludge, infectious waste, chemotherapeutic waste and ash residue from a municipal waste incinerator facility.

3. Policies and Procedures

a. Acceptable waste

The Camp Hope Run Landfill will not require special approval for the following wastes:

- municipal waste as defined by 25 PA Code Section 271.1; and
- construction and demolition waste as defined by 25 PA Code Section 271.1.

While not being considered hazardous, most industrially-generated wastes will require special approval - and are considered Residual Wastes. If the PADEP approves a residual waste as suitable for disposal at the Landfill, additional disposal procedures may be appropriate. Your supervisor will inform you if any approved residual waste will arrive at the facility. Special handling instructions will be given, if required.

b. Recognizing and identifying questionable wastes

A crucial part of every employee's job is to be constantly on the lookout for any waste that is questionable and could potentially be hazardous.

Safety is a major concern. Specifically, the safety of:

- you;
- employees;
- customers;
- the environment; and
- the general public.

c. Preventing hazardous wastes from being disposed of at the Camp Hope Run Landfill

Employees should always be on the lookout for questionable or hazardous waste. Questionable wastes can arrive at a landfill anytime, brought by anyone in any size or type of load.

<u>What to look for:</u>

- Vehicle type - vacuum/tank trucks - name on side;
- New customers - ask what they're carrying;
- Warning labels on containers - drums, buckets, cans, boxes, crates;
- Common forms - leaking loads, sludges or semi-solids, powders, liquids of any kind, or oil wastes;
- Containers - boxes, cans, crates, drums - anything that could contain hazardous or questionable waste; and
- Characteristics – unusual odors or other observable/noticeable signs.

d. Proper response if employees identify a questionable waste

<u>At the gate or scale:</u>

1. Don't allow the customer to unload;
2. Obtain driver's name and vehicle license number;
3. Obtain company name, address and location of where the waste came from;
4. Obtain name and telephone number of the company's representative;
5. Direct driver to park in the holding area (across form scale/truckwash); and
6. Contact your supervisor immediately and give him all information.

Note: Do not accept any load with unusual or unfamiliar paperwork. Contact the supervisor immediately and DON'T SIGN ANYTHING.

At the working face or within the facility:

1. Stop them from unloading;
2. Follow the steps listed above;
3. Isolate and secure the immediate area, if necessary;
4. Contain the material with other waste or soil if it is a type of waste that could spread; and
5. Contact your supervisor.

e. Approval process for residual and special handling wastes

Waste other than general household waste, landscape waste, and construction and demolition waste (not containing asbestos), or previously approved wastes require approval by PADEP for disposal. These wastes are any solid or semi-solid material and associated containers generated as a direct result of a manufacturing process or from the removal of contaminants from the air, water or land and will be considered residual and/or special handling wastes. Residual and special handling wastes will be characterized and evaluated in accordance with **Form R** – Waste Analysis and Classification Plan.

Upon approval of the waste material by PADEP and the landfill, a Landfill Waste Code will be assigned to the waste. If the landfill or PADEP does not approve a waste material no Landfill Waste Code will be issued for the waste. The reasons for non-approval of the waste will be communicated to the generator. Waste materials for which no waste code is issued by the laboratory will not be received at the landfill.

Special Waste Manifest: All special wastes that receive approval will require a non-hazardous waste manifest. This manifest is to be completed by the generator and transporter, then sent with the driver of each load. The landfill scale house personnel will then complete the destination section and give the driver a copy. Another copy will go back to the generator to verify final destination. One copy will be permanently filed at the landfill office. No residual or special handling waste will be accepted without a non-hazardous manifest. The final copy of the manifest will be given to the spotter or operator at the working face by the driver prior to unloading.

f. Waste discrepancy/rejected load reports

A waste discrepancy/rejected load report will be completed when:

- A residual or special handling waste arrives without a non-hazardous waste manifest;
- A residual or special handling waste arrives and the waste material does not match the description on the non-hazardous waste manifest;
- A residual or special handling waste arrives and the non-hazardous waste manifest information is not complete or incorrect; and

The Waste Discrepancy/Rejected Load report will be filed at the landfill office.

g. Radioactive wastes

It is the policy of the Camp Hope Run Landfill to prohibit the disposal of any radioactive material, except where specifically allowed by State and Federal Law. Procedures associated with detection of radioactive material are contained in the permit application in **Form X**, Radiation Protection Plan.

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.2
Handling Procedures for Residual and Special Handling Wastes

FEBRUARY 2018

This page intentionally left blank.

EXHIBIT 14-1.2
HANDLING PROCEDURES FOR RESIDUAL AND SPECIAL HANDLING WASTES

The objective of this plan is to outline and communicate handling procedures for residual and special handling wastes. Residual and special handling wastes must be approved for disposal at the Camp Hope Run Landfill in accordance with requirements, procedures, and criteria defined in **Form R** – Waste Analysis and Classification Plan.

Waste Handling Procedures

Wastes will be visually inspected and monitored upon entering the facility and during unloading to verify that the waste is a single homogeneous waste and is comparable to the approved waste sample. Waste inspection reports will be maintained in the facility office. Visual inspection will include noting the color, odor, texture, physical state, and number of phases.

If a waste load fails inspection, the following procedure will be followed:

- The waste will not be unloaded, or if it has been unloaded, it may be reloaded using landfill personnel and equipment at the discretion of the landfill manager.
- If the waste has been unloaded and is not reloaded, it will be kept segregated and the generator will be notified that it must be reloaded.
- Landfill personnel will prepare a rejection notice and notify the generator of the rejection. The generator will be responsible for transporting the waste back to its point of origin.

As there are currently no approved residual or special handling wastes for the Camp Hope Run Landfill, there are no specific special handling procedures defined. Special handling procedures will be established as needed and this plan will be updated upon approval of such wastes.

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.3
Sequence of Operation and Construction

FEBRUARY 2018

This page intentionally left blank.

Cell Sequence and Site Life Summary
Camp Hope Run Landfill
Boggs Township, Clearfield County Pennsylvania

AREA	CELL	LINED LANDFILL AREA (ACRES)	CUMULATIVE LINED CELL AREA (ACRES)	GROSS AIRSPACE (CY)	FINAL COVER AREA (ACRES)	CORRECTED FINAL COVER AREA (ACRES)	FINAL COVER AREA IN PLACE WHEN CELL OPENS (ACRES)	FINAL COVER VOLUME (CY)	NET AIRSPACE (WASTE + DAILY & INTERIM COVER) (CY)	INCREMENTAL CELL LIFE (YEARS)	CUMULATIVE CELL LIFE (YEARS)
AREA S-2	S2-1	25.7	25.7	2,623,938	13.74	14.3	0.0	46,019	2,577,919	**3.2**	**3.2**
	S2-2	20.1	45.8	3,462,779	24.84	25.8	14.3	83,196	3,379,583	**2.1**	**5.3**
	S2-3	11.6	57.4	1,221,947	8.51	8.8	40.0	28,502	1,193,445	**0.6**	**5.9**
	S2-4	18.1	75.5	1,821,133	13.62	14.1	48.9	45,617	1,775,516	**0.9**	**6.9**
	S2-5	41.7	117.2	9,048,712	39.40	40.9	63.0	131,962	8,916,750	**4.7**	**11.5**
	S2-6	14.2	131.3	3,611,747	18.66	19.4	103.9	62,498	3,549,250	**1.9**	**13.4**
S2 Subtotals		**131.3**		**21,790,256**	**118.77**	**123.3**		**397,794**	**21,392,462**	**13.4**	
AREA S-3	S3-1	15.4	146.7	1,364,287	10.99	11.4	123.3	36,809	1,327,478	**0.7**	**14.1**
	S3-2	19.9	166.6	3,259,159	17.79	18.5	134.7	59,584	3,199,576	**1.7**	**15.8**
	S3-3	15.9	182.6	2,533,432	19.18	19.9	153.2	64,239	2,469,193	**1.3**	**17.1**
	S3-4	34.7	217.3	7,933,701	50.57	52.5	173.1	169,373	7,764,328	**4.1**	**21.2**
S3 Subtotals		**86.0**		**15,090,579**	**98.53**	**102.3**		**330,005**	**14,760,575**	**7.7**	
SITE TOTALS		**217.3**	**217.3**	**36,880,835**	**217.3**	**225.6**		**727,799**	**36,153,037**	**21.2**	**21.2**

Notes:
1. Gross Airspace in this table represents the volume between the top of Final Cover and the Top of Protective Cover.
2. Corrected Final Cover area represents the 3-D area.
3. Net Airspace is the volume occupied by waste and operational cover soils (Daily & Intermediate).
4. Estimated Incremental Cell Life is based on the assumptions noted below.

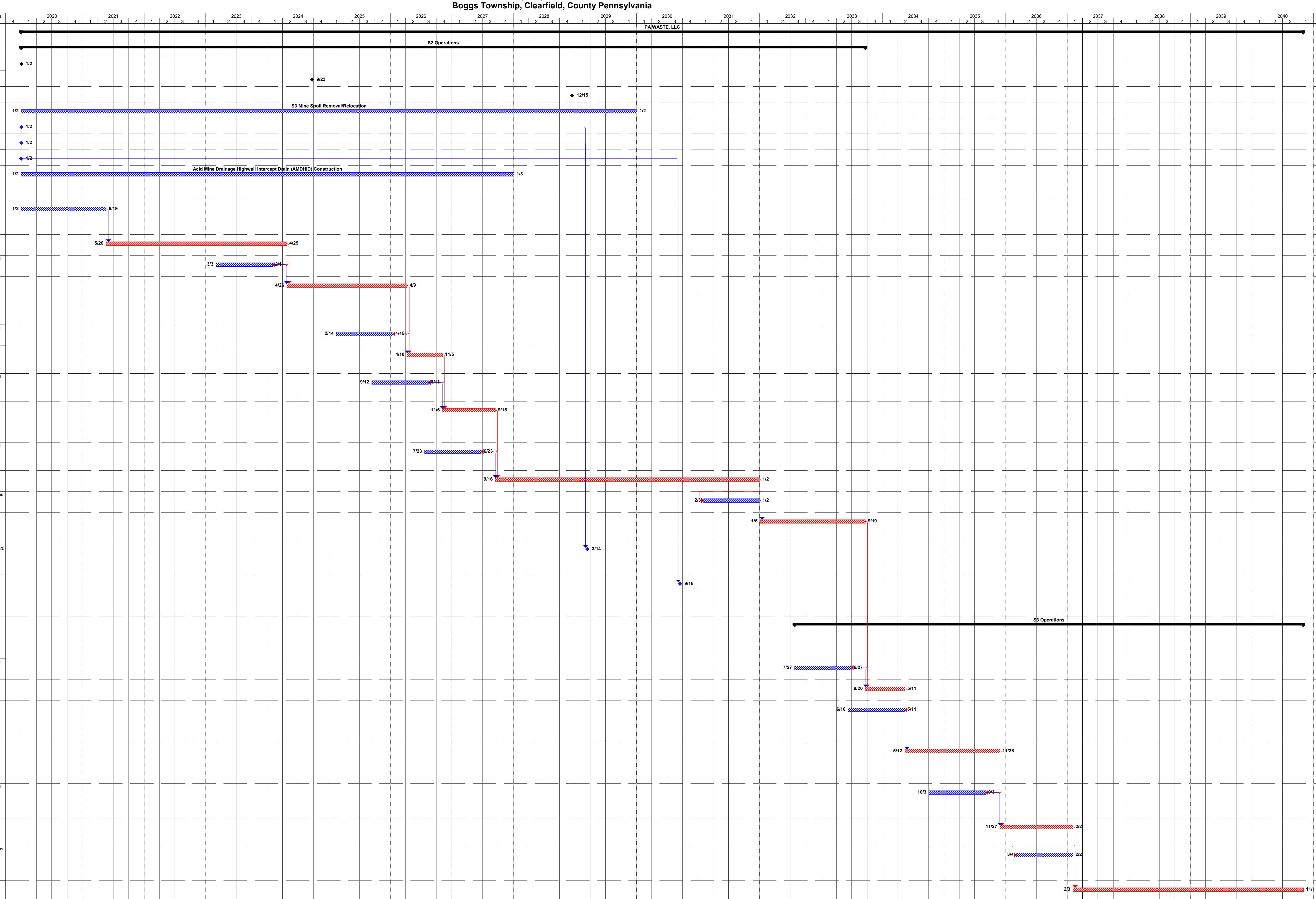
Assumptions:	
Final Cover Thickness (ft)	2.0
Waste Density (Tons/CY)	0.75
Year 1: Average Daily Tonnage (TPD)	1,000
Year 2: Average Daily Tonnage (TPD)	2,000
Year 3: Average Daily Tonnage (TPD)	3,000
Year 4: Average Daily Tonnage (TPD)	4,000
Year 5 Plus: Average Daily Tonnage (TPD)	5,000
Operating Days per week	5.5
Operating Weeks per year	52
Operating Days Year	286

This Page Intentionally Left Blank

REVISED NOV 2014

Exhibit 14-1.3
Construction and Operations Schedule
Camp Hope Run Landfill
Boggs Township, Clearfield, County Pennsylvania

ID	Task Name	Duration	Start	Finish	Predecessors
1	**PA WASTE, LLC**	**5436 days**	**Thu 1/2/20**	**Thu 11/1/40**	
2	**S2 Operations**	**3578 days**	**Thu 1/2/20**	**Mon 9/19/33**	
3	INSTALLATION: Leachate Tank 1	0 days	Thu 1/2/20	Thu 1/2/20	
4	INSTALLATION: Leachate Tank 2	0 days	Mon 9/23/24	Mon 9/23/24	
5	INSTALLATION: Leachate Tank 3	0 days	Fri 12/15/28	Fri 12/15/28	
6	S3 Mine Spoil Removal/Relocation	2610 days	Thu 1/2/20	Wed 1/2/30	
7	START: S3 Mine Spoil Removal/Relocation	0 days	Thu 1/2/20	Thu 1/2/20	
8	START: S1 Placement	0 days	Thu 1/2/20	Thu 1/2/20	
9	START: S2 Placement	0 days	Thu 1/2/20	Thu 1/2/20	
10	Acid Mine Drainage Highwall Intercept Drain (AMDHID) Construction	2088 days	Thu 1/2/20	Mon 1/3/28	
11	Cell S2-1 - Construction	18 mons	Thu 1/2/20	Wed 5/19/21	
12	Cell S2-1 - Operations	38.3 mons	Thu 5/20/21	Thu 4/25/24	11
13	Cell S2-2 - Construction	12 mons	Fri 3/3/23	Thu 2/1/24	12FF-60 days
14	Cell S2-2 - Operations	25.5 mons	Fri 4/26/24	Thu 4/9/26	13,12
15	Cell S2-3 - Construction	12 mons	Fri 2/14/25	Thu 1/15/26	14FF-60 days
16	Cell S2-3 - Operations	7.5 mons	Fri 4/10/26	Thu 11/5/26	15,14
17	Cell S2-4 - Construction	12 mons	Fri 9/12/25	Thu 8/13/26	16FF-60 days
18	Cell S2-4 - Operations	11.2 mons	Fri 11/6/26	Wed 9/15/27	17,16
19	Cell S2-5 - Construction	12 mons	Thu 7/23/26	Wed 6/23/27	18FF-60 days
20	Cell S2-5 - Operations	56.1 mons	Thu 9/16/27	Fri 1/2/32	19,18
21	Cell S2-6 - Construction	12 mons	Mon 2/3/31	Fri 1/2/32	20FS-12 mons
22	Cell S2-6 - Operation	22.3 mons	Mon 1/5/32	Mon 9/19/33	21
23	End Year 10 of Operation	0 days	Wed 3/14/29	Wed 3/14/29	8FS+120 mons,7FS+120 mons
24	FINISH: S2 Placement	0 days	Mon 9/16/30	Mon 9/16/30	9
25	**S3 Operations**	**2158 days**	**Tue 7/27/32**	**Thu 11/1/40**	
26	Cell S3-1 - Construction	12 mons	Tue 7/27/32	Mon 6/27/33	22FF-60 days
27	Cell S3-1 - Operations	8.4 mons	Tue 9/20/33	Thu 5/11/34	26,22
28	Cell S3-2 - Construction	12 mons	Fri 6/10/33	Thu 5/11/34	27FF
29	Cell S3-2 - Operations	20.1 mons	Fri 5/12/34	Mon 11/26/35	28,27
30	Cell S3-3 - Construction	12 mons	Tue 10/3/34	Mon 9/3/35	29FF-60 days
31	Cell S3-3 - Operations	15.5 mons	Tue 11/27/35	Mon 2/2/37	30,29
32	Cell S3-4 - Construction	12 mons	Tue 3/4/36	Mon 2/2/37	31FS-12 mons
33	Cell S3-4 - Operations	48.9 mons	Tue 2/3/37	Thu 11/1/40	31



Project: PA WASTE, LLC
Date: Tue 2/13/18
Exh 14-1.3 CHR Schedule Rev Nov 20

Task | Critical Task | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | External Milestone | Inactive Task | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Progress | Deadline

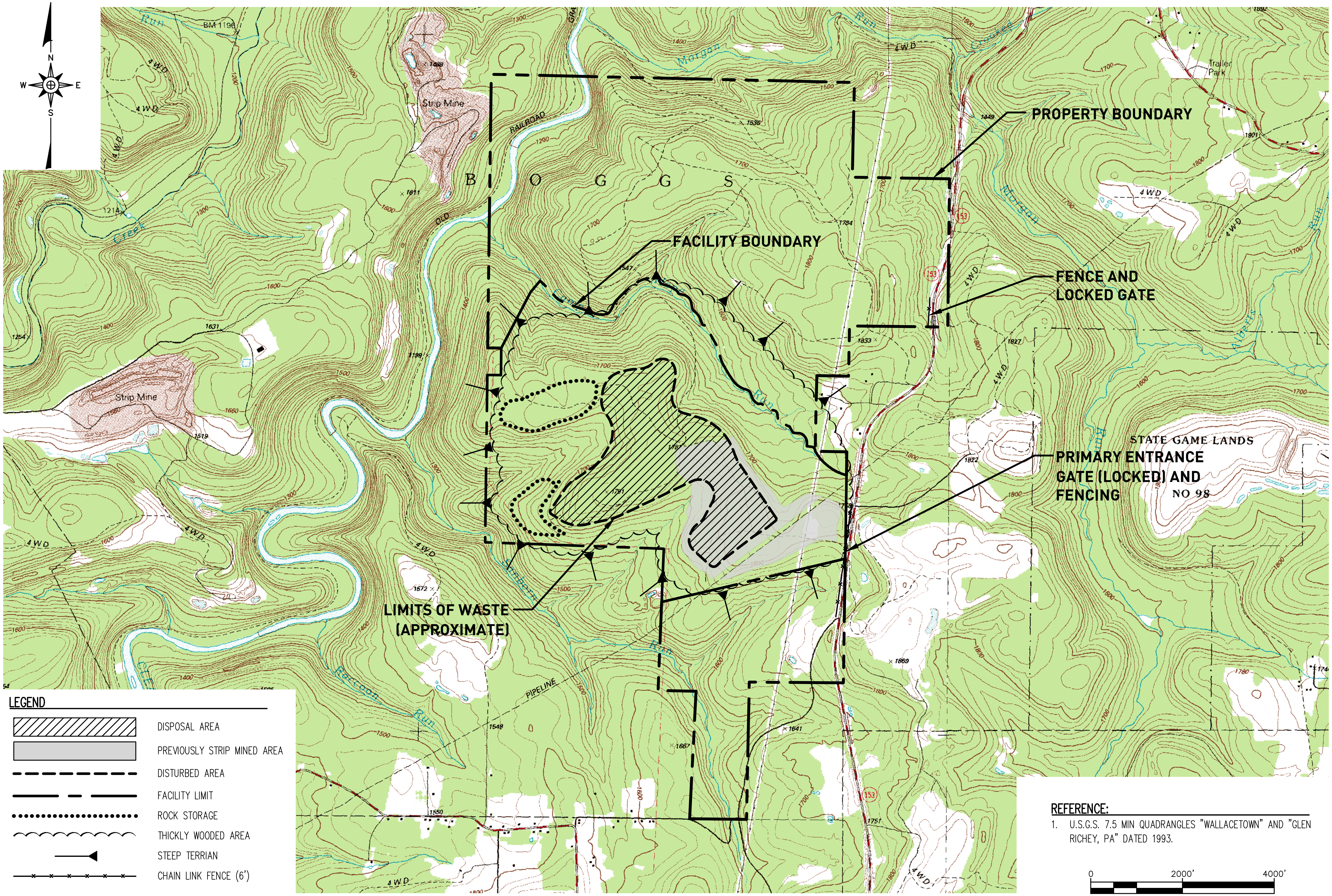
This Page Intentionally Left Blank

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.4
Plan of Access Controls

FEBRUARY 2018

This page intentionally left blank.



G:\CAD\Marshall Miller & Associates\Clearfield\PA Waste 16-1\sheets\PAWASTE-B0075.dwg - 12/22/2017 12:51 PM

PREPARED BY:

SMITH+GARDNER
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

DRAWN:	APPROVED:	SCALE:	FIGURE NO.
C.T.J.	D.M.M.	AS SHOWN	14-1.4
DATE:	PROJECT NO:	FILENAME:	
Dec 2017	PAWASTE 16-1	PAWASTE-B0075	

PREPARED FOR:

PA WASTE, LLC
CAMP HOPE RUN LANDFILL
EXHIBIT 14-1.4
PLAN OF ACCESS CONTROLS

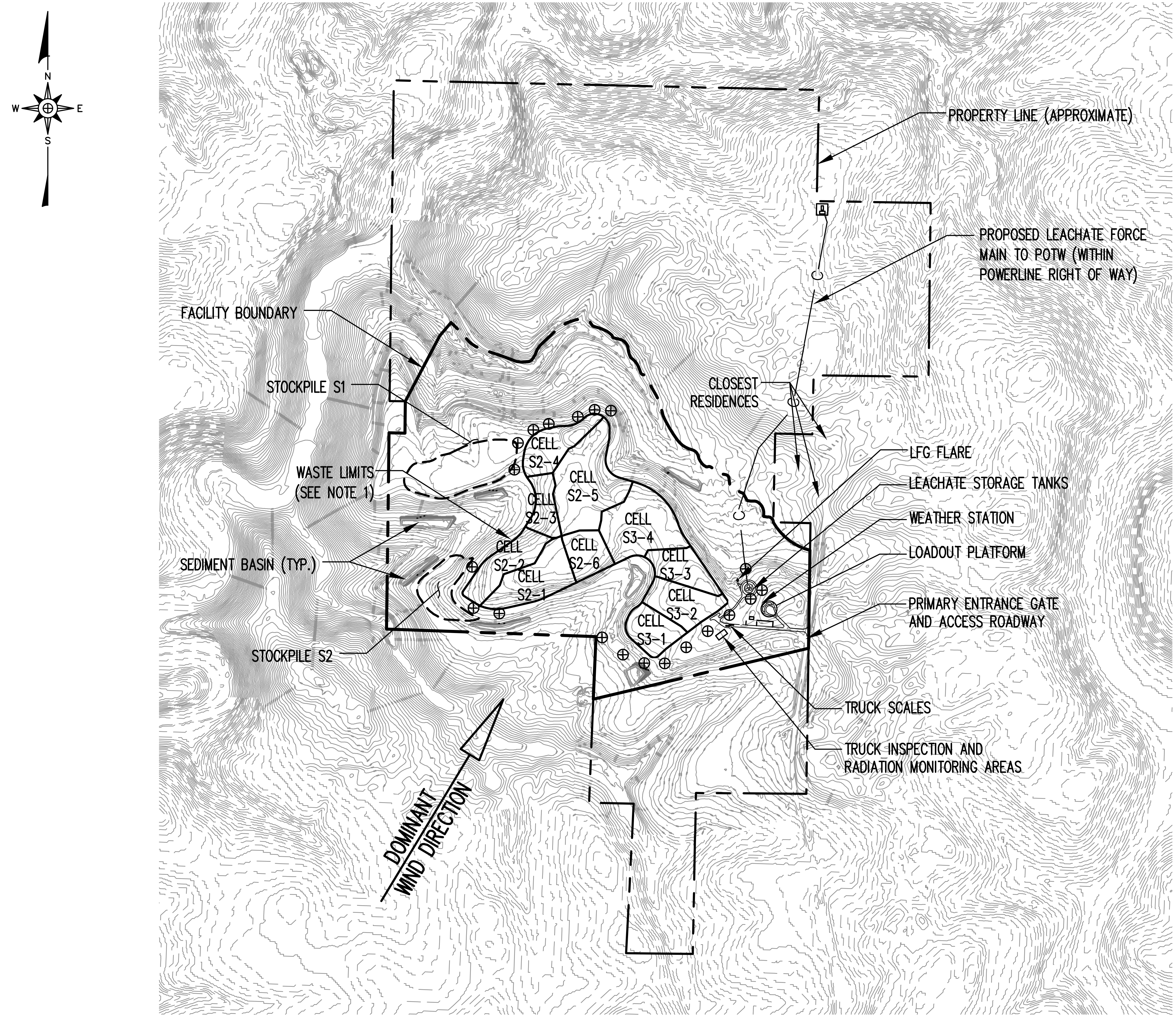
This Page Intentionally Left Blank

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.5
Nuisance Minimization and Control Plan
Potential Nuisance Areas

FEBRUARY 2018

This page intentionally left blank.



LEGEND

⊕ METHANE MONITORING PROBE

NOTES

1. WASTE LIMITS ALSO REPRESENT THE (APPROXIMATE) LIMITS OF INTERMEDIATE COVER SOIL AND THE ANCHOR TRENCH.
2. LANDFILL CELL CONSTRUCTION, FILLING, AND CAPPING SEQUENCE GENERALLY FOLLOWS THE CELL ORDER, BEGINNING IN CELL S2-1 THROUGH S3-3.
3. NO WASTE RELOCATION IS PLANNED, HOWEVER PREVIOUSLY PLACED MINE SPOIL WILL BE EXCAVATED AND USED FOR COVER AND/OR STOCKPILED.

