

**SOLID WASTE PERMITTING  
SUBMISSION INSTRUCTION NO. 27**

**LANDFILL MINING OPERATING PLANS FOR SOLID WASTE DISPOSAL FACILITIES**

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Developed by:

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## I. OPERATING PLAN

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The Operating Plan shall address the requirements of [9 VAC 20-81-385.B.](#) and include supplemental discussions and design calculations to facilitate department review of the proposed landfill mining activity. The sections below have been written to facilitate preparation of an Operating Plan that addresses these requirements.

In accordance with 9 VAC 20-81-485.A., landfills shall have an operations manual that contains (1) an operations plan outlining daily landfill operation instructions; (2) an inspection plan that provides a schedule for inspecting all major aspects of facility operations; (3) a health and safety plan that addresses the requirements of 29 CFR 1910; (4) an unauthorized waste control plan; (5) an emergency contingency plan; and (6) a landscaping plan. Solid waste disposal facilities are required to maintain these plans in the facility's operating record, update them as necessary, and certify annually that the plans address current operations and regulatory requirements

The landfill operations manual, which is separate from the landfill mining operating plan discussed below, is to be maintained in the facility's operating record and updated to account for changes in facility operations and/or the VSWMR. The facility shall develop a plan or review its current inspection plan and update the plan to account for self-inspections that should be performed to ensure the landfill mining operation is in compliance with all requirements of Part III of the VSWMR (9 VAC 20-81-100 *et seq.*). At a minimum, the self-inspection program shall address inspections of the facility features identified in [9 VAC 20-81-140.A.16.](#)

**Format** The format used for the Operating Plan should encourage clear analysis and presentation of the proposed landfill mining operation. The Operating Plan should start with a title page and table of contents followed by the following sections and discussions, which may already exist in the active landfill's Operations Manual, but should be repeated here. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

### A. Introduction

Provide a brief history outlining the landfill's development timeline, landfill's capacity, and types of wastes accepted.

Provide a description of the scope of the proposed landfill mining activity, to include anticipated materials to be recovered, expected quantities, and proposed final use of the recovered air space.

### B. Schedule of Activities

Provide an estimate for the duration of mining activities and benchmarks for certain phases of the mining activities to be completed. Indicate when mining will occur, i.e. what months of the year or if mining will take place year round. Indicate hours of operation for the mining activity.

## C. Operations

### 1. *General*

#### a. Personnel

Provide a list of estimated staffing needs to be used during the landfill mining operations. The list should indicate the staff's title and general responsibilities.

#### b. Equipment

Provide a list of estimated equipment needs to carry out this plan. The list should identify the type, number, and function of each piece of equipment.

### 2. *Procedures that will be employed to initiate mining activities*

Describe procedures to be followed prior to initiating mining activities. These procedures should include, but are not limited to, installation of erosion and sediment control features; creation and/or maintenance of access roads and material and equipment storage areas; acquisition and staging of appropriate equipment; facility monitoring and self-inspections; and any other applicable procedures.

### 3. *Phased description of opened areas*

Using the Design Plans (see [Section II](#)) as a reference, provide a phased description of how landfill mining will proceed. Indicate how specified equipment will be used, anticipated mining sequencing, and locations and phasing of waste management activities to be performed in conjunction with waste excavation.

### 4. *Procedures to meet landfill operational performance standards*

#### a. Types of Wastes

Indicate the types of wastes to be managed during the landfill mining activity. Indicate how wastes will be staged and procedures for handling unauthorized waste discovered during excavation, referencing the facility's Control Plan for Unauthorized Waste developed in accordance with 9 VAC 20-81-100.E.

#### b. Fire Control

Provide a description of fire protection equipment available at the site, indicating the equipment's location, physical description, and capabilities. Indicate the procedures that will be followed by facility personnel in response to observed subsurface fire indicators (such as substantial settlement over a short period of time, smoke, carbon monoxide emissions, or high landfill temperatures) and equipment fires in the excavation area. This section should also outline the facility's evacuation procedure including signals, personnel assembly areas, etc., and at what point emergency response personnel will be summoned.

c. Monitoring for Gaseous Emissions

Indicate any monitoring to be performed and monitoring frequencies for methane, hydrogen sulfide, or other site-specific emissions to be conducted at the excavation area. During landfill mining activities, the facility shall maintain its perimeter landfill gas monitoring system and perform monitoring in accordance with a separate Landfill Gas Management Plan (see [Section III.B.](#)).

d. Stormwater Control

Indicate run-on and run-off control systems to be installed, maintained, and modified during the course of the landfill mining activity in order to prevent stormwater flow to the active excavation area and facilitate run-off without causing pollutant discharge in accordance with [9 VAC 20-81-130.H](#). If a separate stormwater plan has been developed pursuant to a Virginia Pollutant Discharge Elimination System (VPDES) permit, provide a reference to the current plan.

Indicate procedures for dealing with perched leachate conditions encountered during landfill mining activities to prevent pollutant discharge.

e. Dust, Odor, and Vector Control

Describe procedures to be employed to manage dust, odor, and vector control. If a separate Odor Management Plan has been developed, be sure to reference the plan.

f. Litter Control

Describe procedures to be employed to contain litter and blowing paper to landfill mining and waste processing areas. Indicate routines for litter collection to meet the performance standard of [9 VAC 20-81-140.A.9](#).

g. Noise Control

Indicate noise control procedures. In accordance with [9 VAC 20-81-130.E](#), noise attenuation shall be less than 80 dBA at the facility boundary.

h. Excavation and Cover

i. Excavation

This section should address the depth of daily excavation in contrast to addressing height of lifts placed for compaction of incoming waste. Excavation should be performed in a manner that does not create steep slopes (in excess of final permitted grades or 33%). Steeper slopes may be allowed if slope stability calculations demonstrate a steeper slope will be stable. The calculations shall take into consideration the type and age of waste and its shear strength and related properties; expected leachate levels; potential rainfall impacts; and any impacts due to equipment loading. Slopes shall not exceed those allowed under OSHA's regulations regarding excavations ([29