REFERENCES

1. DIGITAL TOPOGRAPHY FOR THE SITE WAS COMPILED FROM AERIAL PHOTOGRAPHY OBTAINED ON DECEMBER 20, 2004, BY MAPMAKER PHOTOGRAMMETRIC SERVICES, ST. ALBANS, VERMONT.
2. TOPOGRAPHY AUGMENTED WITH TOPOGRAPHIC AND CULTURAL INFORMATION FROM U.S.G.S. 7.5 MINUTE GLEN RICHEY (1993) AND WALLACETON (1993) PA QUADRANGLE MAPS.

0 2000' 4000'

PREPARED FOR:

EXHIBIT 14-1.5
NUISANCE AND MINIMIZATION CONTROL PLAN
POTENTIAL NUISANCE AREAS

DRAWN:	APPROVED:	SCALE:	FIGURE NO.
C.T.J.	D.M.M.	AS SHOWN	14-1.5

DATE:	PROJECT NO:	FILENAME:
DEC. 2017	PAWASTE 16-1	PAWASTE-B0074

PREPARED BY:

SMITH+GARDNER
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

G:\CAD\Marshall Miller & Associates\Clearfield\PA Waste 16-1\sheets\PAWASTE-B0074.dwg - 12/22/2017 12:07 PM

This Page Intentionally Left Blank

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.6
Organizational Flow Chart

FEBRUARY 2018

This page intentionally left blank.

ORGANIZATIONAL FLOW CHART
CAMP HOPE RUN LANDFILL

NUISANCE MONITORING
AND RESPONSE ACTIVITIES

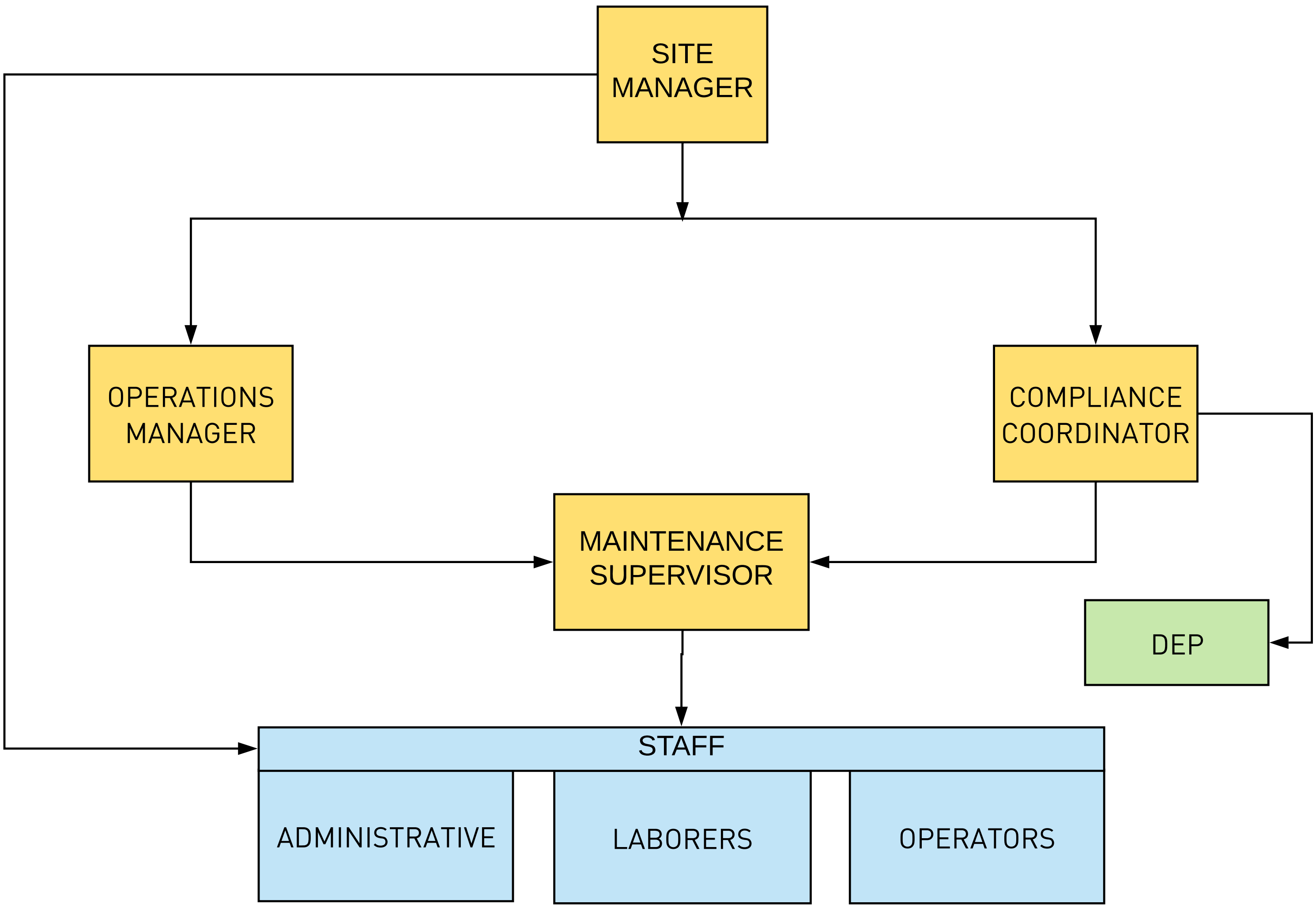


EXHIBIT 14-1.6

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
EXHIBIT 14-1.7
Nuisance Minimization and Control Plan Summary

FEBRUARY 2018

This page intentionally left blank.

EXHIBIT 14-1.7
TABLE 14.1

Nuisance Minimization and Control Plan Summary

Potential Nuisance	Monitoring Methods/Program	Monitoring Frequency/Location(s)	Operational Methods to Eliminate/Control Nuisances	Preventative Measures/Controls During Construction	Countermeasures	Permit Application References
Odor	❖ Visual Inspections/site walk-over ❖ Local public awareness	❖ Daily/Perimeter and public road ways ❖ Daily/scalehouse	❖ Cover soil application ❖ LFG flares (Portable and stationary) ❖ Leachate seep control ❖ Waste load inspection	❖ Odor Nuisances during construction are not anticipated	❖ Cover placement ❖ LFG flares (Temporary and permanent) ❖ Odor neutralizers (As needed)	❖ Form 14 (Operations) ❖ Form F (Soils) ❖ Form K (Gas/odor management) ❖ Form 3 (Permit drawings)
Dust	❖ Visual Inspections/walk-over ❖ Dustfall monitors (As needed)	❖ Daily/facility perimeter	❖ Road watering ❖ Paving with sweeping	❖ Road watering ❖ Stockpile and slope revegetation ❖ Dust suppressants (As needed)	❖ Water application ❖ Rip rap construction entrance ❖ Dust suppressants (As needed)	❖ Form G (A) ❖ Form 54
Mud	❖ Visual Inspections/walk-over ❖ Dustfall monitors ❖ Access road drive-by	❖ Daily/facility perimeter ❖ Daily/access route to site	❖ Road watering/sweeping ❖ Motor grader - road scraping	❖ Road watering ❖ Stockpile and slope revegetation ❖ Motor grader	❖ Water application ❖ Rip rap construction entrance ❖ Dust suppressants (As needed)	❖ Form G (A) ❖ Form 54
Vectors	❖ Visual Inspections	❖ Daily/active area perimeter	❖ Cover soil placement ❖ Litter control ❖ Waste load inspection	❖ Vector Nuisances during construction not anticipated - no waste relocation is planned	❖ Cover soil placement ❖ Licensed extermination services (As needed) ❖ Litter pick-up	❖ Form 14
Litter	❖ Visual Inspections	❖ Daily/Active area perimeter and access roads leading to site	❖ Cover soil placement ❖ Leachate spray application at working face ❖ Limited operations in excessive wind	❖ Litter nuisances during construction not anticipated	❖ Litter fence ❖ Litter pickers ❖ Tarps ❖ Cover soil ❖ Limited operations	❖ Form 14
Noise	❖ Observation/inspections ❖ Local public awareness	❖ Daily/landfill perimeter and approach roads	❖ Equipment (Mufflers) ❖ On-site speed limits ❖ Hours on operation ❖ Sequence of operations	❖ Equipment (Mufflers) ❖ On-site speed limits ❖ Hours on operation	❖ On-site speed limits ❖ Hours on operation	❖ Form 14
Traffic	❖ Daily tonnage limits ❖ Route compliance ❖ Traffic flow and signage ❖ Record keeping	❖ Daily inspection/site roadways and access route ❖ Random inspections/on-site inspection station	❖ Daily inspection/site roadways and access route ❖ Random inspections/on-site inspection station	❖ Daily inspection/site roadways and access route	❖ Modified hours of gate reciepts ❖ Additional restrictions/limits	❖ Form 14 ❖ Form D
Runoff	❖ Observation and inspections ❖ Sampling and reporting	❖ Daily/site discharge points ❖ Weekly inspections ❖ Inspections following each reportable rain event	❖ Increased control devices (Diversions, detention structures, etc.) ❖ Stabilization	❖ Increased control devices (Diversions, detention structures, etc.) ❖ Stabilization	❖ Increased control devices (Diversions, detention structures, etc.) ❖ Stabilization	❖ Form I ❖ Form L ❖ Form 14
Leachate	❖ Inspections ❖ Testing	❖ Daily/workface ❖ Daily/intermediate and final slopes ❖ Daily/leachate management system	❖ Cover application and capping ❖ Leachate management system maintenance	❖ Leachate Nuisances during construction is not anticipated	❖ Cover application and capping ❖ Leachate management system maintenance	❖ Form 25 ❖ Form 14

(FEBRUARY 2018)

This Page Intentionally Left Blank

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM 14
ATTACHMENT 14-2
Mining Special Material Handling Plan

FEBRUARY 2018

This page intentionally left blank.

MATERIAL HANDLING PLAN

1.0 INTRODUCTION

The following is the Material Handling Plan for managing excavated materials from within the S2 and S3 areas of the Camp Hope Run Landfill. A description of the soil and rock materials to be encountered in these areas is described in detail in **Form F** and **Form J.** Some of this information is repeated below for use in developing this proposed plan.

S2 Area
The base grade (i.e. liner subbase) elevations in the S2 area are designed to avoid contact with potentially acid-forming geologic formations; including the lowest (sump) areas within each cell. Base grades were determined through continuous overburden analyses (sampled every foot of drill depth) conducted by Meiser & Earl, Inc. (M&E) on five (5) wells installed in the S2 Area, in concert with overburden analyses conducted during the previous Kauffman mining operation (at 10 drill locations). These results were then used to define geologic "interval" depths where $S_{total} > 0.5\%$. A DEP-recommended method (Theissen Polygon method) was then used to establish the 2-dimensional areas of influence of these vertical intervals and from those depths/areas, the S2 base grades were established.

More specifically, the Theissen Polygon method is used in strip mine settings where the bottom of the excavation is one continuous planar surface, such as the underclay beneath the mined coal. In the case of the S2 Area, the bottom of the excavation is the subbase elevation for the landfill and may have several intersecting planes in one polygon. M&E and Smith Gardner, Inc. conservatively assumed that the lowest subbase elevation has to be above the highest zone with greater than 0.5 percent (total) sulfur everywhere within that polygon.

Consequently, the S2 excavations/subbase grades, based on 15 overburden analyses over the (approximate) 130-acre area, are configured to avoid materials that have an acid potential. The excavated materials where $S_{total} < 0.5\%$ are planned to be used for operational cover and/or structural fill. However, the exception to this is where there is "surplus" excavated material from within S2, primarily due to oversized material that is not processed. These materials will be permanently stockpiled in the S2 Stockpile and treated with alkaline material at a rate of 6 Tons alkaline/1,000 Tons material[1].

Additionally, surface water runoff from the permanent S2 Stockpile will be collected and treated, if necessary, prior to discharge to natural surface waters. If treatment is necessary, the surface water will be collected and transferred (pumped) to the AMD Treatment area in the southwest area of the site, adjacent to Cell S3-1, for treatment and discharge.

S3 Area
The subbase grades within S3 are (previously mined/reclaimed area) to be:

1.) Located entirely above the base of the Lower Kittanning (LK) Coal strip mine floor; and
2.) Located entirely above the LK highest composite potentiometric groundwater surface contours, as presented in **Form 6**.

---

[1] 6 Tons/1,000 Tons means 6 tons of $CaCO_3$ equivalent of alkaline material per 1,000 tons of excavated S2 material.

The S3 (subgrade) excavation will re-excavate and remove all of the reclaimed mine spoil from the former Kauffman mine pit between the North and South highwalls. The plan is to begin removing overburden from the west side of S3 and proceed eastward so that the South Highwall Intercept system can be installed from low-to-high and directly feed the proposed AMD treatment system planned to be located just north/west of Cell S3-1. The S3 material consists of: A.) Pods: All material with a total sulfur analysis equal to or greater than 1% that was previously special handled involved encapsulating the high sulfur strata within "pods" comprised of layered special handled material, clay and alkaline material; and B.) Overburden: consisting of the weathered rock and rock materials that were removed from above the (Lower Kittanning) coal in order to mine it, which were then placed back into the mine "pit" to achieve the approximate original contours that currently exist within the mine area at the site.

Former Kauffman mine floor materials (estimated to include LK Coal binder layers and "LK Coal "bottom split" coal) which were previously planned to be removed and treated as "pod" material, are now planned to be left in place, since the revised design will subsequently cover these materials with structural fill and an overlying composite liner system as part of the phased landfill development.

A. All previously special handled "pod" material encountered within S3 will be disposed within the lined landfill cells as a "waste", and will not be used as operational cover, although it will not be weighed or counted toward the site's daily tonnage. When the pod material is placed, it will be covered daily along with the MSW waste.

B. Overburden (i.e. non-pod) material re-excavated from S3 is planned to be used in three (3) different areas of the development: operational cover within lined areas; structural fill beneath lined (i.e. non-exposed) areas, and permanent stockpile material due to oversized materials that are not processed for size reduction. Based on an analysis conducted by M&E in 2014 it was determined that the alkaline material previously added to the S3 non-pod material (in former mining Phase VI) is in excess of what is required to neutralize the potential acidity, resulting in a Net Neutralization Potential of 3.7 tons/thousand tons prior to any landfill alkaline additions. The other portions of the S3 Area (in former mining Phase V) did not require any alkaline addition due to the natural alkaline materials encountered (i.e. limestone). M&E assumed that the potential acidity in the Phase V area is balanced as a conservative approach (the acidity may actually be more than balanced by the natural alkaline material).

   The planned alkaline addition for these three uses is described below.

   1. <u>As operational cover material</u> – There is no alkaline addition planned since these materials likely have an "excess" alkalinity and are being disposed within lined areas of the landfill.

   2. <u>As Structural fill beneath lined areas</u> - Alkaline material will be added to the re-excavated, non-pod mine spoil during landfill construction at the rate of 6 tons alkaline material per thousand tons of overburden, and will only be placed as structural fill (i.e. controlled, compacted fill) in areas that will be directly beneath the proposed landfill liner system.

   3. <u>As permanent stockpile material</u> - Alkaline material will be added to the re-excavated, non-pod mine spoil that is not processed (i.e. reduced in size) during landfill development, at the rate of 6 tons alkaline material per thousand tons of overburden. Oversized material that is not processed for use will be stockpiled in the S1 Stockpile. Surface water runoff from the permanent S1 Stockpile will be collected and treated, as necessary, prior to discharge. If treatment is necessary, this surface water will be collected and transferred (pumped) to the AMD Treatment area in the Southwest area of the site, adjacent to Cell S3-1, for treatment and discharge.

A summary of this proposed plan for managing the excavated materials is as follows:

Placement of Material	S2 Area - Excavated Material				S3 Area - Non Pod Spoil Material		
	Total Application	Distribution Equivalent (1)			Total Application	Distribution Equivalent (1)	
		Beneath Material	Placed On Material In Haul Truck			Beneath Material	Placed On Material In Haul Truck
Cover Material (<6" Fragments)	None	None	None		None	None	None
Structure Fill (<12" Fragments)	None	None	None		6T/1000T	2T/1000T	4T/1000T
Permanent Stockpiles S1 and S2	6T/1000T	2T/1000T	4T/1000T		6T/1000T	2T/1000T	4T/1000T

NOTE: T = Ton

6T/1000T = 6 tons of CaCO3 equivalent of alkaline material per 1000 tons of excavated (spoil) material

All Pod material in S3 area will be placed in the lined landfill as waste material

(1) Additional alkaline material (agricultural lime) will be placed on the final cover soil based on vegetative growth requirements.

2.0 IDENTIFICATION OF POD MATERIAL – S3 AREA

Upon achieving base grades in S2 and construction of the first lined landfill cell – (S2-1), excavation in S3 will be initiated. During excavation of S3, previously special handled material placed in S3 will be encountered. Sulfur-bearing material in S3 includes the constructed pods as well as the LK bottom split and underlying binders/shales corresponding to the old strip mine pit floor.

Within S3, materials previously placed within the pods should be easily identifiable in the field given the high contrast in color, layered construction features of the pods, and their linear nature. They have been described as dark gray or black material placed into 74 pods measuring about 200'x75'x6' each comprised of alternating layers (bottom to top) of dark gray to black shaley materials (these are expected to be primarily finer materials), alkaline material (again, fine-grained and white to light gray) and a layer of clay (fine-grained, red to brown). Each pod was constructed in two (2) to three (3) cycles of these layers. Therefore, it is expected that these "pods" will stand-out in contrast to the surrounding overburden materials which were randomly placed and will be a more heterogeneous mixture of various colored and sized material.

The remaining (not previously mined) sulfur-bearing strata in S3 include the LK coal bottom split and underlying binders/shale. These sulfur-bearing strata represent the former surface mine's pit floor, which will be easily identifiable during excavation activities. Alkaline material was also placed on top of the surface mine pit floor prior to backfilling. These combined features and the contrast in disturbed versus in place rock will provide an easily identifiable marker horizon during excavation.

3.0 EXCAVATION – S2 AND S3 AREAS

Encountering potentially acid-forming strata within S2 is not expected. These strata will be excavated using standard rock excavation techniques and equipment.

Upon the completion of the landfill's initial cell (S2-1), excavation of the pod-containing area of S3 will commence in successive north-south strips (or block cuts), beginning at the West side and progressing to the East. The excavation floor will drain toward the North and West and be contained by earthen berms. Collected runoff will be directed to the on-site AMD Treatment Facility. These temporary diversion berms will be constructed to prevent any runoff from leaving the excavation area and to direct it to the treatment area.

In general, the pod material within a given block cut will be excavated from south to north. Then pod removal will continue with the next block cut to the East.

The visually identified sulfur-bearing material contained in the constructed pods will be selectively excavated and loaded directly into trucks, keeping it segregated from the non-sulfur-bearing mine spoil. The pod material will be hauled to and disposed in the active, lined landfill cell and covered at the end of each day's work. When appropriate grades are achieved, the proposed AMD Highwall Interceptor Drain (AMDHID) will be constructed along the South Highwall. All pods and sulfur-bearing materials will be excavated from S3 within the first 10 years of landfill operations (refer to Timing/Schedule section).

In general, when previously mentioned preparations have been completed, the pods will be excavated to their full extent and hauled to the active lined landfill areas in such a manner that partial pods will not be left exposed at the end of each day's work. However, as a contingency, and in the event that site conditions and sequencing of landfill construction may not allow for the complete excavation of a pod, protective procedures will be employed, including but not limited to placing compacted soil overburden or geosynthetic rain cover on the exposed face(s) of the unexcavated pod to limit exposure of the pod until the next days' operation.

4.0 HAULING AND PLACEMENT

4.1 HAULING/PLACEMENT OF POD MATERIAL

Pod materials encountered during S3 construction will be loaded and transported to the active landfill cell for subsequent disposal within the cell. The material will be loaded onto rock trucks using standard rock excavation/loading equipment and immediately transported to the active cell and placed within the cell either directly or in a controlled stockpile area within the lined, active cell area.

4.2 HAULING/PLACEMENT OF NON-POD MATERIAL

Non-Pod materials encountered during both S2 and S3 construction will be loaded and transported to the either the active landfill cell for subsequent disposal, to stockpile areas, or for use as structural fill in constructing cell areas. The material will be loaded onto rock trucks using standard rock excavation/loading equipment. As presented in the summary table above, when non-pod materials are to have alkaline addition, the alkaline materials will be added into the haul trucks at the rates shown above (4 Tons Alkaline per 1,000 Tons material) and transported to their final destination. In stockpile or structural fill areas, alkaline material will also be added to the surface beneath these areas at a rate of 2 Tons Alkaline material to 1,000 Tons material.

5.0 CONTACT WATER MANAGEMENT

Stormwater within excavations containing pod material will be considered contact water. Contact water will be directed to the on-site AMD Treatment facility. Where needed, soil berms will be constructed to contain contact water within excavated areas.

Groundwater/ponded water and direct rainfall within the mine spoil in S3 will be treated as contact water and will also be controlled and diverted to proposed containment areas and treatment areas.

6.0 TIMING/SCHEDULE FOR POD/OVERBURDEN RELOCATION

As evaluated by the DEP during their Environmental Assessment Analysis (Redevelopment of Impacted Mine Lands), the proposed elimination (collection/treatment) of historic Acid Mine Drainage (AMD) and resultant elimination of the ongoing AMD discharges collectively minimize impacts from historic mining activities on the property. These environmental benefits were acknowledged as long as the impacts could be minimized within the initial ten (10) years of landfill operations. Consequently, the S3 pod materials and overburden will be removed from the S3 area by the end of the 10^{th} year of operations.

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(A)

AIR RESOURCES PROTECTION
DUST EMISSIONS ESTIMATE AND CONTROL PLAN

FEBRUARY 2018

This page intentionally left blank.

2540-FM-BWM0391a Rev. 10/2016

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised
FEBRUARY 2018
DEP USE ONLY
Date Received

FORM G (A)
AIR RESOURCES PROTECTION DUST EMISSIONS ESTIMATE AND CONTROL PLAN

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form G(A), reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General Reference: Pa Code 121.7, 123.1(c), 123.2, 131.2, 131.3, 273.217, 277.217, 279.218, 281.217, 288.217, 289.227, 293.218, 295.217, 297.218

CHECK TYPE OF FACILITY and whether ☒ NEW or ☐ EXISTING / EXPANSION Facility

Municipal (☒) / Residual (☐) Waste Landfill

Construction/Demolition Waste Landfill.......... ☐ If existing: Permit # ______

Composting Facility .... ☐

Demonstration Facility .... ☐ Proposed Waste through put in tons/day 5,000

Incinerator or Resource Recovery Facility ..... ☐ Proposed operating schedule:

Oil and Gas Wastewater Storage Impoundment.. ☐ Proposed operating schedule:

Other Municipal (☐) / Residual (☐) Waste Processing Facility 286 (OD) days/yr Mon.-Fri.: 06:00 to 20:00

Facility (Describe) ______ Sat.-Sun.: 06:00 to 15:00

Total: 3874 (OH) (hr./yr.)

INSTRUCTIONS/APPLICABILITY: The purpose of this form is to obtain information necessary to determine whether the proposed facility will be operated in such a manner as to prevent particulate matter emitted from the facility from causing air pollution or causing an exceedance of ambient standards and to determine if dust prevention measures comply with applicable operational standards.

I. Unpaved/Paved Road Particulate Emissions Potential

Vehicle Type	Vehicle Wt. Unloaded (ton)	Vehicle Wt. Loaded (ton)	No. of Wheels	Unpaved (lb./VMT)		Paved (lb./VMT)	
				E_{in}	E_{out}	E_{in}	E_{out}
Transfer	19.3	35.6	18	0.052	0.034	2.42E-03	1.58E-03
Trailer							
High Capacity							
Front Loader							
Light Weight							
Rear Loader							
Dump Trucks							
In Plant Trucks							

$$Unpaved\ Road:\ E_{in/out} = 5.9K\left(\frac{s}{12}\right)\left(\frac{S_{in/out}}{30}\right)\left(\frac{W_{in/out}}{3}\right)^{0.7}\left(\frac{w}{4}\right)^{0.5}\left(\frac{365-P}{365}\right) lb./VMT$$

$$Paved\ Road:\ E_{in/out} = .077I\left(\frac{4}{n}\right)\left(\frac{s}{10}\right)\left(\frac{L}{1000}\right)\left(\frac{W_{in/out}}{3}\right)^{0.7} lb./VMT$$

Where:

E_{in} = Emission factor loaded trucks in (lb./VMT)

E_{out} = Emission factor unloaded trucks out (lb./VMT)

K = Particle size multiplier - 1 (total); 0.8 (TSP); 0.36 (PM-10)

VMT = Vehicle mile traveled

Surface Material:

s = Mean silt content

Gravel	=	5%
Limestone	=	10%
Dirt	=	28%
Other	=	_____% (Explain) ______________________________________

S_{in} = Mean vehicle speed in (10 MPH); S_{out} = Mean vehicle speed out (10 MPH)

W = Number of wheels

W_{in} = Vehicle weight loaded (tons); W_{out} = vehicle weight unloaded (tons)

P = Number of days/yr with at least .01 inches of precipitation per day = _____ days

n = number of paved traffic lanes

I = Industrial augmentation factor =
- 7.0 (paved to unpaved)
- 3.5 (unpaved shoulders)
- Other (explain) _________________________

L = Surface dust loading (lb./mile) = 53 lb./mile

UPR = Total length of unpaved roads 9,000 ft. or 1 . 7 miles

PR = Total length of paved roads 1,700 ft. or 0 . 3 miles

Vehicle Type	Trucks/ Yr (A)	UPR (mile) (B)	PR (mile) (C)	Unpaved (lb./VMT) E_{in} (D)	Unpaved (lb./VMT) E_{out} (E)	Paved (lb./VMT) E_{in} (F)	Paved (lb./VMT) E_{out} (G)	Total Dust (lb./yr) Unpaved in (AxBxD) (lb./yr)	Total Dust (lb./yr) Unpaved out (AxBxE) (lb./yr)	Total Dust (lb./yr) Paved in (AxCxF) (lb./yr)	Total Dust (lb./yr) Paved out (AxCxG) (lb./yr)
Transfer	87,730	1.7	0.32	0.052	0.034	2.42E-03	1.58E-03	7846.1	5111.3	68	45
Trailer											
High Capacity											
Front Loader											
Light Weight											
Rear Loader											
Dump Trucks											
In Plant Vehicles											
Other											
							TOTAL:	7846.1	5111.3	68	45
								(h)	(i)	(j)	(k)

Total potential dust emissions from roads ((h+i+j+k) x (1 ton/2,000 lb))= 6.5 t/yr
(T)

II. Construction/Operation Particulate Emissions Potential

Note: General emission factors are given in the following calculations. Should site specific factors be used, please provide reference.

A. Total potential dust emissions from topsoil removal/daily cover:
$6x10^{-5}$ (tons of dust emissions/tons of topsoil removed or covered) X
[(tons topsoil removed/yr)$_{avg.}$ + (tons topsoil daily cover/yr)$_{avg.}$]

($6x10^{-5}$ ton dust/ton topsoil or placed)(20,743 t/yr+154,440 t/yr) = 10.5 t/yr

B. Total potential dust emissions from dozers onsite:
$1.6x10^{-2}$ (tons of dust emissions/dozer hr) X [(#dozers)$_{avg.}$ X
(hr/day dozer opr)$_{avg.}$ X OD]

($1.6x10^{-2}$ tons dust emissions/dozer hr)(2 dozers)(2 hrs/day)(286) = 18.3 t/yr

C. Overburden drilling potential dust emissions:
$7.5x10^{-4}$ (tons of dust emissions/hole drilled) X (holes drilled/yr)$_{avg.}$

($7.5x10^{-4}$ ton dust/hole)(2 holes/year) = $1.5x10^{-3}$ t/yr

D. Blasting potential dust emissions:
$6x10^{-4}$ (tons of dust emissions/tons of overburden removed) X
(tons/yr of overburden removed)$_{avg.}$

($6x10^{-4}$ ton dust/ton removed)(469,762 t/yr) = 282 t/yr

E. Overburden removal potential dust emissions:
$1.85x10^{-5}$ (tons of dust emissions/tons of overburden removed) X
(tons/yr of overburden removed)$_{avg.}$

($1.85x10^{-5}$ ton dust/ton removed)(819,856 t/yr) = 15.2 t/yr

F. Overburden truck dumping potential dust emissions:
$4.0x10^{-6}$ (tons of dust emissions/tons of overburden dumped) X
(tons/yr of overburden dumped)$_{avg.}$

($4.0x10^{-6}$ ton dust/ton dumped)(1,289,618 t/yr) = 5.2 t/yr

G. Road maintenance potential dust emissions:
$1.6x10^{-2}$ (tons of dust emissions/dozer hour opr.) X [(hr/day road maintenance)$_{avg.}$ X OD]

286
($1.6x10^{-2}$ ton dust/hr)(4 hr/day)(~~312~~ day/yr) = 18.3 t/yr

H. Total: 349.5 t/yr
(H)

III. Summary of Potential/Actual Total Dust, & PM-10 Emissions

Total potential dust emissions = T + H = 356.0 t/yr (M)

Total potential PM-10 emissions = 0.36 X M = 128.2 t/yr (N)

Total actual dust emissions = 0.5 X M = 178.0 t/yr (O)

Total actual PM-10 dust emissions = 0.5 X N = 64.1 t/yr (P)

IV. Stationary Sources Standards

1. Will the proposed solid waste facility dust emissions be visible off the permit boundary?

   ☐ Yes ☒ No

2. Are any stationary sources of air contamination other than landfill gas emissions [see Form G (B)] subject to the new source performance standards of 25 PA Code Chapter 122 planned for this proposed facility?

   ☐ Yes ☒ No

   Describe source(s) ______

   If "yes", what is the air quality application # ______

3. Will the proposed facility accept asbestos waste subject to national standard for hazardous air pollutants adopted under 25 PA. Code Chapter 124? ☒ Yes ☐ No

   If yes, describe compliance with Chapter 124.

4. Is the proposed facility subject to any other national standard for hazardous air pollutants?

   ☒ Yes ☐ No

   Identify pollutant(s) Non-Methane Organic Compounds (NMOC) – Refer to Form G(B)

V. Entrance Roads, Access Roads, and Parking Areas

Describe plans for monitoring, maintaining and cleaning all entrance roads, access roads, and parking areas. This plan must effectively control the dust and particulate emissions calculated in Parts I-III above. The use of waste oil for dust suppression is prohibited.

a. For each paved parking lot/area, paved facility haul road, the required paved access roadways from public highway to the facility, and public highways, describe the method and frequency of road cleaning and/or maintenance.

Refer to Attachment G(A)-1

b. For the shoulders of: paved parking lot/areas; paved facility haul roads; the required paved access roadways from public highways to the facility; and public highways, describe the extent of application and frequency of water or other chemical dust suppressants to reduce fugitive dusts. Application of dust suppressants or water on public highway shoulders must be completed for a distance of 500 feet in both directions from the facility. Identify any road maintenance agreements with the local municipality or PennDOT.

Refer to Attachment G(A)-1

c. For unpaved parking lot areas, and unpaved access roads near unloading areas, describe the application and frequency of use of water or other chemical dust suppressants to reduce fugitive dust emissions.

Refer to Attachment G(A)-1

d. Describe how vehicles which transport waste or earth into the facility, will be cleaned before exiting the site.

Refer to Attachment G(A)-1

e. State the roadway speed limit for the proposed facility, and include the locations and size specifications of speed limit signs. On-site speed limit for all roads is 15 MPH

f. Will all trucks entering and leaving the facility be covered? ☒ Yes ☐ No

If no, explain why a cover is not needed to prevent fugitive dust emissions from becoming airborne.

VI. Records Keeping – Refer to Attachment G(A)-1

Describe the records to be kept at the site to insure that the plan discussed in Item IV (2) above is being implemented. These records must include, at a minimum, the following:

a. for paved roads and parking areas:

   i. daily log of time and location of any vacuum sweeping conducted,

   ii. log explaining the reasons any required vacuum sweeping was not performed.

b. for unpaved roads and shoulders of paved roads:

   i. daily log of time and location of treated areas,

   ii. identification of dust suppressants,

   iii. daily log of the dilution ratios of the dust suppressants and dilutent used if chemical suppressants are used, and

   iv. purchase records of the chemical suppressants, if used.

c. Quarterly reports of the above records must be submitted to this Department upon request.

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(A)
ATTACHMENT G(A)-1
Narrative Responses

FEBRUARY 2018

This page intentionally left blank.

FORM G(A) – AIR RESOURCES PROTECTION DUST EMISSIONS ESTIMATE AND CONTROL PLAN

Narrative responses are not presented for Form G(A) Sections I, II, III, and IV. Refer to **Attachment G(A)-2** for calculations performed for Sections I, II, and III. On-site roads are shown on **Exhibit G(A)-1.1**.

V. Entrance Roads, Access Roads, and Parking Areas

A. For each paved parking lot/area, paved facility haul road, the required paved access roadways from public highway to the facility, and public highways, describe the method and frequency of road cleaning and/or maintenance.

Response

These areas will be visually monitored on a daily basis. When needed, water trucks will be used to apply water for dust suppression. In general, water is applied by truck, which is obtained from an on-site source, at regular intervals during appropriate weather conditions. If water spraying does not adequately suppress dust emissions, then broom sweeping and water flushing will be used to clean paved areas. To prevent mud from being tracked onto public highways providing access to the facility, soil will be washed, when appropriate, from the tires and undercarriage of vehicles at the truck wash facility as prior to leaving the outbound scale.

B. For the shoulders of: paved parking lot/areas, paved facility haul roads, the required paved access roadways from public highway to the facility, and public highways, describe the extent of application and frequency of water or other chemical dust suppressants to reduce fugitive dusts. Application of dust suppressants or water on public highway shoulders must be completed for a distance of 500 feet in both directions from the facility. Identify any road maintenance agreements with the local municipality or PennDOT.

Response

Visual monitoring of shoulder areas will be conducted concurrently with monitoring of site and public road surfaces. Shoulder areas extending 500 feet from the facility in both directions will be cleaned as needed, primarily using water flushing.

C. For unpaved parking lot areas, and unpaved access roads near unloading areas, describe the application and frequency of use of water or other chemical dust suppressants to reduce fugitive dust emissions.

Response

Unpaved access roads will be visually monitored on a daily basis. Low traffic areas (e.g., parking lots) may be monitored less frequently than high traffic areas. Greater attention will be given to dust suppression for unpaved roads because their potential for dust emissions is greater than for paved roads. Dust suppression will be accomplished primarily by water spraying from trucks. During appropriate weather conditions, water will be applied at the beginning of the workday and on an as-needed basis thereafter during the day.

Dust suppression techniques will be implemented as needed in the following succession:

1. application of water;
2. reapplication of stone;
3. installation of silt fence along one or both shoulders;
4. application of soil stabilizers; and
5. paving.

The use of chemical dust suppressants is not anticipated.

D. Describe how vehicles which transport waste or earth into the facility will be cleaned before exiting the site.

Response

Transport vehicles will be washed at a permanent truck wash facility, which vehicles must pass through prior to reaching the outbound scale. Tires and undercarriage of vehicles will be washed as needed at the truck wash facility. The truck wash has been deliberately located before the outbound scale such that scale house personnel have the opportunity to monitor truck washing.

E. State the roadway speed limit for the proposed facility, and include the locations and size specifications of speed limit signs.

Response

A sign will be posted immediately after the scale house to notify vehicles entering the site of the 15-mile/hour speed limit on paved roads. Additional signs will be posted to indicate a 10-mile/hour speed limit on unpaved roads. The signs will measure at least 30 inches tall and 24 inches wide, and display “Speed Limit” in 4-inch high letters and “10” in 10-inch high numerals.

F. Will all trucks entering and leaving the facility be covered?

Response

Yes. All trucks entering and leaving the facility will be covered.

VI. Records Keeping

Describe the records to be kept at the site to insure that the plan discussed in Item IV(2) above is being implemented.

A. *Paved Roads and Parking Areas*

The following records will be kept for paved roads and parking areas:

- logs of time and location of treated areas and method of treatment (i.e. water wash, vacuum sweeping); and

- logs explaining why any required treatment was not performed.

B. Unpaved Roads and Shoulders of Paved Roads

The following records will be kept for unpaved roads and shoulders of parking areas:

- logs of time and location of treated areas and method of treatment (i.e. water wash, vacuum sweeping);
- daily logs of engine run time and odometer reading for treatment vehicles (i.e. water truck, vacuum sweeper);
- records of type (i.e. brand and name) of dust suppressants used;
- records of dilution ratios for dust or chemical suppressants used;
- purchase records of chemical suppressants used; and
- daily log of time and location of vacuum sweeping.

C. Quarterly Reports

Quarterly reports documenting the above record keeping and including daily logs will be maintained on-site and submitted to the Department upon request.

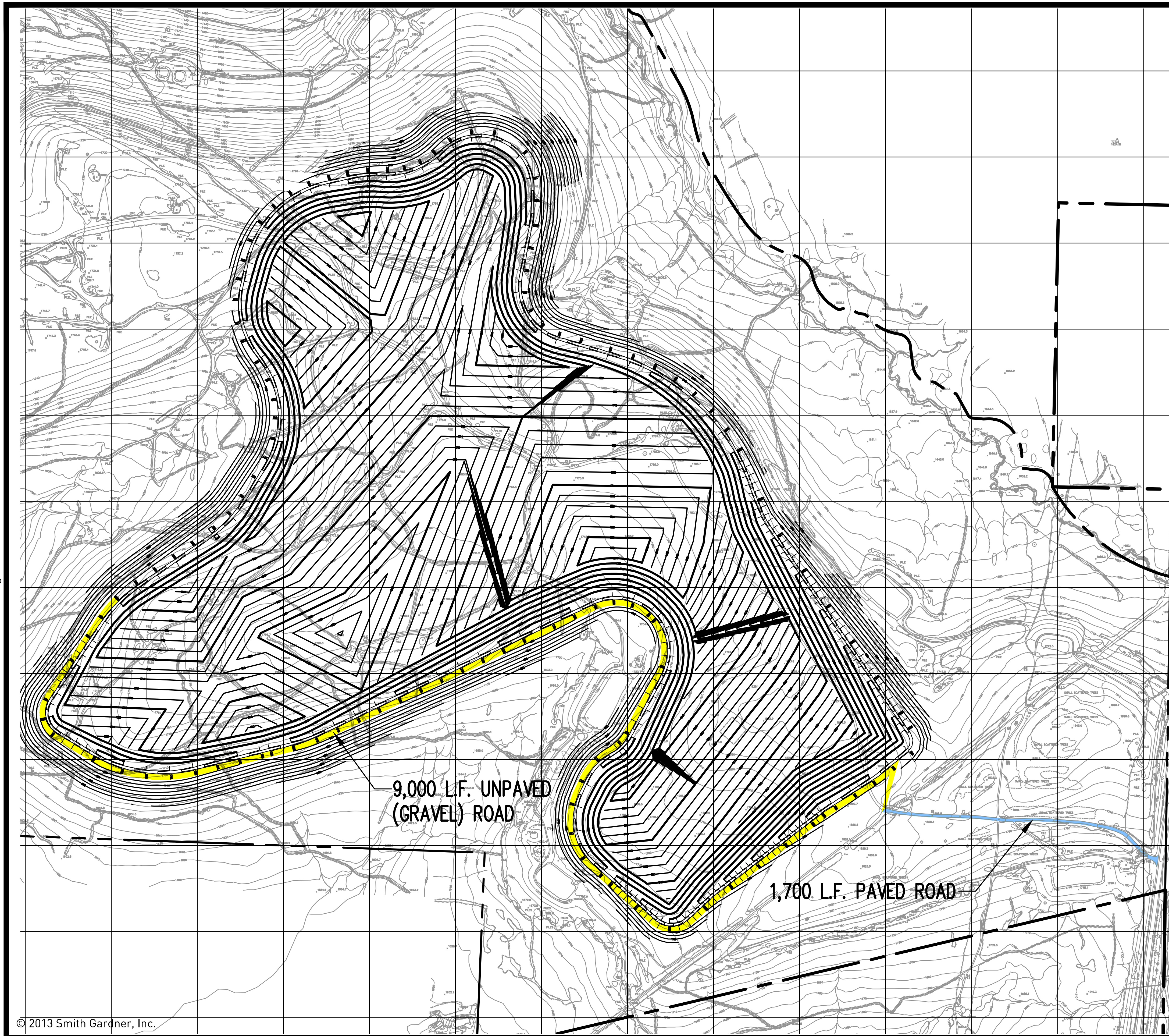
This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(A)
EXHIBIT G(A)-1.1
Facility Map

FEBRUARY 2018

This page intentionally left blank.



NOTES

1. DIGITAL TOPOGRAPHY FOR THE SITE WAS COMPILED FROM AERIAL PHOTOGRAPHY OBTAINED ON DECEMBER 20, 2004, BY MAPMAKER PHOTOGRAMMETRIC SERVICES, ST. ALBANS, VERMONT.

0 600' 1200' 1800'

PREPARED BY:
SMITH+GARDNER
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

DRAWN:	APPROVED:	SCALE:	FIGURE NO.
J.A.L.		AS SHOWN	G(A) - 1.1

DATE:	PROJECT NO:	FILENAME:
FEB. 2018	PAWASTE 16-1	MARSHALL-B0061

PREPARED FOR:

PA WASTE, LLC
CAMP HOPE RUN LANDFILL
EXHIBIT G(A) - 1.1
FACILITY MAP

G:\CAD\Marshall Miller & Associates\Clearfield\Marshall-2\sheets\MARSHALL-B0061.dwg - 2/11/2013 2:00 PM

This Page Intentionally Left Blank

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(A)
ATTACHMENT G(A)-2
Dust Emission Calculations

FEBRUARY 2018

This page intentionally left blank.

Camp Hope Run Landfill
Form G(A) Dust Emissions Estimates
Calculation Coversheet

OBJECTIVE

The calculations determine total facility-wide fugitive dust emissions at the facility for reporting on Form G(A) - Dust Emissions Estimates, for the following particulate sizes categories:
(i) Total;
(ii) TSP, defined as total suspended particulates; and
(iii) PM-10, defined as particulate material with an aerodynamic diameter no greater than 10 microns.

GIVEN

The following information is provided on the Pennsylvania Department of Environmental Protection Form G(A):

- Emission factors and equations;
- Particle size multipliers;
- Surface material mean silt content;
- Industrial augmentation factors; and
- Surface dust loading factor.

Regional precipitation data are obtained from Section 13.2.2 of the AP-42 (**Reference 1**)

ASSUMPTIONS

The proposed facility is a greenfields site, with no current operations. The following information is assumed, based on the best available information:

- Mean vehicle speeds;
- Loaded and unloaded vehicle weights;
- Truck sizes and annual traffic;
- Operating hours per year;
- Incoming waste tonnage; and
- Distance of paved and unpaved roads.

Assumptions used in calculating dust emissions from construction and operation activities are given in Section 3.

REFERENCE

1. Compilation of Air Pollutant Emission Factors, U.S. EPA, Document AP-42, Section 13.2.2, Revised December 2003.

CALCULATION

1. Unpaved road emissions are calculated in **Section 1**.
2. Paved Road emissions are calculated in **Section 2**.
3. Construction/Operation particulate emissions are calculated in **Section 3**.
4. Total potential and actual particulate emissions are calculated in **Section 4**.

SMITH+GARDNER	ADDRESS 14 N. Boylan Avenue, Raleigh, NC 27603	TEL 919.828.057	WEB www.smithgardnerinc.com

PROJECT PA Waste, LLC — SHEET 2 OF 5 — DATE 2/22/2018
COMPUTED BY MCK
SUBJECT Air Emission Calcs — JOB # PA Waste 16-1 — CHECKED BY MSL

Camp Hope Run Landfill
Form G(A) Dust Emissions Estimates

Section 1. Unpaved Road Emissions

1.1 The following equation determines size-specific fugitive emission factors from vehicles traveling on unpaved roads at municipal solid waste landfills:

$$Unpaved\ Road: \ E_{in/out} = 5.9K\left(\frac{s}{12}\right)\left(\frac{S_{in/out}}{30}\right)\left(\frac{W_{in/out}}{3}\right)^{0.7}\left(\frac{w}{4}\right)^{0.5}\left(\frac{365-P}{365}\right) lb./VMT$$

Where:

E_{in}= Emission factor loaded trucks in (lb./VMT)
E_{out}= Emission factor unloaded trucks out (lb./VMT)
K= Particle size multiplier - 1 (total); 0.8 (TSP); 0.36 (PM-10)

		Sec. 1.3	
VMT=	Vehicle mile traveled		
s=	Mean silt content	5%	(given)
S_{in}=	Mean vehicle speed in (MPH)	10	
S_{out}=	Mean vehicle speed out (MPH)	10	
w=	Number of wheels	18	
W_{in}=	Vehicle weight loaded (tons)	35.6	
W_{out}=	Vehicle weight unloaded (tons)	19.3	
P=	Days per year with ≥ 0.01 inches of precipitation	170	(Ref. 1, Figure 13.2.2-1)

Particle size	PM-TOTAL	TSP	PM-10	
Multiplier K (lb/VMT)	1	0.8	0.36	(given)

Particle size	PM-TOTAL	TSP	PM-10
Emission factor E_{in} (lb/VMT)	0.052	0.042	0.019
Emission factor E_{out} (lb/VMT)	0.034	0.027	0.012

1.2 Length of unpaved road (UPR) is determined by measuring the distance from the scalehouse to Cell S2-1 as shown on Exhibit G(A)-1.1.

UPR= Unpaved road — 1.70 miles

1.3 Annual vehicle miles traveled are determined by multiplying UPR (Sec. 1.2) by the annual number of trucks anticipated at the maximum permitted acceptance rate of 5,000 tons per day, during 312 operating days per year.

Trucks/yr=	Annual no. trucks = 5,000 tpd / W_{in} - W_{out} * 286 dpy	87,730	trucks
	VMT/yr_{in} =	149,540	miles
	VMT/yr_{out} =	149,540	miles

1.4 Annual emissions from vehicle traffic on unpaved roads are determined by multiplying vehicle miles traveled per year (VMT/yr) (Sec. 1.3) by the size-specific emission factor (lb/VMT) (Sec. 1.1).

Particle size	PM-TOTAL	TSP	PM-10
$Emissions_{in}$ (lbs/yr)	7846.1	6276.9	2824.6
$Emissions_{out}$ (lbs/yr)	5111.3	4089.0	1840.1
$Emissions_{totalt}$ (tons/yr)	6.5	5.2	2.3

SMITH+GARDNER

ADDRESS	TEL	WEB
14 N. Boylan Avenue, Raleigh, NC 27603	919.828.0577	www.smithgardnerinc.com

Camp Hope Run Landfill
Form G(A) Dust Emissions Estimates

Section 2. Paved Road Emissions

2.1 The following equation determines size-specific fugitive emission factors from vehicles traveling on paved roads at municipal solid waste landfills:

$$Paved\,Road: \quad E_{in/out} = .077I\left(\frac{4}{n}\right)\left(\frac{s}{10}\right)\left(\frac{L}{1000}\right)\left(\frac{W_{in/out}}{3}\right)^{0.7} \; lb./VMT$$

Where:

E_{in}=	Emission factor loaded trucks in (lb./VMT)		
E_{out}=	Emission factor unloaded trucks out (lb./VMT)		
I=	Industrial augmentation factor - 7.0 (paved to unpaved), 3.5 (unpaved shoulders)		
n=	No. paved traffic lanes	2	
VMT=	Vehicle mile traveled	**Sec. 1.3**	
s=	Mean silt content	5%	(given)
L=	Surface dust loading (lb./mile)	53	lb./mile (given)
W_{in}=	Vehicle weight loaded (tons)	35.6	
W_{out}=	Vehicle weight unloaded (tons)	19.3	

Industrial Augmentation Factor	Paved to unpaved	Unpaved shoulders	
	7.0	3.5	(given)

Emission factor E_{in} (lb/VMT)	2.42E-03
Emission factor E_{out} (lb/VMT)	1.58E-03

2.2 Length of paved road (PR) is determined by measuring the distance from the facility entrance to the scalehouse as shown on Exhibit G(A)-1.1.

PR= Paved road | 0.32 | miles

2.3 Annual vehicle miles traveled are determined by multiplying PR (Sec. 1.2) by the annual number of trucks anticipated at the maximum permitted acceptance rate of 5,000 tons per day, during 312 operating days per year.

Trucks/yr=	Annual no. trucks = 5,000 tpd / W_{in} - W_{out} * 286 dpy	87,730	trucks
	VMT/yr_{in} =	28,246	miles
	VMT/yr_{out} =	28,246	miles

2.4 Annual emissions from vehicle traffic on paved roads are determined by multiplying vehicle miles traveled per year (VMT/yr) (Sec. 1.3) by the size-specific emission factor (lb/VMT) (Sec. 1.1).

$Emissions_{in}$ (lbs/yr)	68
$Emissions_{out}$ (lbs/yr)	45
$Emissions_{totalt}$ (tons/yr)	0.1

Section 3. CONSTRUCTION/OPERATION PARTICULATE EMISSIONS

3.1 Topsoil Removal/Daily Cover

Tons of topsoil removed per year:

Topsoil will be removed within the limits of disturbance for the S1 and S2 areas, which has a total base area of 200 acres, and stockpiled. Approximately 12 inches of topsoil will be removed from this area over a period of approximately 21 or more years. Assume the density of topsoil is 1.35 tons/yd^3.

Annual weight of topsoil removed
= (1 ft)(200 ac.)(43560 ft^2/ac.)(1.35 t/yd^3)/[(27 ft^3/yd^3)(21 years)]
= 20,743 t/yr

Tons of topsoil daily cover per year:

The volume of daily cover placed is calculated assuming that the volume of cover soil placed each year will equal 10 percent of the total volume of waste and soil placed each year, and that the density of compacted waste and soil is 0.8 tons/yd^3 and the density of cover soil is 1.35 tons/yd^3.

Annual waste volume = (5,000 t/d)(286 d/yr)/(0.8 t/yd^3) = 1,144,000 yd^3
Annual daily cover weight = (1,144,000 yd^3)(0.10)(1.35 t/yd^3) = 154,440 t/yr

Total potential dust emissions from topsoil removal/daily cover:

($6x10^{-5}$ ton dust/ton topsoil removed or placed)(20,743 t/yr+154,440 t/yr) =10.51 t/yr

3.2 Dozers

Total potential dust emissions from dozers on-site are assumed to be generated when dozers are moving dirt, and not waste. Typical dirt moving operations will occur during application and removal of daily cover, and road maintenance, both of which are addressed elsewhere in this section.

An average of two (2) dozers are anticipated require a one (1) hour period to apply daily cover topsoil at the end of the operating day, and to require one (1) hour to remove daily cover at the beginning of the next operating day.

Total potential dust emissions from dozers onsite:

($1.6x10^{-2}$ tons of dust emissions/dozer hr)$(2\ \text{dozers})_{avg}$$(2\ \text{hr/day dozer opr})_{avg}$ (286 days)=18.3 t/yr

3.3 Overburden Drilling

Average number of holes drilled per year:

(approximately 60 gas probes)/(21 years) = 3 holes/yr

Potential dust emissions from overburden drilling:

($7.5x10^{-4}$ ton dust/hole)(3 holes/yr) = 2.3 $x10^{-3}$ t/yr

3.4 Blasting

The estimated volume of weathered rock that will be removed is approximately 12,980,284 yd^3. Assume that 40 percent, or approximately 5,416,487 yd^3 of this volume must be blasted. Assume the unit weight of weathered rock is 1.9 t/yd^3. Assume that the material will be removed over a 21 year period.

Volume to be blasted = (0.4)(12,980,284 yd^3) = 5,192,114 yd^3
Weight to be blasted = (5,192,114 yd^3)(1.9 t/yd^3) = 9,865,016 t
Weight per year = (9,865,016 t) / (21 yr) = 469,762 t/yr

Dust from blasting:

($6x10^{-4}$ ton dust/ton blasted)(469,762 t/yr) = 282 t/yr

3.5 Overburden Removal

The estimated volume of overburden to be removed is approximately 12,980,284 yd^3 of weathered rock and 1,792,188 yd^3 of soil for an approximate total of 14,772,472 yd^3. Assume that 60 percent, or approximately 8,124,730 yd^3 of the overburden will be excavated rather than blasted. Assume the unit weight of weathered rock is 1.9 t/yd^3 and the soil unit weight is 1.35 t/yd^3.

Volume of weathered rock to be excavated = (0.6)(12,980,284 yd^3) = 7,788,170 yd^3
Weight to be excavated = (7,788,170 yd^3)(1.9 t/yd^3) + (1,792,188 yd^3)(1.35 t/yd^3)
= 17,216,977 t

Assuming that the excavation will occur over a 21 year period, the average tons per year of overburden to be removed is 819,856 t/yr.

Potential dust emissions from overburden removal:

($1.85x10^{-5}$ ton dust/ton removed)(819,856 t/yr) = 15.2 t/yr

3.6 Overburden Truck Dumping

Assume the weight of material dumped is equal to the weight of material excavated and blasted.

Average tons per year of overburden dumped:

(469,762 t/yr) + (819,856 t/yr) = 1,289,618 t/yr

Potential dust emissions from overburden dumping:

($4.0x10^{-6}$ ton dust/ton dumped)(1,289,618 t/yr) = 5.2 t/yr

3.7 Road Maintenance

Average hours per day of road maintenance: 4

Number of operating days: 286

Potential dust emissions from road maintenance:

$(1.6x10^{-2}$ ton dust/hr)(4 hr/day)(286 day/yr) = 18.3 t/yr

3.8 Total Potential Emissions for Construction/Operation Activities

$10.5 + 18.3 + 2.3x10^{-3} + 282 + 15.2 + 5.2 + 18.3 = 349.5$ t/yr

4. SUMMARY OF POTENTIAL AND ACTUAL EMISSIONS

(All formulas used are from Form G(A).)

Total potential dust emissions: 6.5 + 349.5 = 356.0 t/yr

Total potential PM-10 emissions: (0.36)(356.0) = 128.2 t/yr

Total actual dust emissions: (0.5)(356.0) = 178.0 t/yr

Total actual PM-10 dust emissions: (0.5)(128.2) = 64.1 t/yr

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(B)

AIR RESOURCES PROTECTION
NMOC EMISSIONS ESTIMATE AND CONTROL PLAN

FEBRUARY 2018

This page intentionally left blank.

2540-PM-BWM0391b 6/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised **FEBRUARY 2018**
DEP USE ONLY
Date Received

FORM G (B)

AIR RESOURCES PROTECTION
NMOC EMISSIONS ESTIMATE AND CONTROL PLAN

General Reference: 25 Pa Code §§ 121.7, 123.31, 131.2, 273.217, 273.218, 277.217, 279.218, 281.217, 281.218.

CHECK whether ☒ NEW or ☐ EXISTING / EXPANSION municipal waste landfill

If existing: Permit #________________

Proposed waste throughput in tons/day 5000

Proposed operating schedule:

286 (OD) days/yr   Mon.-Fri. 6:00 a.m. to 8:00 p.m.

Sat. 6:00 a.m. to 3:00 p.m.

Total: 3874 (OH) (hrs/yr)

INSTRUCTIONS/APPLICABILITY: The purpose of this form is to obtain information necessary to determine whether the proposed facility will be operated in such a manner as to prevent VOC emissions from the facility from causing air pollution or causing an exceedance of ambient air quality standards, and to determine if VOC emissions and controls comply with applicable emission standards. The facility may also be required to fulfill the NSPS requirements of 40 CFR Part 60, Subparts WWW and Cc.

I. POTENTIAL / ACTUAL VOC EMISSIONS FROM EXISTING DISPOSAL FACILITIES

A. Summarize Existing Disposal Facilities Potential/Actual VOC Emissions as NMOC Expressed as Hexane

Number of existing cells NONE. For each existing cell provide the following data summary:

Cell	Average Refuse Disposed Megagrams/Year	Years Opened (A)	Years Closed * (B)	PER (VOC)** tons	AER (VOC)*** tons
1					
2					
3					
4					
5					
6					
7					
8					
9					

Total PER (VOC) ________
TPER (VOC)

* If the cell is not closed, B equals 0
** PER: potential emission rate at current year
*** AER: actual emission rate at current year

1. Existing Disposal Facilities Potential VOC Emissions

For each cell, calculate the PER (VOC) as follows:

PER (VOC) = Potential VOC emissions (tons/year) / cell as NMOC expressed as Hexane

$$= 2\, R_i L_o \left[e^{-kB} - e^{-kA}\right] C_{NMOC}\ x\ 10^{-9} \left(\frac{1050.2}{273+T}\right) \frac{1x10^6\ g}{Mg}\ x \frac{lb.}{454\ g}\ x \frac{ton}{2000\ lb.}$$

k = Landfill gas generation rate constant (1/yr) = .05/yr or ____________________ (provide proposed EPA method 2E derivation)

L_o = Methane generation potential (m^3/Mg) = 170 m^3CH^4/Mg refuse or ____________________ (provide proposed EPA method 2E derivation)

C_{NMOC} = NMOC gas concentration as hexane equivalent NMOC (ppmv) = 4000 ppmv or _____________ (provide proposed EPA method 25C derivation)

R_i = Average annual disposal rate (Megagrams)

A = years since waste was first disposed in landfill cell (years)

B = years since landfill cell was closed (years) (B=0 for active cell/landfill)

e = base log = 2.718

T = temperature of landfill gas in ºC. If unknown, use 25ºC.

2. Existing Disposal Facilities Actual VOC Emissions

For each cell, calculate the AER (VOC) as follows:

AER (VOC) = actual VOC emissions (tons/year) /cell as NMOC expressed as hexane
= PER (VOC) x (1 - CE * DE)

where:

PER (VOC) = Potential VOC emission rate

AER (VOC) = Actual VOC emission rate

CE = cell gas collection efficiency = ______ %/100. If gas collection efficiency is unknown, use 75%. If no gas collection system is in operation use 0%.

DE = NMOC gas burner destruction efficiency = _____________ %/100. If gas burner destruction efficiency is unknown, use 95%/100 or greater for a flare.

What is Air Quality permit number for system? _____________.

B. Malodorant Emissions from Existing Disposal Facility

1. Are odors detectable off the permit boundary? ☐ yes ☐ no

2. What are the control measures currently being implemented?

   Please attach a copy of your approved "Nuisance Minimization and Control Plan."

   ____

   ____

3. Calculate maximum actual emission rates:

Malodorants	Actual Emission Rate (AER)
Dimethyl sulfide	54.8 x AER (VOC) / C_{NMOC} = ____________ t/yr
Hydrogen sulfide	14.4 x AER (VOC) / C_{NMOC} = ____________ t/yr
Methyl mercaptan	5.84 x AER (VOC) / C_{NMOC} = ____________ t/yr
Other ________	_____x AER (VOC) / C_{NMOC} = ____________ t/yr

II. ESTIMATED ACTUAL VOC EMISSIONS FROM PROPOSED / EXPANDED LANDFILL

A. Determination of Year of Maximum Actual VOC Emissions

Number of proposed/expanded disposal cells: 10 ________. For each proposed disposal cell provide the following Data Summary.

Maximum Estimated AER (VOC) Tons/Year

Cell i / Yr (j)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
1							
2							
3							
4							
5							
TOTAL							

Refer to ATTACHMENT G(B)-1 for Maximum Estimated AER (VOC) Tons/Year.

$$AER_{ij} = 2\,(ADV * OD)\,L_O \left[e^{-kCj} - e^{-kTj}\right] C_{NMOC}\, x10^{-9} \left(\frac{1050.2}{273+T}\right) x \frac{1x10^6\, g}{Mg}\, x \frac{lb.}{454\ g}\, x \frac{ton}{2000\ lb.} (1 - CE_i * DE_i)$$

k = Landfill gas generation constant (1/yr) = .05/yr or 0.05 (provide proposed method 2F derivation).

L_o = Methane gas generation potential (M^3/M_s) = $170 m^3 CH_4/M_g$ refuse or 170 (provide proposed method 2E derivation).

ADV = Proposed average daily disposal volume 4,540 Mg/day [.908xADV (tons/day].
EXCEPT AS PROPOSED IN **EXHIBIT 14-1.3, Cell Sequence and Site Life Summary** DURING YEARS 1 through 4

OD = Proposed operating days/year.

C_{NMOC} = NMOC gas concentration as hexane equivalent NMOC (ppmv) = 4,000 ppmv or 600 (to be determined by site-specific Tier 2 testing as allowed by 40 CFR 60.754 (provide proposed method 25C derivation).

C_j = Years since $cell_i$ disposal ceases at yr_j.

T_j = Years since $cell_i$ disposal began from yr_j.

Ce_i = Cell gas collection efficiency = 85 /100. Use 75% or 85% and 0% before installed.

De_i = NMOC gas burner destruction efficiency = 98 /100. If unknown, use 95% or greater for flare.

T = Temperature of landfill gas. If unknown, use 25ºC.

B. Malodorant Emissions from Proposed Disposal / Expanded Facility

1. Will odors be detectable off the permit boundary? ☐ yes ☒ no

2. What are the measures to be taken to remediate problem?

Application of soil or alternative daily cover

3. Estimate maximum actual emission rate:

Malodorants	Actual Emission Rate (AER)
Dimethyl sulfide	54.8 x AER (VOC) / C_{NMOC} = 18.7 t/yr
Hydrogen sulfide	14.4 x AER (VOC) / C_{NMOC} = 4.9 t/yr
Methyl mercaptan	5.84 x AER (VOC) / C_{NMOC} = 2.0 t/yr
Other ______	______ x AER (VOC) / C_{NMOC} = ______ t/yr

III. AIR TOXIC COMPOUNDS

Will the proposed facility emit air toxic compounds identified in Section 112 of the 1990 CAAA? ☒ yes ☐ no

If yes, identify the air toxic contaminants by compound **REFER TO ATTACHMENT G(B)-2**

Will the air toxic compounds identified be detectable off the permit boundary? ☐ yes ☒ no

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(B)
ATTACHMENT G(B)-1
Narrative Responses

FEBRUARY 2018

This page intentionally left blank.

FORM G(B) - NMOC EMISSIONS ESTIMATE CALCULATIONS

1. Objective

The purpose of this document is to present the calculations performed for completing Form G(B).

2. Calculations

2.1 Potential VOC Emissions from Existing Disposal Facilities

Not Applicable

2.2 Actual Emission Rate of VOCs (AER (VOC)) from Existing Disposal Facilities

Not Applicable

2.3 Estimated Actual VOC Emissions from Proposed/Expanded Landfill

The estimated actual VOC emissions from the facility are calculated using the method presented in **Section II.A** of the Form G(B):

$$AER_{ij} = 2(ADV \times OD) L_o (e^{-kCj} - e^{-kTj}) \left(C_{NMOC} \text{ x } 10^{-9}\right) \left(\frac{1050.2}{273 + T}\right) \left(\frac{1\text{x}10^6 g}{Mg}\right) \left(\frac{lb.}{454 g}\right) \left(\frac{ton}{2000 lb.}\right) \left(1 - CE_i \times DE_i\right)$$

where:

AER_{ij}	=	actual VOC emission rate per cell per year (ton/yr);
ADV	=	proposed average daily disposal mass (Mg/day);
OD	=	operating days per year (days/yr)
L_o	=	methane generation potential (m^3 CH_4/Mg refuse);
k	=	methane generation rate constant (yr^{-1});
C_{NMOC}	=	concentration of NMOC in landfill gas (ppmv as hexane);
C_j	=	Years since $cell_i$ disposal ceases at $year_j$;
T_j	=	Years since $cell_i$ disposal began from $year_j$;
T	=	temperature of landfill gas (º C);
CE_i	=	Cell gas collection efficiency (percent); and
DE_i	=	destruction efficiency (fraction).

Parameter Values

The collection efficiency for a cell with no controls is 0%. For cells with collection systems in place, the collection efficiency is assumed to be 85%.

Parameter	Each Cell
ADV x *OD*	(5000tpd)*(0.908 Mg/t)x286 = 1,298,440 Mg/yr
Lo	170
k	0.05
C_{NMOC}	600
T	25
CE_i	85% (beginning two (2) years after cell closure)
DE_i	98%

C_J and T_j are determined for each cell based on the calculated cell phasing schedule included in **Exhibit 14-1.3, Cell Sequence and Site Life Summary to Form 14.**

C_J and T_j are determined for each cell based on the following factors:

A = Average cell capacity (Mg/cell);
B = ADV X OD, Average gate rate (Mg/year); and
C = Average cell life (years) = A/B

Total landfill capacity, as determined from the tonnage acceptance rates on **Exhibit 14-1.3**, is estimated to be 26,865,322 Mg. The proposed landfill is designed to have a total of 10 cells, labeled S2-1 through S2-6, and S3-1 through S3-4. The landfill is expected to take approximately 908 megagrams per day in its first year, and increasing by 908 megagrams each of the following four (4) years until incoming acceptance rates are approximately 4,540 megagrams per day. Incremental cell life, as shown on **Exhibit 14-1.3**, ranges from 0.6 years to 4.7 years.

Example Calculation

AER_{ij} will vary from one year to the next, depending on the years since the cell began operating, (T_j); years since cell closure (C_j); and collection efficiency (CE_i). The collection system is assumed to be installed and operating two (2) years after cell closure.

To demonstrate this variability, an example calculation is given for year 2026, during which time closed cell S2-1 is operating a collection system, cell S2-2 has closed but not installed a collection system, and cell S2-3 is operating without a collection system.
This calculation is presented below:

$$AER_{ij} = 2(4{,}540 \times 286)170(e^{-0.5Cj} - e^{-0.5Tj})\left(600 \text{ x } 10^{-9}\right)\left(\frac{1050.2}{273+25}\right)\left(\frac{1\text{x}10^{6}\,g}{Mg}\right)\left(\frac{lb.}{454g}\right)\left(\frac{ton}{2000lb.}\right)\left(1 - CE_i \times 0.98\right)$$

Table of Variable Parameters Used for the 2026 Example AER Calculations, by Cell:

Parameter	2020	2021	2022	2023	2024	2025	2026	2027
Cell S2-1								
C_j	0	0	0	0	1	2	3	4
T_j	0	1	2	3	4	5	6	7
CE_j	0	0	0	0	0	85%	85%	85%
DE_j	0	0	0	0	0	98%	98%	98%
AER_{ij} (Mg)	0	11	22	32	30	24	23	22
Cell S2-2								
C_j	0	0	0	0	0	0	1	2
T_j	0	0	0	0	1	2	3	4
CE_j	0	0	0	0	0	0	0	85%
DE_j	0	0	0	0	0	0	0	98%
AER_{ij} (Mg)	0	0	0	0	11	22	20	16
Cell S2-3								
C_j	0	0	0	0	0	0	0	1
T_j	0	0	0	0	0	0	1	2
CE_j	0	0	0	0	0	0	0	0
DE_j	0	0	0	0	0	0	0	0
AER_{ij} (Mg)	0	0	0	0	0	0	11	11
Total Cells S2-1, S2-2 & S2-3								
AER_{ij} (Mg)	0	11	22	32	41	46	54	49

Actual Calculation

Table 1 (**Attached**) includes maximum VOC AERs in Mg/year for each cell, in spreadsheet format. These emissions are calculated using the methods described above.

Note: Several issues of concern were noted during calculation of VOC AERs using the prescribed method above This led to a separate alternative evaluation using the EPA landGEM landfill gas generation model. These issues are related to the following:

- Calculation of ADV X OD;
- Application of DE to CE; and
- Use of NMOC as a surrogate for VOC.

The structure of the equation suggests that this calculation should be run as each individual cell is opened, filled, and closed. During the first years of landfill operation (Cells S2-1 and S2-2), waste acceptance is anticipated to start at 1,000 tons per day (TPD) in the first operating year, and increasing by an additional 1,000 in successive years, until the acceptance rate is 5,000 TPD in year 5. Each operating year has 286 operating days. Therefore, ADV would be derived by dividing the annual waste acceptance by 286. Due to the structure of the equation, however; if no waste is accepted in a cell, as would be the case in the years after closure, **this first term of the calculation, *ADV* x *OD*, would equal 0, resulting in AER being equal to 0 for all years with no waste acceptance.**

The second issue of concern relates to the application of CE and DE to the generated gas. CE is the collection efficiency of the system, and is estimated to equal **85%**. This is the percentage of generated gas that is collected for destruction in the flare. DE, or destruction efficiency, is the percentage of gas (and its constituent contaminants, e.g., NMOC or VOC) that is combusted in the flare. DE is estimated to equal **98%**. Therefore, of the 85% of the NMOCs or VOCs that is collected, 98% of that will be destroyed through flare combustion. The last term of the calculation is not written to reflect this, however. It does account for collection of 85% of the NMOC, leaving a remaining 15% to be to be emitted to the atmosphere by multiplying the generated NMOC by (1 – 0.85). **Based on a DE of 98%, only 2% of this collected 85% should be emitted to the atmosphere, however; the structure of the last term of the equation as *1-CE X DE* shows 98% of collected NMOC is emitted**. This last term should be modified as follows:

(1-CE) X (1-DE)

Finally, it is a major issue of concern to use non-methane organic compounds (NMOCs) as surrogates for volatile organic compounds (VOCs). <u>NMOCs</u> are a combination of the remaining organic compounds in landfill gas containing carbon in their molecular structure, after methane, carbon monoxide, and carbon dioxide are excluded. <u>VOCs</u> are a regulated criteria pollutant under the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act, which are used to trigger such compliance requirements as Title V, PSD, and NSR permitting. They are regulated due to their participation in photochemical reactions to form trophospheric ozone, according to 40 CFR §51.100(s). The regulation identifies several organic compounds which have negligible photochemical reactivity, and are therefore excluded from the statutory definition of "volatile organic compounds". These include such organics as methylene chloride, acetone, perchloroethylene, and ethane. This last compound, ethane, has a default value in the AP-42 emission factors for MSW landfills that is actually higher (890 ppmv) than the default value for NMOCs (600 ppmv). Therefore, it is believed that using NMOC as a surrogate for VOCs when projecting actual emissions is confusing and may imply a facility is subject to regulation when it is not.

These first two issues with the equation are addressed in the alternate approach to calculating AER, as shown on **Table 2 and associated LandGEM output files (Attached)**. It is noted that the treatment of *ADV X OD* in the alternate approach actually leads to higher total facility emissions over the life of the landfill due to continued calculated emissions in the years after the cell has reached capacity.

2.4 Malodorant Emissions from Proposed Disposal Facility

The maximum actual emission rates (AER) of malodoroants at the facility are calculated using the method presented in **Section II.B** of the Form G(B). Malodorant emission factors are multiplied by the maximum VOC AER (**Section II.A**) and divided by C_{NMOC}. Malodorant emission factors are presented below:

Malodorant	Emission Factor
Dimethyl Sulfide	54.8
Hydrogen Sulfide	14.4
Methyl Mercaptan	5.8

2.5 Air Toxic Compounds Emissions from Proposed Disposal Facility

Air toxic compounds are calculated for **Section III** of the Form G(B) using the LandGEM V.3.02 Landfill Gas Emission Model, developed by U.S. EPA and released in May 2005. The LandGEM output is included in **Attachment G(B)-2**. Model results reflect maximum emissions, which are generated during the year of closure (2038). No reduction in emissions is accounted for due to landfill gas collection and control, therefore, these model results should not be relied upon for determination of actual emission rates of VOCs or malodorous pollutants.

Hazardous air pollutants listed in Section 112 of the 1990 Clean Air Act Amendments, and identified in the model results include trace amounts of the following:

- 1,1,1-Trichloroethane (methyl chloroform)
- 1,1,2,2-Tetrachloroethane
- 1,1-Dichloroethane (ethylidene dichloride)
- 1,1-Dichloroethene (vinylidene chloride)
- 1,2-Dichloroethane (ethylene dichloride)
- 1,2-Dichloropropane (propylene dichloride)
- Acrylonitrile
- Benzene
- Carbon disulfide
- Carbon tetrachloride
- Carbonyl sulfide
- Chlorobenzene
- Chloroethane (ethyl chloride)
- Chloroform
- Dichlorobenzene
- Dichloromethane (methylene chloride)
- Ethylbenzene
- Ethylene dibromide
- Hexane
- Mercury (total)
- Methyl isobutyl ketone
- Perchloroethylene (tetrachloroethylene)
- Toluene
- Trichloroethylene (trichloroethene)
- Vinyl chloride
- Xylenes

3.0 Summary

As shown by the calculations on the preceding pages, the maximum Actual VOC and Malodorous Pollutant Emission Rates are expected to occur in 2041 from the proposed facility. This coincides with the last year of waste acceptance.

A summary of the expected maximum Actual VOC (both calculation methods from Tables 1 and 2) and Malodorous Pollutant Emission Rates for the year 2038 is presented below:

Pollutant	2038 Emission Rate (Mg/year)	2038 Emission Rate (tons/year)
AER (VOC) – Table 1	118	130
AER (VOC) – Table 2	143	158
AER (Dimethyl Sulfide)	10.8	11.9
AER(Hydrogen Sulfide)	2.8	3.1
AER (Methyl Mercaptan)	1.1	1.3

SMITH+GARDNER

Camp Hope Run MSW Landfill
Form G(B) NMOC Emission Calculations
Table 1: Estimated Actual VOC Emissions, as NMOC

Year	Cell S2-1			Cell S2-2			Cell S2-3			Cell S2-4			Cell S2-5			Cell S2-6			Cell S3-1			Cell S3-2			Cell S3-3			Cell S3-4			Total VOC tons/year
	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	
2020	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
2021	0	22.1	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	22
2022	0	64.6	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	65
2023	0	24.0	3	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	24
2024	1	0.0	4	0	55.2	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	55
2025	2	0.0	5	0	13.4	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	13
2026	3	0.0	6	1	0.0	3	1	0.0	1	0	37.6	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	38
2027	4	0.0	7	2	0.0	4	2	0.0	2	1	0.0	2	0	55.2	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	55
2028	5	0.0	8	3	0.0	5	3	0.0	3	2	0.0	3	0	107.7	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	108
2029	6	0.0	9	4	0.0	6	4	0.0	4	3	0.0	4	0	157.7	3	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	158
2030	7	0.0	10	5	0.0	7	5	0.0	5	4	0.0	5	0	205.2	4	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	205
2031	8	0.0	11	6	0.0	8	6	0.0	6	5	0.0	6	0	89.7	5	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	90
2032	9	0.0	12	7	0.0	9	7	0.0	7	6	0.0	7	1	0.0	6	0	55.2	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	55
2033	10	0.0	13	8	0.0	10	8	0.0	8	7	0.0	8	2	0.0	7	0	23.7	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	24
2034	11	0.0	14	9	0.0	11	9	0.0	9	8	0.0	9	3	0.0	8	1	0.0	3	1	0.0	1	0	55.2	1	0	0.0	0	0	0.0	0	55
2035	12	0.0	15	10	0.0	12	10	0.0	10	9	0.0	10	4	0.0	9	2	0.0	4	2	0.0	2	0	64.0	2	0	0.0	0	0	0.0	0	64
2036	13	0.0	16	11	0.0	13	11	0.0	11	10	0.0	11	5	0.0	10	3	0.0	5	3	0.0	3	1	0.0	3	0	49.1	1	0	0.0	0	49
2037	14	0.0	17	12	0.0	14	12	0.0	12	11	0.0	12	6	0.0	11	4	0.0	6	4	0.0	4	2	0.0	4	1	0.0	2	0	55.2	1	55
2038	15	0.0	18	13	0.0	15	13	0.0	13	12	0.0	13	7	0.0	12	5	0.0	7	5	0.0	5	3	0.0	5	2	0.0	3	0	107.7	2	108
2039	16	0.0	19	14	0.0	16	14	0.0	14	13	0.0	14	8	0.0	13	6	0.0	8	6	0.0	6	4	0.0	6	3	0.0	4	0	157.7	3	158
2040	17	0.0	20	15	0.0	17	15	0.0	15	14	0.0	15	9	0.0	14	7	0.0	9	7	0.0	7	5	0.0	7	4	0.0	5	0	197.3	4	197
2041	18	0.0	21	16	0.0	18	16	0.0	16	15	0.0	16	10	0.0	15	8	0.0	10	8	0.0	8	6	0.0	8	5	0.0	6	1	0.0	5	0
2042	19	0.0	22	17	0.0	19	17	0.0	17	16	0.0	17	11	0.0	16	9	0.0	11	9	0.0	9	7	0.0	9	6	0.0	7	2	0.0	6	0

$$AER_{ij} = 2(ADV * OD)L_o\left[e^{-kCj} - e^{-kTj}\right]C_{NMOC}x10^{-9}\left(\frac{1050.2}{273+T}\right)x\frac{1x10^6 g}{Mg}x\frac{lb.}{454g}x\frac{ton}{2000lb.}\left(1 - CE_i * DE_i\right)$$

k= 0.05 methane generation rate constant, CAA default
L_o= 170 methane generation rate capacity, CAA default
1 Ton= 0.908 Mg
OD= 286 operating days/year
C_{NMOC}= 600 (Note 1)

C_j= years since $cell_i$ disposal ceased at $year_j$ (Note 2)
T_j= years since $cell_i$ disposal began at $year_j$ (Note 2)
Ce_i= 85%
De_i= 98%
T= 25

Note 1: NMOC concentration, to be determined by Tier 2 testing
Note 2: Refer to **EXHIBIT 14-1.3, Cell Sequence and Site Life Summary** , for cell phasing.
Note 3: LFG collection begins two (2) years after cell closure

February 2018

SMITH+GARDNER

Camp Hope Run MSW Landfill
Form G(B) NMOC Emission Calculations
Table 2: Estimated Actual VOC Emissions, as NMOC, using LandGEM Output for each Cell (ATTACHED)

	Cell S2-1			Cell S2-2			Cell S2-3			Cell S2-4			Cell S2-5			Cell S2-6			Cell S3-1			Cell S3-2			Cell S3-3			Cell S3-4			
Year	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	C_j	AER (Tons/Yr)	T_j	Total VOC tons/year
2020	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
2021	0	8.4	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	8
2022	0	24.9	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	25
2023	0	49.0	3	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	49
2024	1	53.1	4	0	27.3	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	80
2025	2	0.2	5	0	68.2	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	68
2026	3	0.2	6	1	70.1	3	1	26.4	1	0	10.5	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	107
2027	4	0.2	7	2	0.2	4	2	0.1	2	1	43.1	2	0	9.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	53
2028	5	0.1	8	3	0.2	5	3	0.1	3	2	0.1	3	0	50.8	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	51
2029	6	0.1	9	4	0.2	6	4	0.1	4	3	0.1	4	0	90.5	3	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	91
2030	7	0.1	10	5	0.2	7	5	0.1	5	4	0.1	5	0	128.3	4	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	129
2031	8	0.1	11	6	0.2	8	6	0.1	6	5	0.1	6	0	164.3	5	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	165
2032	9	0.1	12	7	0.2	9	7	0.1	7	6	0.1	7	1	172.4	6	0	26.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	199
2033	10	0.1	13	8	0.2	10	8	0.1	8	7	0.1	8	2	0.5	7	0	67.0	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	68
2034	11	0.1	14	9	0.2	11	9	0.1	9	8	0.1	9	3	0.5	8	1	74.0	3	1	31.9	1	0	39.5	1	0	0.0	0	0	0.0	0	146
2035	12	0.1	15	10	0.1	12	10	0.1	10	9	0.1	10	4	0.5	9	2	0.2	4	1	33.0	2	0	58.3	2	0	0.0	0	0	0.0	0	92
2036	13	0.1	16	11	0.1	13	11	0.1	11	10	0.1	11	5	0.5	10	3	0.2	5	2	0.1	3	1	55.4	3	0	21.5	1	0	0.0	0	78
2037	14	0.1	17	12	0.1	14	12	0.1	12	11	0.1	12	6	0.4	11	4	0.2	6	3	0.1	4	2	0.2	4	0	62.7	2	0	0.0	1	64
2038	15	0.1	18	13	0.1	15	13	0.0	13	12	0.1	13	7	0.4	12	5	0.2	7	4	0.1	5	3	0.2	5	1	59.7	3	0	42.1	2	103
2039	16	0.1	19	14	0.1	16	14	0.0	14	13	0.1	14	8	0.4	13	6	0.2	8	5	0.1	6	4	0.2	6	2	0.2	4	0	82.2	3	84
2040	17	0.1	20	15	0.1	17	15	0.0	15	14	0.1	15	9	0.4	14	7	0.2	9	6	0.1	7	5	0.2	7	3	0.2	5	0	120.4	4	122
2041	18	0.1	21	16	0.1	18	16	0.0	16	15	0.1	16	10	0.4	15	8	0.2	10	7	0.1	8	6	0.1	8	4	0.2	6	1	156.8	5	158
2042	19	0.1	22	17	0.1	19	17	0.0	17	16	0.1	17	11	0.3	16	9	0.2	11	8	0.1	9	7	0.1	9	5	0.2	7	2	0.5	6	2

LandGEM first-order decay rate equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10}\right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*) (0.05)
L_o = potential methane generation capacity (*m^3/Mg*) (170)
1 Ton= 0.908 Mg
OD= 286 operating days/year
C_{NMOC}= 600 (Note 1)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ii} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)
C_j= years since $cell_i$ disposal ceased at $year_j$ (Note 2)
T_j= years since $cell_i$ disposal began at $year_j$ (Note 2)
Ce_i= 85%
De_i= 98%

Note 1: NMOC concentration, to be determined by Tier 2 testing
Note 2: Refer to **EXHIBIT 14-1.3, Cell Sequence and Site Life Summary**, for cell phasing.
Note 3: LFG collection begins two (2) years after cell closure

February 2018

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-1

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate *(year^{-1})*

L_o = potential methane generation capacity *(m^3/Mg)*

M_i = mass of waste accepted in the i^{th} year *(Mg)*

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2020**	
Landfill Closure Year (with 80-year limit)	**2023**	
Actual Closure Year (without limit)	***2023***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**1,933,439**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2020	260,000	286,000	0	0
2021	520,000	572,000	260,000	286,000
2022	780,000	858,000	780,000	858,000
2023	197,672	217,439	1,560,000	1,716,000
2024	0	0	1,757,672	1,933,439
2025	0	0	1,757,672	1,933,439
2026	0	0	1,757,672	1,933,439
2027	0	0	1,757,672	1,933,439
2028	0	0	1,757,672	1,933,439
2029	0	0	1,757,672	1,933,439
2030	0	0	1,757,672	1,933,439
2031	0	0	1,757,672	1,933,439
2032	0	0	1,757,672	1,933,439
2033	0	0	1,757,672	1,933,439
2034	0	0	1,757,672	1,933,439
2035	0	0	1,757,672	1,933,439
2036	0	0	1,757,672	1,933,439
2037	0	0	1,757,672	1,933,439
2038	0	0	1,757,672	1,933,439
2039	0	0	1,757,672	1,933,439
2040	0	0	1,757,672	1,933,439
2041	0	0	1,757,672	1,933,439
2042	0	0	1,757,672	1,933,439
2043	0	0	1,757,672	1,933,439
2044	0	0	1,757,672	1,933,439
2045	0	0	1,757,672	1,933,439
2046	0	0	1,757,672	1,933,439
2047	0	0	1,757,672	1,933,439
2048	0	0	1,757,672	1,933,439
2049	0	0	1,757,672	1,933,439
2050	0	0	1,757,672	1,933,439
2051	0	0	1,757,672	1,933,439
2052	0	0	1,757,672	1,933,439
2053	0	0	1,757,672	1,933,439
2054	0	0	1,757,672	1,933,439
2055	0	0	1,757,672	1,933,439
2056	0	0	1,757,672	1,933,439
2057	0	0	1,757,672	1,933,439
2058	0	0	1,757,672	1,933,439
2059	0	0	1,757,672	1,933,439

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2020	0	0	0	0	0	0
2021	9.295E+00	2.593E+03	1.742E-01	1.442E+03	2.161E+06	1.452E+02
2022	2.743E+01	7.653E+03	5.142E-01	4.255E+03	6.378E+06	4.285E+02
2023	5.398E+01	1.506E+04	1.012E+00	8.373E+03	1.255E+07	8.432E+02
2024	5.842E+01	1.630E+04	1.095E+00	9.060E+03	1.358E+07	9.125E+02
2025	5.557E+01	1.550E+04	1.042E+00	8.619E+03	1.292E+07	8.680E+02
2026	5.286E+01	1.475E+04	9.908E-01	8.198E+03	1.229E+07	8.257E+02
2027	5.028E+01	1.403E+04	9.425E-01	7.798E+03	1.169E+07	7.854E+02
2028	4.783E+01	1.334E+04	8.965E-01	7.418E+03	1.112E+07	7.471E+02
2029	4.549E+01	1.269E+04	8.528E-01	7.056E+03	1.058E+07	7.107E+02
2030	4.328E+01	1.207E+04	8.112E-01	6.712E+03	1.006E+07	6.760E+02
2031	4.117E+01	1.148E+04	7.716E-01	6.385E+03	9.570E+06	6.430E+02
2032	3.916E+01	1.092E+04	7.340E-01	6.073E+03	9.103E+06	6.117E+02
2033	3.725E+01	1.039E+04	6.982E-01	5.777E+03	8.660E+06	5.818E+02
2034	3.543E+01	9.885E+03	6.641E-01	5.495E+03	8.237E+06	5.535E+02
2035	3.370E+01	9.403E+03	6.318E-01	5.227E+03	7.835E+06	5.265E+02
2036	3.206E+01	8.944E+03	6.009E-01	4.972E+03	7.453E+06	5.008E+02
2037	3.050E+01	8.508E+03	5.716E-01	4.730E+03	7.090E+06	4.764E+02
2038	2.901E+01	8.093E+03	5.438E-01	4.499E+03	6.744E+06	4.531E+02
2039	2.759E+01	7.698E+03	5.172E-01	4.280E+03	6.415E+06	4.310E+02
2040	2.625E+01	7.323E+03	4.920E-01	4.071E+03	6.102E+06	4.100E+02
2041	2.497E+01	6.966E+03	4.680E-01	3.873E+03	5.805E+06	3.900E+02
2042	2.375E+01	6.626E+03	4.452E-01	3.684E+03	5.522E+06	3.710E+02
2043	2.259E+01	6.303E+03	4.235E-01	3.504E+03	5.252E+06	3.529E+02
2044	2.149E+01	5.995E+03	4.028E-01	3.333E+03	4.996E+06	3.357E+02
2045	2.044E+01	5.703E+03	3.832E-01	3.171E+03	4.752E+06	3.193E+02
2046	1.944E+01	5.425E+03	3.645E-01	3.016E+03	4.521E+06	3.037E+02
2047	1.850E+01	5.160E+03	3.467E-01	2.869E+03	4.300E+06	2.889E+02
2048	1.759E+01	4.909E+03	3.298E-01	2.729E+03	4.090E+06	2.748E+02
2049	1.674E+01	4.669E+03	3.137E-01	2.596E+03	3.891E+06	2.614E+02
2050	1.592E+01	4.441E+03	2.984E-01	2.469E+03	3.701E+06	2.487E+02
2051	1.514E+01	4.225E+03	2.839E-01	2.349E+03	3.521E+06	2.366E+02
2052	1.441E+01	4.019E+03	2.700E-01	2.234E+03	3.349E+06	2.250E+02
2053	1.370E+01	3.823E+03	2.569E-01	2.125E+03	3.186E+06	2.140E+02
2054	1.303E+01	3.636E+03	2.443E-01	2.022E+03	3.030E+06	2.036E+02
2055	1.240E+01	3.459E+03	2.324E-01	1.923E+03	2.882E+06	1.937E+02
2056	1.179E+01	3.290E+03	2.211E-01	1.829E+03	2.742E+06	1.842E+02
2057	1.122E+01	3.130E+03	2.103E-01	1.740E+03	2.608E+06	1.752E+02
2058	1.067E+01	2.977E+03	2.000E-01	1.655E+03	2.481E+06	1.667E+02
2059	1.015E+01	2.832E+03	1.903E-01	1.574E+03	2.360E+06	1.586E+02
2060	9.656E+00	2.694E+03	1.810E-01	1.498E+03	2.245E+06	1.508E+02
2061	9.185E+00	2.562E+03	1.722E-01	1.425E+03	2.135E+06	1.435E+02
2062	8.737E+00	2.438E+03	1.638E-01	1.355E+03	2.031E+06	1.365E+02
2063	8.311E+00	2.319E+03	1.558E-01	1.289E+03	1.932E+06	1.298E+02
2064	7.906E+00	2.206E+03	1.482E-01	1.226E+03	1.838E+06	1.235E+02
2065	7.520E+00	2.098E+03	1.410E-01	1.166E+03	1.748E+06	1.175E+02
2066	7.153E+00	1.996E+03	1.341E-01	1.110E+03	1.663E+06	1.117E+02
2067	6.805E+00	1.898E+03	1.275E-01	1.055E+03	1.582E+06	1.063E+02
2068	6.473E+00	1.806E+03	1.213E-01	1.004E+03	1.505E+06	1.011E+02
2069	6.157E+00	1.718E+03	1.154E-01	9.550E+02	1.431E+06	9.618E+01

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-2

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2023**	
Landfill Closure Year (with 80-year limit)	**2025**	
Actual Closure Year (without limit)	***2025***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**2,534,687**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2023	842,328	926,561	0	0
2024	1,300,000	1,430,000	842,328	926,561
2025	161,933	178,126	2,142,328	2,356,561
2026	0	0	2,304,261	2,534,687
2027	0	0	2,304,261	2,534,687
2028	0	0	2,304,261	2,534,687
2029	0	0	2,304,261	2,534,687
2030	0	0	2,304,261	2,534,687
2031	0	0	2,304,261	2,534,687
2032	0	0	2,304,261	2,534,687
2033	0	0	2,304,261	2,534,687
2034	0	0	2,304,261	2,534,687
2035	0	0	2,304,261	2,534,687
2036	0	0	2,304,261	2,534,687
2037	0	0	2,304,261	2,534,687
2038	0	0	2,304,261	2,534,687
2039	0	0	2,304,261	2,534,687
2040	0	0	2,304,261	2,534,687
2041	0	0	2,304,261	2,534,687
2042	0	0	2,304,261	2,534,687
2043	0	0	2,304,261	2,534,687
2044	0	0	2,304,261	2,534,687
2045	0	0	2,304,261	2,534,687
2046	0	0	2,304,261	2,534,687
2047	0	0	2,304,261	2,534,687
2048	0	0	2,304,261	2,534,687
2049	0	0	2,304,261	2,534,687
2050	0	0	2,304,261	2,534,687
2051	0	0	2,304,261	2,534,687
2052	0	0	2,304,261	2,534,687
2053	0	0	2,304,261	2,534,687
2054	0	0	2,304,261	2,534,687
2055	0	0	2,304,261	2,534,687
2056	0	0	2,304,261	2,534,687
2057	0	0	2,304,261	2,534,687
2058	0	0	2,304,261	2,534,687
2059	0	0	2,304,261	2,534,687
2060	0	0	2,304,261	2,534,687
2061	0	0	2,304,261	2,534,687
2062	0	0	2,304,261	2,534,687

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2023	0	0	0	0	0	0
2024	3.011E+01	8.401E+03	5.645E-01	4.671E+03	7.001E+06	4.704E+02
2025	7.512E+01	2.096E+04	1.408E+00	1.165E+04	1.747E+07	1.173E+03
2026	7.725E+01	2.155E+04	1.448E+00	1.198E+04	1.796E+07	1.207E+03
2027	7.348E+01	2.050E+04	1.377E+00	1.140E+04	1.708E+07	1.148E+03
2028	6.990E+01	1.950E+04	1.310E+00	1.084E+04	1.625E+07	1.092E+03
2029	6.649E+01	1.855E+04	1.246E+00	1.031E+04	1.546E+07	1.039E+03
2030	6.325E+01	1.764E+04	1.186E+00	9.810E+03	1.470E+07	9.879E+02
2031	6.016E+01	1.678E+04	1.128E+00	9.331E+03	1.399E+07	9.398E+02
2032	5.723E+01	1.597E+04	1.073E+00	8.876E+03	1.330E+07	8.939E+02
2033	5.444E+01	1.519E+04	1.020E+00	8.443E+03	1.266E+07	8.503E+02
2034	5.178E+01	1.445E+04	9.706E-01	8.031E+03	1.204E+07	8.089E+02
2035	4.926E+01	1.374E+04	9.233E-01	7.640E+03	1.145E+07	7.694E+02
2036	4.685E+01	1.307E+04	8.783E-01	7.267E+03	1.089E+07	7.319E+02
2037	4.457E+01	1.243E+04	8.354E-01	6.913E+03	1.036E+07	6.962E+02
2038	4.240E+01	1.183E+04	7.947E-01	6.576E+03	9.856E+06	6.622E+02
2039	4.033E+01	1.125E+04	7.559E-01	6.255E+03	9.376E+06	6.299E+02
2040	3.836E+01	1.070E+04	7.191E-01	5.950E+03	8.918E+06	5.992E+02
2041	3.649E+01	1.018E+04	6.840E-01	5.660E+03	8.483E+06	5.700E+02
2042	3.471E+01	9.684E+03	6.506E-01	5.384E+03	8.070E+06	5.422E+02
2043	3.302E+01	9.211E+03	6.189E-01	5.121E+03	7.676E+06	5.158E+02
2044	3.141E+01	8.762E+03	5.887E-01	4.871E+03	7.302E+06	4.906E+02
2045	2.988E+01	8.335E+03	5.600E-01	4.634E+03	6.946E+06	4.667E+02
2046	2.842E+01	7.928E+03	5.327E-01	4.408E+03	6.607E+06	4.439E+02
2047	2.703E+01	7.542E+03	5.067E-01	4.193E+03	6.285E+06	4.223E+02
2048	2.571E+01	7.174E+03	4.820E-01	3.988E+03	5.978E+06	4.017E+02
2049	2.446E+01	6.824E+03	4.585E-01	3.794E+03	5.687E+06	3.821E+02
2050	2.327E+01	6.491E+03	4.361E-01	3.609E+03	5.409E+06	3.634E+02
2051	2.213E+01	6.174E+03	4.149E-01	3.433E+03	5.145E+06	3.457E+02
2052	2.105E+01	5.873E+03	3.946E-01	3.265E+03	4.894E+06	3.289E+02
2053	2.003E+01	5.587E+03	3.754E-01	3.106E+03	4.656E+06	3.128E+02
2054	1.905E+01	5.314E+03	3.571E-01	2.955E+03	4.429E+06	2.976E+02
2055	1.812E+01	5.055E+03	3.397E-01	2.810E+03	4.213E+06	2.831E+02
2056	1.724E+01	4.809E+03	3.231E-01	2.673E+03	4.007E+06	2.692E+02
2057	1.640E+01	4.574E+03	3.073E-01	2.543E+03	3.812E+06	2.561E+02
2058	1.560E+01	4.351E+03	2.923E-01	2.419E+03	3.626E+06	2.436E+02
2059	1.484E+01	4.139E+03	2.781E-01	2.301E+03	3.449E+06	2.317E+02
2060	1.411E+01	3.937E+03	2.645E-01	2.189E+03	3.281E+06	2.204E+02
2061	1.342E+01	3.745E+03	2.516E-01	2.082E+03	3.121E+06	2.097E+02
2062	1.277E+01	3.562E+03	2.394E-01	1.981E+03	2.969E+06	1.995E+02
2063	1.215E+01	3.389E+03	2.277E-01	1.884E+03	2.824E+06	1.897E+02
2064	1.155E+01	3.223E+03	2.166E-01	1.792E+03	2.686E+06	1.805E+02
2065	1.099E+01	3.066E+03	2.060E-01	1.705E+03	2.555E+06	1.717E+02
2066	1.045E+01	2.917E+03	1.960E-01	1.622E+03	2.431E+06	1.633E+02
2067	9.945E+00	2.774E+03	1.864E-01	1.542E+03	2.312E+06	1.553E+02
2068	9.460E+00	2.639E+03	1.773E-01	1.467E+03	2.199E+06	1.478E+02
2069	8.998E+00	2.510E+03	1.687E-01	1.396E+03	2.092E+06	1.406E+02
2070	8.559E+00	2.388E+03	1.604E-01	1.328E+03	1.990E+06	1.337E+02
2071	8.142E+00	2.271E+03	1.526E-01	1.263E+03	1.893E+06	1.272E+02
2072	7.745E+00	2.161E+03	1.452E-01	1.201E+03	1.801E+06	1.210E+02

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-3

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2025**	
Landfill Closure Year (with 80-year limit)	**2025**	
Actual Closure Year (without limit)	***2025***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**895,083**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2025	813,712	895,083	0	0
2026	0	0	813,712	895,083
2027	0	0	813,712	895,083
2028	0	0	813,712	895,083
2029	0	0	813,712	895,083
2030	0	0	813,712	895,083
2031	0	0	813,712	895,083
2032	0	0	813,712	895,083
2033	0	0	813,712	895,083
2034	0	0	813,712	895,083
2035	0	0	813,712	895,083
2036	0	0	813,712	895,083
2037	0	0	813,712	895,083
2038	0	0	813,712	895,083
2039	0	0	813,712	895,083
2040	0	0	813,712	895,083
2041	0	0	813,712	895,083
2042	0	0	813,712	895,083
2043	0	0	813,712	895,083
2044	0	0	813,712	895,083
2045	0	0	813,712	895,083
2046	0	0	813,712	895,083
2047	0	0	813,712	895,083
2048	0	0	813,712	895,083
2049	0	0	813,712	895,083
2050	0	0	813,712	895,083
2051	0	0	813,712	895,083
2052	0	0	813,712	895,083
2053	0	0	813,712	895,083
2054	0	0	813,712	895,083
2055	0	0	813,712	895,083
2056	0	0	813,712	895,083
2057	0	0	813,712	895,083
2058	0	0	813,712	895,083
2059	0	0	813,712	895,083
2060	0	0	813,712	895,083
2061	0	0	813,712	895,083
2062	0	0	813,712	895,083
2063	0	0	813,712	895,083
2064	0	0	813,712	895,083

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2025	0	0	0	0	0	0
2026	2.909E+01	8.116E+03	5.453E-01	4.512E+03	6.763E+06	4.544E+02
2027	2.767E+01	7.720E+03	5.187E-01	4.292E+03	6.434E+06	4.323E+02
2028	2.632E+01	7.344E+03	4.934E-01	4.083E+03	6.120E+06	4.112E+02
2029	2.504E+01	6.986E+03	4.694E-01	3.884E+03	5.821E+06	3.911E+02
2030	2.382E+01	6.645E+03	4.465E-01	3.694E+03	5.537E+06	3.721E+02
2031	2.266E+01	6.321E+03	4.247E-01	3.514E+03	5.267E+06	3.539E+02
2032	2.155E+01	6.013E+03	4.040E-01	3.343E+03	5.010E+06	3.366E+02
2033	2.050E+01	5.719E+03	3.843E-01	3.180E+03	4.766E+06	3.202E+02
2034	1.950E+01	5.440E+03	3.655E-01	3.025E+03	4.534E+06	3.046E+02
2035	1.855E+01	5.175E+03	3.477E-01	2.877E+03	4.313E+06	2.898E+02
2036	1.764E+01	4.923E+03	3.308E-01	2.737E+03	4.102E+06	2.756E+02
2037	1.678E+01	4.683E+03	3.146E-01	2.603E+03	3.902E+06	2.622E+02
2038	1.597E+01	4.454E+03	2.993E-01	2.476E+03	3.712E+06	2.494E+02
2039	1.519E+01	4.237E+03	2.847E-01	2.356E+03	3.531E+06	2.372E+02
2040	1.445E+01	4.030E+03	2.708E-01	2.241E+03	3.359E+06	2.257E+02
2041	1.374E+01	3.834E+03	2.576E-01	2.131E+03	3.195E+06	2.147E+02
2042	1.307E+01	3.647E+03	2.450E-01	2.027E+03	3.039E+06	2.042E+02
2043	1.243E+01	3.469E+03	2.331E-01	1.929E+03	2.891E+06	1.942E+02
2044	1.183E+01	3.300E+03	2.217E-01	1.835E+03	2.750E+06	1.848E+02
2045	1.125E+01	3.139E+03	2.109E-01	1.745E+03	2.616E+06	1.757E+02
2046	1.070E+01	2.986E+03	2.006E-01	1.660E+03	2.488E+06	1.672E+02
2047	1.018E+01	2.840E+03	1.908E-01	1.579E+03	2.367E+06	1.590E+02
2048	9.684E+00	2.702E+03	1.815E-01	1.502E+03	2.251E+06	1.513E+02
2049	9.211E+00	2.570E+03	1.727E-01	1.429E+03	2.142E+06	1.439E+02
2050	8.762E+00	2.445E+03	1.642E-01	1.359E+03	2.037E+06	1.369E+02
2051	8.335E+00	2.325E+03	1.562E-01	1.293E+03	1.938E+06	1.302E+02
2052	7.928E+00	2.212E+03	1.486E-01	1.230E+03	1.843E+06	1.238E+02
2053	7.542E+00	2.104E+03	1.414E-01	1.170E+03	1.753E+06	1.178E+02
2054	7.174E+00	2.001E+03	1.345E-01	1.113E+03	1.668E+06	1.121E+02
2055	6.824E+00	1.904E+03	1.279E-01	1.058E+03	1.586E+06	1.066E+02
2056	6.491E+00	1.811E+03	1.217E-01	1.007E+03	1.509E+06	1.014E+02
2057	6.175E+00	1.723E+03	1.157E-01	9.577E+02	1.436E+06	9.645E+01
2058	5.874E+00	1.639E+03	1.101E-01	9.110E+02	1.366E+06	9.175E+01
2059	5.587E+00	1.559E+03	1.047E-01	8.666E+02	1.299E+06	8.727E+01
2060	5.315E+00	1.483E+03	9.962E-02	8.243E+02	1.236E+06	8.302E+01
2061	5.055E+00	1.410E+03	9.476E-02	7.841E+02	1.175E+06	7.897E+01
2062	4.809E+00	1.342E+03	9.014E-02	7.459E+02	1.118E+06	7.512E+01
2063	4.574E+00	1.276E+03	8.574E-02	7.095E+02	1.063E+06	7.145E+01
2064	4.351E+00	1.214E+03	8.156E-02	6.749E+02	1.012E+06	6.797E+01
2065	4.139E+00	1.155E+03	7.758E-02	6.420E+02	9.623E+05	6.465E+01
2066	3.937E+00	1.098E+03	7.380E-02	6.107E+02	9.153E+05	6.150E+01
2067	3.745E+00	1.045E+03	7.020E-02	5.809E+02	8.707E+05	5.850E+01
2068	3.562E+00	9.939E+02	6.678E-02	5.525E+02	8.282E+05	5.565E+01
2069	3.389E+00	9.454E+02	6.352E-02	5.256E+02	7.878E+05	5.293E+01
2070	3.223E+00	8.993E+02	6.042E-02	5.000E+02	7.494E+05	5.035E+01
2071	3.066E+00	8.554E+02	5.748E-02	4.756E+02	7.129E+05	4.790E+01
2072	2.917E+00	8.137E+02	5.467E-02	4.524E+02	6.781E+05	4.556E+01
2073	2.774E+00	7.740E+02	5.201E-02	4.303E+02	6.450E+05	4.334E+01
2074	2.639E+00	7.363E+02	4.947E-02	4.093E+02	6.136E+05	4.122E+01

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-4

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate *(year^{-1})*

L_o = potential methane generation capacity *(m^3/Mg)*

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2025**	
Landfill Closure Year (with 80-year limit)	**2026**	
Actual Closure Year (without limit)	***2026***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**1,331,637**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2025	324,355	356,790	0	0
2026	886,224	974,847	324,355	356,790
2027	0	0	1,210,579	1,331,637
2028	0	0	1,210,579	1,331,637
2029	0	0	1,210,579	1,331,637
2030	0	0	1,210,579	1,331,637
2031	0	0	1,210,579	1,331,637
2032	0	0	1,210,579	1,331,637
2033	0	0	1,210,579	1,331,637
2034	0	0	1,210,579	1,331,637
2035	0	0	1,210,579	1,331,637
2036	0	0	1,210,579	1,331,637
2037	0	0	1,210,579	1,331,637
2038	0	0	1,210,579	1,331,637
2039	0	0	1,210,579	1,331,637
2040	0	0	1,210,579	1,331,637
2041	0	0	1,210,579	1,331,637
2042	0	0	1,210,579	1,331,637
2043	0	0	1,210,579	1,331,637
2044	0	0	1,210,579	1,331,637
2045	0	0	1,210,579	1,331,637
2046	0	0	1,210,579	1,331,637
2047	0	0	1,210,579	1,331,637
2048	0	0	1,210,579	1,331,637
2049	0	0	1,210,579	1,331,637
2050	0	0	1,210,579	1,331,637
2051	0	0	1,210,579	1,331,637
2052	0	0	1,210,579	1,331,637
2053	0	0	1,210,579	1,331,637
2054	0	0	1,210,579	1,331,637
2055	0	0	1,210,579	1,331,637
2056	0	0	1,210,579	1,331,637
2057	0	0	1,210,579	1,331,637
2058	0	0	1,210,579	1,331,637
2059	0	0	1,210,579	1,331,637
2060	0	0	1,210,579	1,331,637
2061	0	0	1,210,579	1,331,637
2062	0	0	1,210,579	1,331,637
2063	0	0	1,210,579	1,331,637
2064	0	0	1,210,579	1,331,637

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2025	0	0	0	0	0	0
2026	1.160E+01	3.235E+03	2.174E-01	1.799E+03	2.696E+06	1.811E+02
2027	4.271E+01	1.192E+04	8.007E-01	6.625E+03	9.931E+06	6.672E+02
2028	4.063E+01	1.134E+04	7.616E-01	6.302E+03	9.446E+06	6.347E+02
2029	3.865E+01	1.078E+04	7.245E-01	5.995E+03	8.986E+06	6.037E+02
2030	3.676E+01	1.026E+04	6.891E-01	5.702E+03	8.547E+06	5.743E+02
2031	3.497E+01	9.757E+03	6.555E-01	5.424E+03	8.130E+06	5.463E+02
2032	3.327E+01	9.281E+03	6.236E-01	5.160E+03	7.734E+06	5.196E+02
2033	3.164E+01	8.828E+03	5.932E-01	4.908E+03	7.357E+06	4.943E+02
2034	3.010E+01	8.398E+03	5.642E-01	4.669E+03	6.998E+06	4.702E+02
2035	2.863E+01	7.988E+03	5.367E-01	4.441E+03	6.657E+06	4.473E+02
2036	2.724E+01	7.598E+03	5.105E-01	4.224E+03	6.332E+06	4.254E+02
2037	2.591E+01	7.228E+03	4.856E-01	4.018E+03	6.023E+06	4.047E+02
2038	2.464E+01	6.875E+03	4.620E-01	3.822E+03	5.729E+06	3.850E+02
2039	2.344E+01	6.540E+03	4.394E-01	3.636E+03	5.450E+06	3.662E+02
2040	2.230E+01	6.221E+03	4.180E-01	3.459E+03	5.184E+06	3.483E+02
2041	2.121E+01	5.918E+03	3.976E-01	3.290E+03	4.931E+06	3.313E+02
2042	2.018E+01	5.629E+03	3.782E-01	3.129E+03	4.691E+06	3.152E+02
2043	1.919E+01	5.354E+03	3.598E-01	2.977E+03	4.462E+06	2.998E+02
2044	1.826E+01	5.093E+03	3.422E-01	2.832E+03	4.244E+06	2.852E+02
2045	1.737E+01	4.845E+03	3.255E-01	2.694E+03	4.037E+06	2.713E+02
2046	1.652E+01	4.609E+03	3.097E-01	2.562E+03	3.841E+06	2.580E+02
2047	1.571E+01	4.384E+03	2.946E-01	2.437E+03	3.653E+06	2.455E+02
2048	1.495E+01	4.170E+03	2.802E-01	2.318E+03	3.475E+06	2.335E+02
2049	1.422E+01	3.967E+03	2.665E-01	2.205E+03	3.306E+06	2.221E+02
2050	1.353E+01	3.773E+03	2.535E-01	2.098E+03	3.144E+06	2.113E+02
2051	1.287E+01	3.589E+03	2.412E-01	1.995E+03	2.991E+06	2.010E+02
2052	1.224E+01	3.414E+03	2.294E-01	1.898E+03	2.845E+06	1.912E+02
2053	1.164E+01	3.248E+03	2.182E-01	1.806E+03	2.706E+06	1.818E+02
2054	1.107E+01	3.089E+03	2.076E-01	1.718E+03	2.574E+06	1.730E+02
2055	1.053E+01	2.939E+03	1.974E-01	1.634E+03	2.449E+06	1.645E+02
2056	1.002E+01	2.795E+03	1.878E-01	1.554E+03	2.329E+06	1.565E+02
2057	9.531E+00	2.659E+03	1.787E-01	1.478E+03	2.216E+06	1.489E+02
2058	9.066E+00	2.529E+03	1.699E-01	1.406E+03	2.108E+06	1.416E+02
2059	8.624E+00	2.406E+03	1.617E-01	1.338E+03	2.005E+06	1.347E+02
2060	8.203E+00	2.289E+03	1.538E-01	1.272E+03	1.907E+06	1.281E+02
2061	7.803E+00	2.177E+03	1.463E-01	1.210E+03	1.814E+06	1.219E+02
2062	7.423E+00	2.071E+03	1.391E-01	1.151E+03	1.726E+06	1.159E+02
2063	7.061E+00	1.970E+03	1.324E-01	1.095E+03	1.642E+06	1.103E+02
2064	6.716E+00	1.874E+03	1.259E-01	1.042E+03	1.561E+06	1.049E+02
2065	6.389E+00	1.782E+03	1.198E-01	9.909E+02	1.485E+06	9.980E+01
2066	6.077E+00	1.695E+03	1.139E-01	9.426E+02	1.413E+06	9.493E+01
2067	5.781E+00	1.613E+03	1.084E-01	8.966E+02	1.344E+06	9.030E+01
2068	5.499E+00	1.534E+03	1.031E-01	8.529E+02	1.278E+06	8.590E+01
2069	5.231E+00	1.459E+03	9.805E-02	8.113E+02	1.216E+06	8.171E+01
2070	4.976E+00	1.388E+03	9.327E-02	7.717E+02	1.157E+06	7.772E+01
2071	4.733E+00	1.320E+03	8.872E-02	7.341E+02	1.100E+06	7.393E+01
2072	4.502E+00	1.256E+03	8.439E-02	6.983E+02	1.047E+06	7.033E+01
2073	4.283E+00	1.195E+03	8.028E-02	6.642E+02	9.956E+05	6.690E+01
2074	4.074E+00	1.136E+03	7.636E-02	6.318E+02	9.471E+05	6.363E+01

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-5

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2026**	
Landfill Closure Year (with 80-year limit)	**2031**	
Actual Closure Year (without limit)	***2031***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**6,687,563**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2026	413,776	455,153	0	0
2027	1,300,000	1,430,000	413,776	455,153
2028	1,300,000	1,430,000	1,713,776	1,885,153
2029	1,300,000	1,430,000	3,013,776	3,315,153
2030	1,300,000	1,430,000	4,313,776	4,745,153
2031	465,827	512,409	5,613,776	6,175,153
2032	0	0	6,079,603	6,687,563
2033	0	0	6,079,603	6,687,563
2034	0	0	6,079,603	6,687,563
2035	0	0	6,079,603	6,687,563
2036	0	0	6,079,603	6,687,563
2037	0	0	6,079,603	6,687,563
2038	0	0	6,079,603	6,687,563
2039	0	0	6,079,603	6,687,563
2040	0	0	6,079,603	6,687,563
2041	0	0	6,079,603	6,687,563
2042	0	0	6,079,603	6,687,563
2043	0	0	6,079,603	6,687,563
2044	0	0	6,079,603	6,687,563
2045	0	0	6,079,603	6,687,563
2046	0	0	6,079,603	6,687,563
2047	0	0	6,079,603	6,687,563
2048	0	0	6,079,603	6,687,563
2049	0	0	6,079,603	6,687,563
2050	0	0	6,079,603	6,687,563
2051	0	0	6,079,603	6,687,563
2052	0	0	6,079,603	6,687,563
2053	0	0	6,079,603	6,687,563
2054	0	0	6,079,603	6,687,563
2055	0	0	6,079,603	6,687,563
2056	0	0	6,079,603	6,687,563
2057	0	0	6,079,603	6,687,563
2058	0	0	6,079,603	6,687,563
2059	0	0	6,079,603	6,687,563
2060	0	0	6,079,603	6,687,563
2061	0	0	6,079,603	6,687,563
2062	0	0	6,079,603	6,687,563
2063	0	0	6,079,603	6,687,563
2064	0	0	6,079,603	6,687,563
2065	0	0	6,079,603	6,687,563

Results

Year	NMOC			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2026	0	0	0	0	0	0
2027	1.479E+01	4.127E+03	2.773E-01	2.294E+03	3.439E+06	2.311E+02
2028	6.055E+01	1.689E+04	1.135E+00	9.391E+03	1.408E+07	9.458E+02
2029	1.041E+02	2.903E+04	1.951E+00	1.614E+04	2.420E+07	1.626E+03
2030	1.455E+02	4.058E+04	2.727E+00	2.256E+04	3.382E+07	2.272E+03
2031	1.849E+02	5.157E+04	3.465E+00	2.867E+04	4.298E+07	2.888E+03
2032	1.925E+02	5.370E+04	3.608E+00	2.986E+04	4.475E+07	3.007E+03
2033	1.831E+02	5.108E+04	3.432E+00	2.840E+04	4.257E+07	2.860E+03
2034	1.742E+02	4.859E+04	3.265E+00	2.702E+04	4.049E+07	2.721E+03
2035	1.657E+02	4.622E+04	3.106E+00	2.570E+04	3.852E+07	2.588E+03
2036	1.576E+02	4.397E+04	2.954E+00	2.444E+04	3.664E+07	2.462E+03
2037	1.499E+02	4.182E+04	2.810E+00	2.325E+04	3.485E+07	2.342E+03
2038	1.426E+02	3.978E+04	2.673E+00	2.212E+04	3.315E+07	2.228E+03
2039	1.356E+02	3.784E+04	2.543E+00	2.104E+04	3.154E+07	2.119E+03
2040	1.290E+02	3.600E+04	2.419E+00	2.001E+04	3.000E+07	2.016E+03
2041	1.227E+02	3.424E+04	2.301E+00	1.904E+04	2.854E+07	1.917E+03
2042	1.168E+02	3.257E+04	2.189E+00	1.811E+04	2.714E+07	1.824E+03
2043	1.111E+02	3.098E+04	2.082E+00	1.723E+04	2.582E+07	1.735E+03
2044	1.056E+02	2.947E+04	1.980E+00	1.639E+04	2.456E+07	1.650E+03
2045	1.005E+02	2.804E+04	1.884E+00	1.559E+04	2.336E+07	1.570E+03
2046	9.559E+01	2.667E+04	1.792E+00	1.483E+04	2.222E+07	1.493E+03
2047	9.093E+01	2.537E+04	1.704E+00	1.410E+04	2.114E+07	1.420E+03
2048	8.649E+01	2.413E+04	1.621E+00	1.342E+04	2.011E+07	1.351E+03
2049	8.228E+01	2.295E+04	1.542E+00	1.276E+04	1.913E+07	1.285E+03
2050	7.826E+01	2.183E+04	1.467E+00	1.214E+04	1.819E+07	1.223E+03
2051	7.445E+01	2.077E+04	1.395E+00	1.155E+04	1.731E+07	1.163E+03
2052	7.082E+01	1.976E+04	1.327E+00	1.098E+04	1.646E+07	1.106E+03
2053	6.736E+01	1.879E+04	1.263E+00	1.045E+04	1.566E+07	1.052E+03
2054	6.408E+01	1.788E+04	1.201E+00	9.938E+03	1.490E+07	1.001E+03
2055	6.095E+01	1.700E+04	1.143E+00	9.454E+03	1.417E+07	9.521E+02
2056	5.798E+01	1.617E+04	1.087E+00	8.993E+03	1.348E+07	9.057E+02
2057	5.515E+01	1.539E+04	1.034E+00	8.554E+03	1.282E+07	8.615E+02
2058	5.246E+01	1.464E+04	9.834E-01	8.137E+03	1.220E+07	8.195E+02
2059	4.990E+01	1.392E+04	9.354E-01	7.740E+03	1.160E+07	7.795E+02
2060	4.747E+01	1.324E+04	8.898E-01	7.363E+03	1.104E+07	7.415E+02
2061	4.515E+01	1.260E+04	8.464E-01	7.003E+03	1.050E+07	7.053E+02
2062	4.295E+01	1.198E+04	8.051E-01	6.662E+03	9.986E+06	6.709E+02
2063	4.086E+01	1.140E+04	7.659E-01	6.337E+03	9.499E+06	6.382E+02
2064	3.886E+01	1.084E+04	7.285E-01	6.028E+03	9.035E+06	6.071E+02
2065	3.697E+01	1.031E+04	6.930E-01	5.734E+03	8.595E+06	5.775E+02
2066	3.517E+01	9.811E+03	6.592E-01	5.454E+03	8.176E+06	5.493E+02
2067	3.345E+01	9.332E+03	6.270E-01	5.188E+03	7.777E+06	5.225E+02
2068	3.182E+01	8.877E+03	5.964E-01	4.935E+03	7.398E+06	4.970E+02
2069	3.027E+01	8.444E+03	5.674E-01	4.695E+03	7.037E+06	4.728E+02
2070	2.879E+01	8.032E+03	5.397E-01	4.466E+03	6.694E+06	4.497E+02
2071	2.739E+01	7.641E+03	5.134E-01	4.248E+03	6.367E+06	4.278E+02
2072	2.605E+01	7.268E+03	4.883E-01	4.041E+03	6.057E+06	4.069E+02
2073	2.478E+01	6.913E+03	4.645E-01	3.844E+03	5.761E+06	3.871E+02
2074	2.357E+01	6.576E+03	4.419E-01	3.656E+03	5.480E+06	3.682E+02
2075	2.242E+01	6.256E+03	4.203E-01	3.478E+03	5.213E+06	3.503E+02

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S2-6

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*year^{-1}*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2031**	
Landfill Closure Year (with 80-year limit)	**2033**	
Actual Closure Year (without limit)	***2033***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**2,661,937**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2031	834,173	917,591	0	0
2032	1,300,000	1,430,000	834,173	917,591
2033	285,770	314,347	2,134,173	2,347,591
2034	0	0	2,419,943	2,661,937
2035	0	0	2,419,943	2,661,937
2036	0	0	2,419,943	2,661,937
2037	0	0	2,419,943	2,661,937
2038	0	0	2,419,943	2,661,937
2039	0	0	2,419,943	2,661,937
2040	0	0	2,419,943	2,661,937
2041	0	0	2,419,943	2,661,937
2042	0	0	2,419,943	2,661,937
2043	0	0	2,419,943	2,661,937
2044	0	0	2,419,943	2,661,937
2045	0	0	2,419,943	2,661,937
2046	0	0	2,419,943	2,661,937
2047	0	0	2,419,943	2,661,937
2048	0	0	2,419,943	2,661,937
2049	0	0	2,419,943	2,661,937
2050	0	0	2,419,943	2,661,937
2051	0	0	2,419,943	2,661,937
2052	0	0	2,419,943	2,661,937
2053	0	0	2,419,943	2,661,937
2054	0	0	2,419,943	2,661,937
2055	0	0	2,419,943	2,661,937
2056	0	0	2,419,943	2,661,937
2057	0	0	2,419,943	2,661,937
2058	0	0	2,419,943	2,661,937
2059	0	0	2,419,943	2,661,937
2060	0	0	2,419,943	2,661,937
2061	0	0	2,419,943	2,661,937
2062	0	0	2,419,943	2,661,937
2063	0	0	2,419,943	2,661,937
2064	0	0	2,419,943	2,661,937
2065	0	0	2,419,943	2,661,937
2066	0	0	2,419,943	2,661,937
2067	0	0	2,419,943	2,661,937
2068	0	0	2,419,943	2,661,937
2069	0	0	2,419,943	2,661,937
2070	0	0	2,419,943	2,661,937

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2031	0	0	0	0	0	0
2032	2.982E+01	8.320E+03	5.590E-01	4.626E+03	6.933E+06	4.659E+02
2033	7.485E+01	2.088E+04	1.403E+00	1.161E+04	1.740E+07	1.169E+03
2034	8.141E+01	2.271E+04	1.526E+00	1.263E+04	1.893E+07	1.272E+03
2035	7.744E+01	2.160E+04	1.452E+00	1.201E+04	1.800E+07	1.210E+03
2036	7.367E+01	2.055E+04	1.381E+00	1.143E+04	1.713E+07	1.151E+03
2037	7.007E+01	1.955E+04	1.313E+00	1.087E+04	1.629E+07	1.095E+03
2038	6.665E+01	1.860E+04	1.249E+00	1.034E+04	1.550E+07	1.041E+03
2039	6.340E+01	1.769E+04	1.188E+00	9.834E+03	1.474E+07	9.904E+02
2040	6.031E+01	1.683E+04	1.131E+00	9.354E+03	1.402E+07	9.421E+02
2041	5.737E+01	1.601E+04	1.075E+00	8.898E+03	1.334E+07	8.962E+02
2042	5.457E+01	1.522E+04	1.023E+00	8.464E+03	1.269E+07	8.525E+02
2043	5.191E+01	1.448E+04	9.731E-01	8.051E+03	1.207E+07	8.109E+02
2044	4.938E+01	1.378E+04	9.256E-01	7.659E+03	1.148E+07	7.713E+02
2045	4.697E+01	1.310E+04	8.805E-01	7.285E+03	1.092E+07	7.337E+02
2046	4.468E+01	1.246E+04	8.375E-01	6.930E+03	1.039E+07	6.979E+02
2047	4.250E+01	1.186E+04	7.967E-01	6.592E+03	9.881E+06	6.639E+02
2048	4.043E+01	1.128E+04	7.578E-01	6.270E+03	9.399E+06	6.315E+02
2049	3.846E+01	1.073E+04	7.209E-01	5.965E+03	8.941E+06	6.007E+02
2050	3.658E+01	1.021E+04	6.857E-01	5.674E+03	8.505E+06	5.714E+02
2051	3.480E+01	9.708E+03	6.523E-01	5.397E+03	8.090E+06	5.435E+02
2052	3.310E+01	9.234E+03	6.204E-01	5.134E+03	7.695E+06	5.170E+02
2053	3.149E+01	8.784E+03	5.902E-01	4.883E+03	7.320E+06	4.918E+02
2054	2.995E+01	8.355E+03	5.614E-01	4.645E+03	6.963E+06	4.678E+02
2055	2.849E+01	7.948E+03	5.340E-01	4.419E+03	6.623E+06	4.450E+02
2056	2.710E+01	7.560E+03	5.080E-01	4.203E+03	6.300E+06	4.233E+02
2057	2.578E+01	7.192E+03	4.832E-01	3.998E+03	5.993E+06	4.027E+02
2058	2.452E+01	6.841E+03	4.596E-01	3.803E+03	5.701E+06	3.830E+02
2059	2.333E+01	6.507E+03	4.372E-01	3.618E+03	5.423E+06	3.644E+02
2060	2.219E+01	6.190E+03	4.159E-01	3.441E+03	5.158E+06	3.466E+02
2061	2.111E+01	5.888E+03	3.956E-01	3.273E+03	4.907E+06	3.297E+02
2062	2.008E+01	5.601E+03	3.763E-01	3.114E+03	4.667E+06	3.136E+02
2063	1.910E+01	5.328E+03	3.580E-01	2.962E+03	4.440E+06	2.983E+02
2064	1.817E+01	5.068E+03	3.405E-01	2.818E+03	4.223E+06	2.838E+02
2065	1.728E+01	4.821E+03	3.239E-01	2.680E+03	4.017E+06	2.699E+02
2066	1.644E+01	4.586E+03	3.081E-01	2.549E+03	3.821E+06	2.568E+02
2067	1.564E+01	4.362E+03	2.931E-01	2.425E+03	3.635E+06	2.442E+02
2068	1.487E+01	4.149E+03	2.788E-01	2.307E+03	3.458E+06	2.323E+02
2069	1.415E+01	3.947E+03	2.652E-01	2.194E+03	3.289E+06	2.210E+02
2070	1.346E+01	3.754E+03	2.523E-01	2.087E+03	3.129E+06	2.102E+02
2071	1.280E+01	3.571E+03	2.400E-01	1.985E+03	2.976E+06	2.000E+02
2072	1.218E+01	3.397E+03	2.283E-01	1.889E+03	2.831E+06	1.902E+02
2073	1.158E+01	3.231E+03	2.171E-01	1.797E+03	2.693E+06	1.809E+02
2074	1.102E+01	3.074E+03	2.065E-01	1.709E+03	2.562E+06	1.721E+02
2075	1.048E+01	2.924E+03	1.965E-01	1.626E+03	2.437E+06	1.637E+02
2076	9.969E+00	2.781E+03	1.869E-01	1.546E+03	2.318E+06	1.557E+02
2077	9.483E+00	2.646E+03	1.778E-01	1.471E+03	2.205E+06	1.481E+02
2078	9.021E+00	2.517E+03	1.691E-01	1.399E+03	2.097E+06	1.409E+02
2079	8.581E+00	2.394E+03	1.608E-01	1.331E+03	1.995E+06	1.340E+02
2080	8.162E+00	2.277E+03	1.530E-01	1.266E+03	1.898E+06	1.275E+02

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S3-1

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*year*$^{-1}$)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2033**	
Landfill Closure Year (with 80-year limit)	**2033**	
Actual Closure Year (without limit)	***2033***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**995,609**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*year^{-1}*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2033	905,099	995,609	0	0
2034	0	0	905,099	995,609
2035	0	0	905,099	995,609
2036	0	0	905,099	995,609
2037	0	0	905,099	995,609
2038	0	0	905,099	995,609
2039	0	0	905,099	995,609
2040	0	0	905,099	995,609
2041	0	0	905,099	995,609
2042	0	0	905,099	995,609
2043	0	0	905,099	995,609
2044	0	0	905,099	995,609
2045	0	0	905,099	995,609
2046	0	0	905,099	995,609
2047	0	0	905,099	995,609
2048	0	0	905,099	995,609
2049	0	0	905,099	995,609
2050	0	0	905,099	995,609
2051	0	0	905,099	995,609
2052	0	0	905,099	995,609
2053	0	0	905,099	995,609
2054	0	0	905,099	995,609
2055	0	0	905,099	995,609
2056	0	0	905,099	995,609
2057	0	0	905,099	995,609
2058	0	0	905,099	995,609
2059	0	0	905,099	995,609
2060	0	0	905,099	995,609
2061	0	0	905,099	995,609
2062	0	0	905,099	995,609
2063	0	0	905,099	995,609
2064	0	0	905,099	995,609
2065	0	0	905,099	995,609
2066	0	0	905,099	995,609
2067	0	0	905,099	995,609
2068	0	0	905,099	995,609
2069	0	0	905,099	995,609
2070	0	0	905,099	995,609
2071	0	0	905,099	995,609
2072	0	0	905,099	995,609

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2033	0	0	0	0	0	0
2034	3.236E+01	9.028E+03	6.066E-01	5.019E+03	7.523E+06	5.055E+02
2035	3.078E+01	8.587E+03	5.770E-01	4.774E+03	7.156E+06	4.808E+02
2036	2.928E+01	8.168E+03	5.488E-01	4.541E+03	6.807E+06	4.574E+02
2037	2.785E+01	7.770E+03	5.221E-01	4.320E+03	6.475E+06	4.351E+02
2038	2.649E+01	7.391E+03	4.966E-01	4.109E+03	6.159E+06	4.138E+02
2039	2.520E+01	7.031E+03	4.724E-01	3.909E+03	5.859E+06	3.937E+02
2040	2.397E+01	6.688E+03	4.494E-01	3.718E+03	5.573E+06	3.745E+02
2041	2.280E+01	6.362E+03	4.274E-01	3.537E+03	5.301E+06	3.562E+02
2042	2.169E+01	6.051E+03	4.066E-01	3.364E+03	5.043E+06	3.388E+02
2043	2.063E+01	5.756E+03	3.868E-01	3.200E+03	4.797E+06	3.223E+02
2044	1.963E+01	5.475E+03	3.679E-01	3.044E+03	4.563E+06	3.066E+02
2045	1.867E+01	5.208E+03	3.500E-01	2.896E+03	4.340E+06	2.916E+02
2046	1.776E+01	4.954E+03	3.329E-01	2.754E+03	4.129E+06	2.774E+02
2047	1.689E+01	4.713E+03	3.167E-01	2.620E+03	3.927E+06	2.639E+02
2048	1.607E+01	4.483E+03	3.012E-01	2.492E+03	3.736E+06	2.510E+02
2049	1.529E+01	4.264E+03	2.865E-01	2.371E+03	3.554E+06	2.388E+02
2050	1.454E+01	4.056E+03	2.725E-01	2.255E+03	3.380E+06	2.271E+02
2051	1.383E+01	3.859E+03	2.593E-01	2.145E+03	3.215E+06	2.160E+02
2052	1.316E+01	3.670E+03	2.466E-01	2.041E+03	3.059E+06	2.055E+02
2053	1.251E+01	3.491E+03	2.346E-01	1.941E+03	2.909E+06	1.955E+02
2054	1.190E+01	3.321E+03	2.231E-01	1.846E+03	2.768E+06	1.860E+02
2055	1.132E+01	3.159E+03	2.123E-01	1.756E+03	2.633E+06	1.769E+02
2056	1.077E+01	3.005E+03	2.019E-01	1.671E+03	2.504E+06	1.683E+02
2057	1.025E+01	2.858E+03	1.921E-01	1.589E+03	2.382E+06	1.600E+02
2058	9.746E+00	2.719E+03	1.827E-01	1.512E+03	2.266E+06	1.522E+02
2059	9.271E+00	2.586E+03	1.738E-01	1.438E+03	2.155E+06	1.448E+02
2060	8.819E+00	2.460E+03	1.653E-01	1.368E+03	2.050E+06	1.378E+02
2061	8.389E+00	2.340E+03	1.572E-01	1.301E+03	1.950E+06	1.310E+02
2062	7.980E+00	2.226E+03	1.496E-01	1.238E+03	1.855E+06	1.246E+02
2063	7.590E+00	2.118E+03	1.423E-01	1.177E+03	1.765E+06	1.186E+02
2064	7.220E+00	2.014E+03	1.353E-01	1.120E+03	1.679E+06	1.128E+02
2065	6.868E+00	1.916E+03	1.287E-01	1.065E+03	1.597E+06	1.073E+02
2066	6.533E+00	1.823E+03	1.225E-01	1.013E+03	1.519E+06	1.021E+02
2067	6.215E+00	1.734E+03	1.165E-01	9.639E+02	1.445E+06	9.707E+01
2068	5.911E+00	1.649E+03	1.108E-01	9.169E+02	1.374E+06	9.234E+01
2069	5.623E+00	1.569E+03	1.054E-01	8.722E+02	1.307E+06	8.784E+01
2070	5.349E+00	1.492E+03	1.003E-01	8.296E+02	1.244E+06	8.355E+01
2071	5.088E+00	1.419E+03	9.537E-02	7.892E+02	1.183E+06	7.948E+01
2072	4.840E+00	1.350E+03	9.072E-02	7.507E+02	1.125E+06	7.560E+01
2073	4.604E+00	1.284E+03	8.630E-02	7.141E+02	1.070E+06	7.191E+01
2074	4.379E+00	1.222E+03	8.209E-02	6.792E+02	1.018E+06	6.841E+01
2075	4.166E+00	1.162E+03	7.809E-02	6.461E+02	9.685E+05	6.507E+01
2076	3.963E+00	1.105E+03	7.428E-02	6.146E+02	9.212E+05	6.190E+01
2077	3.769E+00	1.052E+03	7.065E-02	5.846E+02	8.763E+05	5.888E+01
2078	3.585E+00	1.000E+03	6.721E-02	5.561E+02	8.336E+05	5.601E+01
2079	3.411E+00	9.515E+02	6.393E-02	5.290E+02	7.929E+05	5.328E+01
2080	3.244E+00	9.051E+02	6.081E-02	5.032E+02	7.542E+05	5.068E+01
2081	3.086E+00	8.609E+02	5.785E-02	4.787E+02	7.175E+05	4.821E+01
2082	2.936E+00	8.190E+02	5.503E-02	4.553E+02	6.825E+05	4.585E+01

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S3-2

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate *($year^{-1}$)*
L_o = potential methane generation capacity *(m^3/Mg)*

M_i = mass of waste accepted in the i^{th} year *(Mg)*
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2033**	
Landfill Closure Year (with 80-year limit)	**2035**	
Actual Closure Year (without limit)	***2035***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**2,399,682**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2033	109,132	120,045	0	0
2034	1,300,000	1,430,000	109,132	120,045
2035	772,397	849,637	1,409,132	1,550,045
2036	0	0	2,181,529	2,399,682
2037	0	0	2,181,529	2,399,682
2038	0	0	2,181,529	2,399,682
2039	0	0	2,181,529	2,399,682
2040	0	0	2,181,529	2,399,682
2041	0	0	2,181,529	2,399,682
2042	0	0	2,181,529	2,399,682
2043	0	0	2,181,529	2,399,682
2044	0	0	2,181,529	2,399,682
2045	0	0	2,181,529	2,399,682
2046	0	0	2,181,529	2,399,682
2047	0	0	2,181,529	2,399,682
2048	0	0	2,181,529	2,399,682
2049	0	0	2,181,529	2,399,682
2050	0	0	2,181,529	2,399,682
2051	0	0	2,181,529	2,399,682
2052	0	0	2,181,529	2,399,682
2053	0	0	2,181,529	2,399,682
2054	0	0	2,181,529	2,399,682
2055	0	0	2,181,529	2,399,682
2056	0	0	2,181,529	2,399,682
2057	0	0	2,181,529	2,399,682
2058	0	0	2,181,529	2,399,682
2059	0	0	2,181,529	2,399,682
2060	0	0	2,181,529	2,399,682
2061	0	0	2,181,529	2,399,682
2062	0	0	2,181,529	2,399,682
2063	0	0	2,181,529	2,399,682
2064	0	0	2,181,529	2,399,682
2065	0	0	2,181,529	2,399,682
2066	0	0	2,181,529	2,399,682
2067	0	0	2,181,529	2,399,682
2068	0	0	2,181,529	2,399,682
2069	0	0	2,181,529	2,399,682
2070	0	0	2,181,529	2,399,682
2071	0	0	2,181,529	2,399,682
2072	0	0	2,181,529	2,399,682

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2033	0	0	0	0	0	0
2034	3.902E+00	1.088E+03	7.314E-02	6.052E+02	9.071E+05	6.095E+01
2035	5.019E+01	1.400E+04	9.408E-01	7.784E+03	1.167E+07	7.840E+02
2036	7.536E+01	2.102E+04	1.413E+00	1.169E+04	1.752E+07	1.177E+03
2037	7.168E+01	2.000E+04	1.344E+00	1.112E+04	1.666E+07	1.120E+03
2038	6.818E+01	1.902E+04	1.278E+00	1.058E+04	1.585E+07	1.065E+03
2039	6.486E+01	1.809E+04	1.216E+00	1.006E+04	1.508E+07	1.013E+03
2040	6.170E+01	1.721E+04	1.156E+00	9.569E+03	1.434E+07	9.637E+02
2041	5.869E+01	1.637E+04	1.100E+00	9.102E+03	1.364E+07	9.167E+02
2042	5.582E+01	1.557E+04	1.046E+00	8.659E+03	1.298E+07	8.720E+02
2043	5.310E+01	1.481E+04	9.954E-01	8.236E+03	1.235E+07	8.295E+02
2044	5.051E+01	1.409E+04	9.468E-01	7.835E+03	1.174E+07	7.890E+02
2045	4.805E+01	1.340E+04	9.007E-01	7.452E+03	1.117E+07	7.506E+02
2046	4.571E+01	1.275E+04	8.567E-01	7.089E+03	1.063E+07	7.139E+02
2047	4.348E+01	1.213E+04	8.150E-01	6.743E+03	1.011E+07	6.791E+02
2048	4.136E+01	1.154E+04	7.752E-01	6.414E+03	9.615E+06	6.460E+02
2049	3.934E+01	1.097E+04	7.374E-01	6.102E+03	9.146E+06	6.145E+02
2050	3.742E+01	1.044E+04	7.014E-01	5.804E+03	8.700E+06	5.845E+02
2051	3.560E+01	9.930E+03	6.672E-01	5.521E+03	8.275E+06	5.560E+02
2052	3.386E+01	9.446E+03	6.347E-01	5.252E+03	7.872E+06	5.289E+02
2053	3.221E+01	8.985E+03	6.037E-01	4.996E+03	7.488E+06	5.031E+02
2054	3.064E+01	8.547E+03	5.743E-01	4.752E+03	7.123E+06	4.786E+02
2055	2.914E+01	8.130E+03	5.463E-01	4.520E+03	6.775E+06	4.552E+02
2056	2.772E+01	7.734E+03	5.196E-01	4.300E+03	6.445E+06	4.330E+02
2057	2.637E+01	7.357E+03	4.943E-01	4.090E+03	6.131E+06	4.119E+02
2058	2.508E+01	6.998E+03	4.702E-01	3.891E+03	5.832E+06	3.918E+02
2059	2.386E+01	6.657E+03	4.473E-01	3.701E+03	5.547E+06	3.727E+02
2060	2.270E+01	6.332E+03	4.254E-01	3.520E+03	5.277E+06	3.545E+02
2061	2.159E+01	6.023E+03	4.047E-01	3.349E+03	5.019E+06	3.372E+02
2062	2.054E+01	5.729E+03	3.850E-01	3.185E+03	4.774E+06	3.208E+02
2063	1.954E+01	5.450E+03	3.662E-01	3.030E+03	4.542E+06	3.052E+02
2064	1.858E+01	5.184E+03	3.483E-01	2.882E+03	4.320E+06	2.903E+02
2065	1.768E+01	4.931E+03	3.313E-01	2.742E+03	4.109E+06	2.761E+02
2066	1.681E+01	4.691E+03	3.152E-01	2.608E+03	3.909E+06	2.626E+02
2067	1.599E+01	4.462E+03	2.998E-01	2.481E+03	3.718E+06	2.498E+02
2068	1.521E+01	4.244E+03	2.852E-01	2.360E+03	3.537E+06	2.377E+02
2069	1.447E+01	4.037E+03	2.713E-01	2.245E+03	3.365E+06	2.261E+02
2070	1.377E+01	3.841E+03	2.580E-01	2.135E+03	3.200E+06	2.150E+02
2071	1.309E+01	3.653E+03	2.455E-01	2.031E+03	3.044E+06	2.045E+02
2072	1.246E+01	3.475E+03	2.335E-01	1.932E+03	2.896E+06	1.946E+02
2073	1.185E+01	3.306E+03	2.221E-01	1.838E+03	2.755E+06	1.851E+02
2074	1.127E+01	3.144E+03	2.113E-01	1.748E+03	2.620E+06	1.761E+02
2075	1.072E+01	2.991E+03	2.010E-01	1.663E+03	2.493E+06	1.675E+02
2076	1.020E+01	2.845E+03	1.912E-01	1.582E+03	2.371E+06	1.593E+02
2077	9.701E+00	2.706E+03	1.818E-01	1.505E+03	2.255E+06	1.515E+02
2078	9.228E+00	2.574E+03	1.730E-01	1.431E+03	2.145E+06	1.441E+02
2079	8.778E+00	2.449E+03	1.645E-01	1.361E+03	2.041E+06	1.371E+02
2080	8.350E+00	2.329E+03	1.565E-01	1.295E+03	1.941E+06	1.304E+02
2081	7.942E+00	2.216E+03	1.489E-01	1.232E+03	1.846E+06	1.241E+02
2082	7.555E+00	2.108E+03	1.416E-01	1.172E+03	1.756E+06	1.180E+02

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S3-3

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate *(year^{-1})*
L_o = potential methane generation capacity *(m^3/Mg)*

M_i = mass of waste accepted in the i^{th} year *(Mg)*
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2035**	
Landfill Closure Year (with 80-year limit)	**2036**	
Actual Closure Year (without limit)	***2036***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**1,851,895**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2035	527,603	580,363	0	0
2036	1,155,938	1,271,532	527,603	580,363
2037	0	0	1,683,541	1,851,895
2038	0	0	1,683,541	1,851,895
2039	0	0	1,683,541	1,851,895
2040	0	0	1,683,541	1,851,895
2041	0	0	1,683,541	1,851,895
2042	0	0	1,683,541	1,851,895
2043	0	0	1,683,541	1,851,895
2044	0	0	1,683,541	1,851,895
2045	0	0	1,683,541	1,851,895
2046	0	0	1,683,541	1,851,895
2047	0	0	1,683,541	1,851,895
2048	0	0	1,683,541	1,851,895
2049	0	0	1,683,541	1,851,895
2050	0	0	1,683,541	1,851,895
2051	0	0	1,683,541	1,851,895
2052	0	0	1,683,541	1,851,895
2053	0	0	1,683,541	1,851,895
2054	0	0	1,683,541	1,851,895
2055	0	0	1,683,541	1,851,895
2056	0	0	1,683,541	1,851,895
2057	0	0	1,683,541	1,851,895
2058	0	0	1,683,541	1,851,895
2059	0	0	1,683,541	1,851,895
2060	0	0	1,683,541	1,851,895
2061	0	0	1,683,541	1,851,895
2062	0	0	1,683,541	1,851,895
2063	0	0	1,683,541	1,851,895
2064	0	0	1,683,541	1,851,895
2065	0	0	1,683,541	1,851,895
2066	0	0	1,683,541	1,851,895
2067	0	0	1,683,541	1,851,895
2068	0	0	1,683,541	1,851,895
2069	0	0	1,683,541	1,851,895
2070	0	0	1,683,541	1,851,895
2071	0	0	1,683,541	1,851,895
2072	0	0	1,683,541	1,851,895
2073	0	0	1,683,541	1,851,895
2074	0	0	1,683,541	1,851,895

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2035	0	0	0	0	0	0
2036	1.886E+01	5.262E+03	3.536E-01	2.926E+03	4.385E+06	2.946E+02
2037	5.927E+01	1.654E+04	1.111E+00	9.193E+03	1.378E+07	9.258E+02
2038	5.638E+01	1.573E+04	1.057E+00	8.744E+03	1.311E+07	8.807E+02
2039	5.363E+01	1.496E+04	1.005E+00	8.318E+03	1.247E+07	8.377E+02
2040	5.101E+01	1.423E+04	9.562E-01	7.912E+03	1.186E+07	7.969E+02
2041	4.853E+01	1.354E+04	9.096E-01	7.526E+03	1.128E+07	7.580E+02
2042	4.616E+01	1.288E+04	8.652E-01	7.159E+03	1.073E+07	7.210E+02
2043	4.391E+01	1.225E+04	8.230E-01	6.810E+03	1.021E+07	6.859E+02
2044	4.177E+01	1.165E+04	7.829E-01	6.478E+03	9.710E+06	6.524E+02
2045	3.973E+01	1.108E+04	7.447E-01	6.162E+03	9.237E+06	6.206E+02
2046	3.779E+01	1.054E+04	7.084E-01	5.862E+03	8.786E+06	5.903E+02
2047	3.595E+01	1.003E+04	6.739E-01	5.576E+03	8.358E+06	5.615E+02
2048	3.420E+01	9.540E+03	6.410E-01	5.304E+03	7.950E+06	5.342E+02
2049	3.253E+01	9.075E+03	6.097E-01	5.045E+03	7.562E+06	5.081E+02
2050	3.094E+01	8.632E+03	5.800E-01	4.799E+03	7.193E+06	4.833E+02
2051	2.943E+01	8.211E+03	5.517E-01	4.565E+03	6.843E+06	4.598E+02
2052	2.800E+01	7.811E+03	5.248E-01	4.342E+03	6.509E+06	4.373E+02
2053	2.663E+01	7.430E+03	4.992E-01	4.131E+03	6.191E+06	4.160E+02
2054	2.533E+01	7.067E+03	4.749E-01	3.929E+03	5.889E+06	3.957E+02
2055	2.410E+01	6.723E+03	4.517E-01	3.738E+03	5.602E+06	3.764E+02
2056	2.292E+01	6.395E+03	4.297E-01	3.555E+03	5.329E+06	3.581E+02
2057	2.180E+01	6.083E+03	4.087E-01	3.382E+03	5.069E+06	3.406E+02
2058	2.074E+01	5.786E+03	3.888E-01	3.217E+03	4.822E+06	3.240E+02
2059	1.973E+01	5.504E+03	3.698E-01	3.060E+03	4.587E+06	3.082E+02
2060	1.877E+01	5.236E+03	3.518E-01	2.911E+03	4.363E+06	2.932E+02
2061	1.785E+01	4.980E+03	3.346E-01	2.769E+03	4.150E+06	2.789E+02
2062	1.698E+01	4.737E+03	3.183E-01	2.634E+03	3.948E+06	2.653E+02
2063	1.615E+01	4.506E+03	3.028E-01	2.505E+03	3.755E+06	2.523E+02
2064	1.537E+01	4.287E+03	2.880E-01	2.383E+03	3.572E+06	2.400E+02
2065	1.462E+01	4.078E+03	2.740E-01	2.267E+03	3.398E+06	2.283E+02
2066	1.390E+01	3.879E+03	2.606E-01	2.156E+03	3.232E+06	2.172E+02
2067	1.322E+01	3.689E+03	2.479E-01	2.051E+03	3.075E+06	2.066E+02
2068	1.258E+01	3.510E+03	2.358E-01	1.951E+03	2.925E+06	1.965E+02
2069	1.197E+01	3.338E+03	2.243E-01	1.856E+03	2.782E+06	1.869E+02
2070	1.138E+01	3.176E+03	2.134E-01	1.765E+03	2.646E+06	1.778E+02
2071	1.083E+01	3.021E+03	2.030E-01	1.679E+03	2.517E+06	1.691E+02
2072	1.030E+01	2.873E+03	1.931E-01	1.597E+03	2.394E+06	1.609E+02
2073	9.797E+00	2.733E+03	1.836E-01	1.520E+03	2.278E+06	1.530E+02
2074	9.319E+00	2.600E+03	1.747E-01	1.445E+03	2.167E+06	1.456E+02
2075	8.865E+00	2.473E+03	1.662E-01	1.375E+03	2.061E+06	1.385E+02
2076	8.433E+00	2.353E+03	1.581E-01	1.308E+03	1.960E+06	1.317E+02
2077	8.021E+00	2.238E+03	1.504E-01	1.244E+03	1.865E+06	1.253E+02
2078	7.630E+00	2.129E+03	1.430E-01	1.183E+03	1.774E+06	1.192E+02
2079	7.258E+00	2.025E+03	1.360E-01	1.126E+03	1.687E+06	1.134E+02
2080	6.904E+00	1.926E+03	1.294E-01	1.071E+03	1.605E+06	1.078E+02
2081	6.567E+00	1.832E+03	1.231E-01	1.019E+03	1.527E+06	1.026E+02
2082	6.247E+00	1.743E+03	1.171E-01	9.689E+02	1.452E+06	9.758E+01
2083	5.942E+00	1.658E+03	1.114E-01	9.217E+02	1.381E+06	9.282E+01
2084	5.652E+00	1.577E+03	1.060E-01	8.767E+02	1.314E+06	8.830E+01

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill-S3-4

Date: Tuesday, January 23, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate *(year^{-1})*

L_o = potential methane generation capacity *(m^3/Mg)*

M_i = mass of waste accepted in the i^{th} year *(Mg)*

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year *(decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2036**	
Landfill Closure Year (with 80-year limit)	**2040**	
Actual Closure Year (without limit)	***2040***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**5,823,246**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Total landfill gas**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2036	144,062	158,468	0	0
2037	1,300,000	1,430,000	144,062	158,468
2038	1,300,000	1,430,000	1,444,062	1,588,468
2039	1,300,000	1,430,000	2,744,062	3,018,468
2040	1,249,798	1,374,778	4,044,062	4,448,468
2041	0	0	5,293,860	5,823,246
2042	0	0	5,293,860	5,823,246
2043	0	0	5,293,860	5,823,246
2044	0	0	5,293,860	5,823,246
2045	0	0	5,293,860	5,823,246
2046	0	0	5,293,860	5,823,246
2047	0	0	5,293,860	5,823,246
2048	0	0	5,293,860	5,823,246
2049	0	0	5,293,860	5,823,246
2050	0	0	5,293,860	5,823,246
2051	0	0	5,293,860	5,823,246
2052	0	0	5,293,860	5,823,246
2053	0	0	5,293,860	5,823,246
2054	0	0	5,293,860	5,823,246
2055	0	0	5,293,860	5,823,246
2056	0	0	5,293,860	5,823,246
2057	0	0	5,293,860	5,823,246
2058	0	0	5,293,860	5,823,246
2059	0	0	5,293,860	5,823,246
2060	0	0	5,293,860	5,823,246
2061	0	0	5,293,860	5,823,246
2062	0	0	5,293,860	5,823,246
2063	0	0	5,293,860	5,823,246
2064	0	0	5,293,860	5,823,246
2065	0	0	5,293,860	5,823,246
2066	0	0	5,293,860	5,823,246
2067	0	0	5,293,860	5,823,246
2068	0	0	5,293,860	5,823,246
2069	0	0	5,293,860	5,823,246
2070	0	0	5,293,860	5,823,246
2071	0	0	5,293,860	5,823,246
2072	0	0	5,293,860	5,823,246
2073	0	0	5,293,860	5,823,246
2074	0	0	5,293,860	5,823,246
2075	0	0	5,293,860	5,823,246

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2036	0	0	0	0	0	0
2037	5.150E+00	1.437E+03	9.654E-02	7.988E+02	1.197E+06	8.045E+01
2038	5.138E+01	1.433E+04	9.630E-01	7.969E+03	1.194E+07	8.025E+02
2039	9.535E+01	2.660E+04	1.787E+00	1.479E+04	2.217E+07	1.489E+03
2040	1.372E+02	3.827E+04	2.571E+00	2.128E+04	3.189E+07	2.143E+03
2041	1.752E+02	4.887E+04	3.283E+00	2.717E+04	4.072E+07	2.736E+03
2042	1.666E+02	4.649E+04	3.123E+00	2.584E+04	3.874E+07	2.603E+03
2043	1.585E+02	4.422E+04	2.971E+00	2.458E+04	3.685E+07	2.476E+03
2044	1.508E+02	4.206E+04	2.826E+00	2.338E+04	3.505E+07	2.355E+03
2045	1.434E+02	4.001E+04	2.688E+00	2.224E+04	3.334E+07	2.240E+03
2046	1.364E+02	3.806E+04	2.557E+00	2.116E+04	3.172E+07	2.131E+03
2047	1.298E+02	3.620E+04	2.432E+00	2.013E+04	3.017E+07	2.027E+03
2048	1.234E+02	3.444E+04	2.314E+00	1.915E+04	2.870E+07	1.928E+03
2049	1.174E+02	3.276E+04	2.201E+00	1.821E+04	2.730E+07	1.834E+03
2050	1.117E+02	3.116E+04	2.094E+00	1.732E+04	2.597E+07	1.745E+03
2051	1.062E+02	2.964E+04	1.992E+00	1.648E+04	2.470E+07	1.660E+03
2052	1.011E+02	2.819E+04	1.894E+00	1.568E+04	2.350E+07	1.579E+03
2053	9.613E+01	2.682E+04	1.802E+00	1.491E+04	2.235E+07	1.502E+03
2054	9.145E+01	2.551E+04	1.714E+00	1.418E+04	2.126E+07	1.428E+03
2055	8.699E+01	2.427E+04	1.631E+00	1.349E+04	2.022E+07	1.359E+03
2056	8.274E+01	2.308E+04	1.551E+00	1.283E+04	1.924E+07	1.293E+03
2057	7.871E+01	2.196E+04	1.475E+00	1.221E+04	1.830E+07	1.229E+03
2058	7.487E+01	2.089E+04	1.403E+00	1.161E+04	1.741E+07	1.170E+03
2059	7.122E+01	1.987E+04	1.335E+00	1.105E+04	1.656E+07	1.112E+03
2060	6.774E+01	1.890E+04	1.270E+00	1.051E+04	1.575E+07	1.058E+03
2061	6.444E+01	1.798E+04	1.208E+00	9.995E+03	1.498E+07	1.007E+03
2062	6.130E+01	1.710E+04	1.149E+00	9.507E+03	1.425E+07	9.575E+02
2063	5.831E+01	1.627E+04	1.093E+00	9.044E+03	1.356E+07	9.108E+02
2064	5.546E+01	1.547E+04	1.040E+00	8.603E+03	1.289E+07	8.664E+02
2065	5.276E+01	1.472E+04	9.890E-01	8.183E+03	1.227E+07	8.241E+02
2066	5.019E+01	1.400E+04	9.407E-01	7.784E+03	1.167E+07	7.839E+02
2067	4.774E+01	1.332E+04	8.949E-01	7.404E+03	1.110E+07	7.457E+02
2068	4.541E+01	1.267E+04	8.512E-01	7.043E+03	1.056E+07	7.093E+02
2069	4.320E+01	1.205E+04	8.097E-01	6.700E+03	1.004E+07	6.747E+02
2070	4.109E+01	1.146E+04	7.702E-01	6.373E+03	9.553E+06	6.418E+02
2071	3.909E+01	1.090E+04	7.326E-01	6.062E+03	9.087E+06	6.105E+02
2072	3.718E+01	1.037E+04	6.969E-01	5.767E+03	8.644E+06	5.808E+02
2073	3.537E+01	9.866E+03	6.629E-01	5.485E+03	8.222E+06	5.524E+02
2074	3.364E+01	9.385E+03	6.306E-01	5.218E+03	7.821E+06	5.255E+02
2075	3.200E+01	8.927E+03	5.998E-01	4.963E+03	7.440E+06	4.999E+02
2076	3.044E+01	8.492E+03	5.706E-01	4.721E+03	7.077E+06	4.755E+02
2077	2.896E+01	8.078E+03	5.428E-01	4.491E+03	6.732E+06	4.523E+02
2078	2.754E+01	7.684E+03	5.163E-01	4.272E+03	6.403E+06	4.302E+02
2079	2.620E+01	7.309E+03	4.911E-01	4.064E+03	6.091E+06	4.093E+02
2080	2.492E+01	6.953E+03	4.672E-01	3.865E+03	5.794E+06	3.893E+02
2081	2.371E+01	6.614E+03	4.444E-01	3.677E+03	5.511E+06	3.703E+02
2082	2.255E+01	6.291E+03	4.227E-01	3.498E+03	5.243E+06	3.522E+02
2083	2.145E+01	5.984E+03	4.021E-01	3.327E+03	4.987E+06	3.351E+02
2084	2.040E+01	5.692E+03	3.825E-01	3.165E+03	4.744E+06	3.187E+02
2085	1.941E+01	5.415E+03	3.638E-01	3.010E+03	4.512E+06	3.032E+02

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM G(B)
ATTACHMENT G(B)-2
EPA LANDGEM V3.02 Gas Emissions Model

FEBRUARY 2018

This page intentionally left blank.

Summary Report

Landfill Name or Identifier: Camp Hope Run Landfill

Date: Tuesday, January 23, 2018

Description/Comments:

Input units of annual waste acceptance in short tons per year are based on actual tonnage records through 2011. Projected values are escalated by the average annual increase in acceptance rates from 2007 to 2011, equal to 104%. Annual acceptance rates are capped at 1,430,000 (5000 tons/day).

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2020**	
Landfill Closure Year (with 80-year limit)	**2040**	
Actual Closure Year (without limit)	***2040***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**27,114,778**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.050**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**NMOC**
Gas / Pollutant #4:	**Carbon dioxide**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2020	260,000	286,000	0	0
2021	520,000	572,000	260,000	286,000
2022	780,000	858,000	780,000	858,000
2023	1,040,000	1,144,000	1,560,000	1,716,000
2024	1,300,000	1,430,000	2,600,000	2,860,000
2025	1,300,000	1,430,000	3,900,000	4,290,000
2026	1,300,000	1,430,000	5,200,000	5,720,000
2027	1,300,000	1,430,000	6,500,000	7,150,000
2028	1,300,000	1,430,000	7,800,000	8,580,000
2029	1,300,000	1,430,000	9,100,000	10,010,000
2030	1,300,000	1,430,000	10,400,000	11,440,000
2031	1,300,000	1,430,000	11,700,000	12,870,000
2032	1,300,000	1,430,000	13,000,000	14,300,000
2033	1,300,000	1,430,000	14,300,000	15,730,000
2034	1,300,000	1,430,000	15,600,000	17,160,000
2035	1,300,000	1,430,000	16,900,000	18,590,000
2036	1,300,000	1,430,000	18,200,000	20,020,000
2037	1,300,000	1,430,000	19,500,000	21,450,000
2038	1,300,000	1,430,000	20,800,000	22,880,000
2039	1,300,000	1,430,000	22,100,000	24,310,000
2040	1,249,798	1,374,778	23,400,000	25,740,000
2041	0	0	24,649,798	27,114,778
2042	0	0	24,649,798	27,114,778
2043	0	0	24,649,798	27,114,778
2044	0	0	24,649,798	27,114,778
2045	0	0	24,649,798	27,114,778
2046	0	0	24,649,798	27,114,778
2047	0	0	24,649,798	27,114,778
2048	0	0	24,649,798	27,114,778
2049	0	0	24,649,798	27,114,778
2050	0	0	24,649,798	27,114,778
2051	0	0	24,649,798	27,114,778
2052	0	0	24,649,798	27,114,778
2053	0	0	24,649,798	27,114,778
2054	0	0	24,649,798	27,114,778
2055	0	0	24,649,798	27,114,778
2056	0	0	24,649,798	27,114,778
2057	0	0	24,649,798	27,114,778
2058	0	0	24,649,798	27,114,778
2059	0	0	24,649,798	27,114,778

Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2020	0	0	0	0	0	0
2021	5.398E+03	4.322E+06	2.904E+02	1.442E+03	2.161E+06	1.452E+02
2022	1.593E+04	1.276E+07	8.570E+02	4.255E+03	6.378E+06	4.285E+02
2023	3.135E+04	2.510E+07	1.686E+03	8.373E+03	1.255E+07	8.432E+02
2024	5.141E+04	4.116E+07	2.766E+03	1.373E+04	2.058E+07	1.383E+03
2025	7.589E+04	6.077E+07	4.083E+03	2.027E+04	3.038E+07	2.041E+03
2026	9.917E+04	7.941E+07	5.336E+03	2.649E+04	3.971E+07	2.668E+03
2027	1.213E+05	9.715E+07	6.528E+03	3.241E+04	4.858E+07	3.264E+03
2028	1.424E+05	1.140E+08	7.661E+03	3.804E+04	5.701E+07	3.831E+03
2029	1.624E+05	1.301E+08	8.740E+03	4.339E+04	6.504E+07	4.370E+03
2030	1.815E+05	1.453E+08	9.765E+03	4.848E+04	7.267E+07	4.883E+03
2031	1.996E+05	1.599E+08	1.074E+04	5.333E+04	7.993E+07	5.371E+03
2032	2.169E+05	1.737E+08	1.167E+04	5.793E+04	8.684E+07	5.835E+03
2033	2.333E+05	1.868E+08	1.255E+04	6.232E+04	9.341E+07	6.276E+03
2034	2.489E+05	1.993E+08	1.339E+04	6.649E+04	9.966E+07	6.696E+03
2035	2.638E+05	2.112E+08	1.419E+04	7.045E+04	1.056E+08	7.095E+03
2036	2.779E+05	2.225E+08	1.495E+04	7.423E+04	1.113E+08	7.475E+03
2037	2.913E+05	2.333E+08	1.567E+04	7.781E+04	1.166E+08	7.837E+03
2038	3.041E+05	2.435E+08	1.636E+04	8.123E+04	1.218E+08	8.181E+03
2039	3.163E+05	2.532E+08	1.702E+04	8.448E+04	1.266E+08	8.508E+03
2040	3.278E+05	2.625E+08	1.764E+04	8.756E+04	1.313E+08	8.819E+03
2041	3.378E+05	2.705E+08	1.817E+04	9.022E+04	1.352E+08	9.087E+03
2042	3.213E+05	2.573E+08	1.729E+04	8.582E+04	1.286E+08	8.643E+03
2043	3.056E+05	2.447E+08	1.644E+04	8.164E+04	1.224E+08	8.222E+03
2044	2.907E+05	2.328E+08	1.564E+04	7.766E+04	1.164E+08	7.821E+03
2045	2.765E+05	2.214E+08	1.488E+04	7.387E+04	1.107E+08	7.439E+03
2046	2.631E+05	2.106E+08	1.415E+04	7.027E+04	1.053E+08	7.077E+03
2047	2.502E+05	2.004E+08	1.346E+04	6.684E+04	1.002E+08	6.732E+03
2048	2.380E+05	1.906E+08	1.281E+04	6.358E+04	9.530E+07	6.403E+03
2049	2.264E+05	1.813E+08	1.218E+04	6.048E+04	9.065E+07	6.091E+03
2050	2.154E+05	1.725E+08	1.159E+04	5.753E+04	8.623E+07	5.794E+03
2051	2.049E+05	1.641E+08	1.102E+04	5.472E+04	8.203E+07	5.511E+03
2052	1.949E+05	1.561E+08	1.049E+04	5.205E+04	7.803E+07	5.243E+03
2053	1.854E+05	1.484E+08	9.974E+03	4.952E+04	7.422E+07	4.987E+03
2054	1.763E+05	1.412E+08	9.487E+03	4.710E+04	7.060E+07	4.744E+03
2055	1.677E+05	1.343E+08	9.025E+03	4.480E+04	6.716E+07	4.512E+03
2056	1.596E+05	1.278E+08	8.584E+03	4.262E+04	6.388E+07	4.292E+03
2057	1.518E+05	1.215E+08	8.166E+03	4.054E+04	6.077E+07	4.083E+03
2058	1.444E+05	1.156E+08	7.768E+03	3.856E+04	5.780E+07	3.884E+03
2059	1.373E+05	1.100E+08	7.389E+03	3.668E+04	5.498E+07	3.694E+03
2060	1.306E+05	1.046E+08	7.028E+03	3.489E+04	5.230E+07	3.514E+03
2061	1.243E+05	9.950E+07	6.686E+03	3.319E+04	4.975E+07	3.343E+03
2062	1.182E+05	9.465E+07	6.359E+03	3.157E+04	4.732E+07	3.180E+03
2063	1.124E+05	9.003E+07	6.049E+03	3.003E+04	4.502E+07	3.025E+03
2064	1.070E+05	8.564E+07	5.754E+03	2.857E+04	4.282E+07	2.877E+03
2065	1.017E+05	8.147E+07	5.474E+03	2.717E+04	4.073E+07	2.737E+03
2066	9.677E+04	7.749E+07	5.207E+03	2.585E+04	3.875E+07	2.603E+03
2067	9.205E+04	7.371E+07	4.953E+03	2.459E+04	3.686E+07	2.476E+03
2068	8.757E+04	7.012E+07	4.711E+03	2.339E+04	3.506E+07	2.356E+03
2069	8.329E+04	6.670E+07	4.481E+03	2.225E+04	3.335E+07	2.241E+03

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM H

REVEGETATION

FEBRUARY 2018

This page intentionally left blank.

2540-PM-BWM0375 6/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised FEBRUARY 2018
DEP USE ONLY
Date Received

FORM H
REVEGETATION

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form H, reference the item number and identify the date prepared. The "date prepared/revised" on attached sheets should match the "date prepared/revised" on this page.

General References: Sections 273.142, 277.142, 281.131, 288.142, 289.142, 291.415, 295.131

SECTION A. SITE IDENTIFIER

Applicant/permittee: **PA WASTE, LLC**

Site Name: **CAMP HOPE RUN LANDFILL**

Facility ID (as issued by DEP): **101688**

SECTION B. SOIL TEST PLAN

Provide a soil test plan for determining plant nutrients and soil amendments required to establish temporary and final cover.
REFER TO ATTACHMENT H-1 (SOIL TEST PLAN)

SECTION C. TEMPORARY COVER

a)

Seed Mixture			Seed Quality		
No.	Species	lbs./acre	Min. % Germ.	Min. % Purity	Seeding Dates
	REFER TO ATTACHMENT H-2				

b) The proposed use of each seed mixture. Include where and when each mixture is to be used.
REFER TO ATTACHMENT H-2 (TEMPORARY COVER)

c) The seedbed preparation, including lime and fertilizer application and incorporation procedures.
REFER TO ATTACHMENT H-2 (TEMPORARY COVER)

d) Method(s) of seeding. **REFER TO ATTACHMENT H-2 (TEMPORARY COVER)**

e) Type(s) of mulch to be used and rate(s) of application. **REFER TO ATTACHMENT H-2 (TEMPORARY COVER)**

f) The technique to be used to evaluate the success of revegetation. **REFER TO ATTACHMENT H-2 (TEMPORARY COVER) AND H-4 (METHOD FOR DETERMINING THE SUCCESS OF REVEGETATION)**

g) Proposed maintenance procedures. **REFER TO ATTACHMENT H-2 (TEMPORARY COVER)**

SECTION D. PERMANENT COVER

a)

Seed Mixture			Seed Quality		
No.	Species	lbs./acre	Min. % Germ.	Min. % Purity	Seeding Dates
	REFER TO ATTACHMENT H-3 (PERMANENT COVER)				

b) The proposed use of each seed mixture. Include where and when each mixture is to be used.

REFER TO ATTACHMENT H-3 (PERMANENT COVER)

c) The seedbed preparation, including lime and fertilizer application and incorporation procedures.

REFER TO ATTACHMENT H-3 (PERMANENT COVER)

d) Method(s) of seeding. **REFER TO ATTACHMENT H-3 (PERMANENT COVER)**

e) Type(s) of mulch to be used and rate(s) of application. **REFER TO ATTACHMENT H-3 (PERMANENT COVER)**

f) The technique to be used to evaluate the success of revegetation. **REFER TO ATTACHMENT H-3 (PERMANENT COVER) AND H-4 (METHOD OF DETERMINING THE SUCCESS OF REVEGETATION)**

g) Proposed maintenance procedures. **REFER TO ATTACHMENT H-3 (PERMANENT COVER)**

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM H
ATTACHMENT H-1
Soil Test Plan

FEBRUARY 2018

This page intentionally left blank.

FORM H – REVEGETATION – PHASE II

SECTION B. SOIL TEST PLAN

INTRODUCTION

This document presents the procedures to be followed to evaluate soil nutrients and characteristics to provide recommendations for soil amendments to establish temporary and permanent vegetative cover. The Owner or his representative (i.e. Engineer or General Contractor) will be responsible for obtaining soil samples, shipping them to a Pennsylvania State University Agricultural Analytical Services Laboratory (soil testing laboratory), paying soil analyses costs, and implementing recommendations for establishment of temporary and/or permanent vegetative cover, as appropriate. Such testing would be in addition to testing results presented in **FORM F** of this application.

SOIL SAMPLING

For each source of soil to be used as topsoil, with the purpose of supporting vegetative growth, sample soil according to the procedure specified in *The Penn State Agronomy Guide*. For this project, soil probe samples shall be taken at a rate of 1 per every other acre until the results demonstrate uniformity and soil quality. This frequency will be applied whenever there is a change in the soil source. Stockpiles shall be sampled by taking representative probes at various depths and locations over and around the pile at a frequency of not less than 1 per 5,000 cubic yards of stockpiled material. Samples may be placed in containers supplied by the soil testing laboratory (or equivalent) or self-supplied containers and will be shipped with a completed soil submission form(s) and payment. Soil submission forms may be downloaded from: www.aasl.psu.edu/ssft.htm.

SOIL ANALYSIS

The soil testing laboratory will analyze soil samples and provide soil amendment recommendations to promote the permanent establishment of the vegetation species specified. Analysis requirements will be recommended by the soil testing laboratory based on the specified predominant species indicated on the required soil submission forms. The soil testing laboratory will submit copies of the test results and recommendations for amendments to the Owner/Operator and other interested parties.

INCORPORATION OF SOIL AMENDMENTS

The Owner or his representative will incorporate the type and quantity of soil amendments recommended by the soil testing laboratory into the soil. Amendments shall be added after the soil has been placed in the location(s) and thickness specified in the contract documents.

This page intentionally left blank.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM H
ATTACHMENT H-2
Temporary Cover

FEBRUARY 2018

This page intentionally left blank.

FORM H – REVEGETATION – PHASE II

SECTION C. TEMPORARY COVER

TEMPORARY REVEGETATION SPECIFICATIONS

A. DESCRIPTION

1. General:

   Temporary vegetation shall be used in areas requiring vegetative stabilization for up to 4 months time before permanent vegetation is planted. This will include areas that will not be disturbed for more than 30 days. During this period, the Owner shall be responsible for the maintenance items described in **Section D.4** of this Specification. The Owner shall furnish all labor, material, and equipment to complete Revegetation in accordance with the Permit Drawings and these Specifications.

2. Related Work: Not Included

3. Warranty:

   The Owner shall be responsible for the satisfactory establishment and growth of a temporary stand of vegetation, as evaluated by the Engineer.

B. MATERIALS

1. Limestone: Lime application shall be based on the site-specific soil tests.

2. Fertilizer: Fertilizer application shall be based on the site-specific soil tests. Do not use cyanamic compounds of hydrated lime. Deliver fertilizer in original containers labeled with content analysis.

3. Grass Seed: Supply fresh, clean, new-crop seed as specified in **Table H2-1** of this section. Do not use seed which is wet, moldy, or otherwise damaged. Deliver seed in standard sealed containers labeled with producer's name and seed analysis, and in accordance with US Department of Agriculture Rules and Regulations under the Federal Seed Act.

4. Mulch: Supply clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, or other locally available mulch material in accordance with the rates shown in **Table H2-1**.

   a. Do not use mulch containing a quantity of matured, noxious weed seeds or other species that will be detrimental to seeding, or provide a menace to surrounding land.

   b. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

5. Binder: Supply emulsified asphalt or synthetic binder.

6. Water: Supply potable water, free of substances harmful to growth.

C. SUBMITTALS

The Owner shall submit the following to the Engineer:

1. Results of soil tests performed and proposed modifications, if any, to the specified requirements.

2. Certificates for each grass seed mixture, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Certify that each container of seed delivered is fully labeled in accordance with Federal Seed Act and equals or exceeds specification requirements.

3. Copies of invoices for fertilizer, showing grade furnished and total quantity applied.

D. CONSTRUCTION

1. Areas shall be revegetated within 30 days of final grading, in accordance with the timetable provided in **Table H2-1**. In the event that the surface becomes eroded and non-uniform within the 30 days prior to seeding, the surface shall be regarded immediately prior to reseeding. The Owner shall establish a smooth, healthy, uniform, close stand of grass from the specified seed. Prior to revegetation, the Owner or his representative (i.e. General Contractor or Engineer) shall adequately test the soils to be revegetated in accordance with the **Attachment H-1** (Soil Test Plan) to assess the adequacy of the specified requirements. Any modifications to these requirements deemed necessary after the review of soil test results, shall be at the Owner's sole expense. The Engineer will perform the observations to determine when successful Revegetation is achieved.

2. Soil Preparation:

   a. Limit preparation to areas which will be planted soon after preparation.

   b. Loosen surface to minimum depth of four (4) inches.

   c. Remove stones, sticks, roots, rubbish and other extraneous matter over three (3) inches in any dimension.

   d. Spread lime uniformly over designated areas at the rate specified in **Table H2-1** of this section. Alternatively, lime may be used in direct mix with hydroseeding.

   e. After application of lime, prior to applying fertilizer, loosen areas to be seeded with double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.

   f. Distribute fertilizer uniformly over areas to be seeded at the rate specified in **Table H2-1** of this section.

      (1) Use suitable distributor.

      (2) Incorporate fertilizer into soil to depth of at least two (2) inches. Alternatively, fertilizer may be used in direct mix with hydroseeding.

      (3) Remove stones or other substances which will interfere with turf development or subsequent mowing.

g. Grade seeded areas to smooth, even surface with loose, uniformly fine texture.

(1) Roll and rake, remove ridges and fill depressions, as required to meet finish grades.

(2) Fine grade just prior to planting.

h. If seeding on adverse sites, inoculants will be used at a rate 5 times higher than recommended on the inoculants package.

3. <u>Seeding:</u>

a. Use approved hydroseeding or mechanical power driven drills or seeders, mechanical hand seeders, or other approved equipment.

b. Distribute seed evenly over entire area at the rate specified in **Table H2-1** of this section.

c. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors.

d. Resume work only when favorable condition develops, or as directed by the Engineer.

e. Lightly rake seed into soil followed by light rolling or cultipacking. Alternatively, this is not required in hydroseeding methods.

f. Immediately protect seeded areas against erosion by mulching or placing Rolled Erosion Control Products, in accordance with manufacturer's recommendations.

(1) Spread mulch in a continuous blanket at the rate specified in **Table H2-1** of this section.

(2) Immediately following spreading mulch, secure with evenly distributed binder at the rate specified in **Table H2-1** of this section.

(3) Alternatively, mulch may be applied in direct mix with hydroseeding.

4. <u>Maintenance:</u>

Maintenance shall include, but not be limited to, the following items:

a. Regrade to repair bare and eroded areas and revegetate all eroded areas until adequately stabilized by grass.

b. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

c. Replant bare areas using same materials specified in **Table H2-1**. Prior to reseeding, soil testing in accordance with the provisions included in **Attachment H-1** (Soil Test Plan) shall be performed.

TABLE H2-1: TEMPORARY SEEDING SCHEDULE

MATERIAL	SEED TYPE	% GERMINATION (MIN)	MINIMUM SEED PURITY (%)	SEEDING DATES (MONTHS)	APPLICATION RATE[1] (lbs./ac)
Lime	-----	-----	-----	-----	4,000
Fertilizer	-----	-----	-----	------	1,000
Seed Mix	Annual Ryegrass[2]	85	95	**April 1 to June 15**	40
	or spring oats	85	98		96
	or spring oats and ryegrass	85	98		60 and 20
	or winter wheat	85	95		180
	or winter rye	85	98		168
	Annual Ryegrass[2]	85	95	**June 16 to August 15**	40
	or Japanese or foxtail millet	85	98		35
	or sudangrass	85	98		40
	or spring oats	85	98		96
	or winter wheat	85	98		180
	or winter rye	85	98		168
	Annual Ryegrass[2]	85	95	**August 16 to October 8[4]**	40
	or winter rye	85	98		168
	or winter wheat	85	98		180
	or spring oats[3]	85	98		96
Mulch	-----	-----	-----	-----	3 Tons/acre
Binder	-----	-----	-----	-----	150 gallons/acre

Notes:

1. Application rates and/or chemical analysis shall be confirmed or established by a soil test.
2. Annual or Perennial ryegrass.
3. This can be planted but may winter kill.
4. Fall planting after October 8 will require a winter hardy variety with high percent germination.

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM H
ATTACHMENT H-3
Permanent Cover

FEBRUARY 2018

This page intentionally left blank.

FORM H – REVEGETATION – PHASE II

D. PERMANENT COVER

PERMANENT REVEGETATION SPECIFICATIONS

A. DESCRIPTION

1. General:

Permanent vegetation shall be used in areas requiring vegetative stabilization for more than 4 months. The Owner shall be responsible for the maintenance items described in **Section D.4** of this Specification. The Owner shall furnish all labor, material, and equipment to complete Revegetation in accordance with the Permit Drawings and these Specifications.

2. Related Work: Not Included

3. Warranty:

The Owner shall be responsible for the satisfactory establishment and growth of a permanent stand of vegetation, as evaluated by the Engineer.

B. MATERIALS

1. Limestone: Lime application shall be based on the site-specific soil tests.

2. Fertilizer: Fertilizer application shall be based on the site-specific soil tests. Do not use cyanamic compounds of hydrated lime. Deliver fertilizer in original containers labeled with content analysis.

3. Grass Seed: Supply fresh, clean, new-crop seed as specified in **Table H3-1** of this section. Do not use seed which is wet, moldy, or otherwise damaged. Deliver seed in standard sealed containers labeled with producer's name and seed analysis, and in accordance with US Department of Agriculture Rules and Regulations under the Federal Seed Act.

4. Mulch: Supply clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, or other locally available mulch material.

   a. Do not use mulch containing a quantity of matured, noxious weed seeds or other species that will be detrimental to seeding, or provide a menace to surrounding land.

   b. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

5. Binder: Supply emulsified asphalt or synthetic binder.

6. Water: Supply potable water, free of substances harmful to growth.

C. SUBMITTALS

The Owner shall submit the following to the Engineer:

1. Results of soil tests performed and proposed modifications, if any, to the specified requirements.

2. Certificates for each grass seed mixture, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Certify that each container of seed delivered is fully labeled in accordance with Federal Seed Act and equals or exceeds specification requirements.

3. Copies of invoices for fertilizer, showing grade furnished and total quantity applied.

D. <u>CONSTRUCTION</u>

1. Areas shall be revegetated within 30 days of final grading, in accordance with the timetable provided in **Table H3-1**. In the event that the surface becomes eroded and non-uniform within the 30 days prior to seeding, the surface shall be regarded immediately prior to reseeding. The Owner shall establish a smooth, healthy, uniform, close stand of grass from the specified seed. Prior to revegetation, the Owner or his representative (i.e. General Contractor or Engineer) shall adequately test the soils to be revegetated in accordance with the **Attachment H-1** (Soil Test Plan) to assess the adequacy of the specified requirements. Any modifications to these requirements deemed necessary after the review of soil test results, shall be at the Owner's sole expense. The Engineer will perform the observations to determine when successful Revegetation is achieved.

2. <u>Soil Preparation:</u>

   a. Limit preparation to areas which will be planted soon after preparation.

   b. Loosen surface to minimum depth of four (4) inches.

   c. Remove stones, sticks, roots, rubbish and other extraneous matter over three (3) inches in any dimension.

   d. Spread lime uniformly over designated areas at the rate specified in **Table H3-1** of this section. Alternatively, lime may be used in direct mix with hydroseeding.

   e. After application of lime, prior to applying fertilizer, loosen areas to be seeded with double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.

   f. Distribute fertilizer uniformly over areas to be seeded at the rate specified in **Table H3-1** of this section.

      (1) Use suitable distributor.

      (2) Incorporate fertilizer into soil to depth of at least two (2) inches. Alternatively, fertilizer may be used in direct mix with hydroseeding.

      (3) Remove stones or other substances which will interfere with turf development or subsequent mowing.

   g. Grade seeded areas to smooth, even surface with loose, uniformly fine texture.

      (1) Roll and rake, remove ridges and fill depressions, as required to meet finish grades.

(2) Fine grade just prior to planting.

h. If hydroseeding or seeding on adverse sites, inoculants will be used at a rate of 5 times higher than recommended on the inoculants package.

3. <u>Seeding:</u>

a. Use approved hydroseeding or mechanical power driven drills or seeders, mechanical hand seeders, or other approved equipment.

b. Distribute seed evenly over entire area at the rate specified in **Table H3-1** of this section.

c. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors.

d. Resume work only when favorable condition develops, or as directed by the Engineer.

e. Lightly rake seed into soil followed by light rolling or cultipacking. Alternatively, this is not required in hydroseeding methods.

f. Immediately protect seeded areas against erosion by mulching or placing Rolled Erosion Control Products in accordance with manufacturer's specifications.

(1) Spread mulch in a continuous blanket at the rate specified in **Table H3-1** of this section.

(2) Immediately following spreading mulch, secure with evenly distributed binder at the rate specified in **Table H3-1** of this section.

(3) Alternatively, mulch may be applied in direct mix with hydroseeding.

4. <u>Maintenance:</u>

The Owner shall be responsible for maintaining all seeded areas through the end of his warranty period. The Owner shall provide, at his expense, protection of all seeded areas against damage at all times until acceptance of the work. Maintenance shall include, but not be limited to, the following items:

a. Regrade and revegetate all eroded and bare areas until adequately stabilized by grass.

b. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

c. Replant bare areas using same materials specified in **Table H3-1**. Prior to reseeding, soil testing in accordance with the provisions included in **Attachment H-1** (Soil Test Plan) shall be performed.

d. Growth of trees, woody plants, and deep-rooted plants will be controlled by mowing, as necessary.

TABLE H3-1: PERMANENT SEEDING SCHEDULE

MATERIAL	SEED TYPE	% GERMINATION (MIN)	MINIMUM SEED PURITY (%)	APPLICATION RATE[1]
Lime	-----		-----	4,000 lbs/acre
Fertilizer	-----		-----	1,000 lbs/acre
Seed[2]	Kentucky 31 Tall Fescue Timothy Hay Alsike Clover Birdsfoot Trefoil[3] Seasonal Nurse Crop[4]	80 80 80 80 80	95 95 95 98 95	25 lbs/acre 7.5 lbs/acre 7.5 lbs/acre 15 lbs/acre -----
Mulch	-----		-----	3 Tons/acre
Binder	-----		-----	150 gallons/acre

Notes:

1. Application rates and/or chemical analysis shall be confirmed or established by a soil test.
2. Perform seeding between: April 1 to May 30 or August 15 to September 15.
3. For Birdsfoot Trefoil: 60% ready germination and 20% hard seed.
4. Seasonal nurse crop shall be applied at a rate of 25% of the specified rates listed in the Temporary Cover attachment (**Attachment H-2**).

PHASE II APPLICATION
CAMP HOPE RUN LANDFILL
BOGGS TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

FORM H
ATTACHMENT H-4
Method For Determining Success of Revegetation

FEBRUARY 2018

This page intentionally left blank.

FORM H – REVEGETATION – PHASE II

METHOD OF DETERMINING THE SUCCESS OF REVEGETATION

1. GENERAL

Visual evaluations of the success of temporary and permanent vegetation will be made 4 to 6 weeks after seeding and germination. Additional visual inspections will be made weekly and after major storm events by site operations personnel. Estimates of the percentage of vegetative cover will be made using the step transect or other methods as approved by the Department.

2. STEP TRANSECT METHOD

The step transect method can be used for estimating points placed randomly or systematically. Use at least 100 observation points within the area being evaluated. The observer paces across the area to be sampled and the presence or absence of vegetation at each data point, to be positioned at the tip of the observer's shoe, is noted. The occurrence of vegetation, litter, or bare ground can be noted at each observation point to help define distribution of cover. The number of steps between observations can be systematic or varied. It is necessary to lay out one or more random "walks" to cover the area to be evaluated.

3. CRITERIA

The successfulness of revegetation will be visually evaluated as follows:

A. On intermediate and final landfill slopes:
   - 75 percent ground cover of permanent plant species (minimum) in the first year, and
   - 95 percent success in the subsequent years;
   - No more than 1 percent total area may be less than 30 percent ground cover, and
   - No area greater than 3,000 square feet may have less than 30 percent ground cover.

B. On all other areas:
   - 70 percent ground cover of permanent plant species (minimum);
   - No more than 1 percent total area may be less than 30 percent ground cover, and
   - No area greater than 3,000 square feet may have less than 30 percent ground cover.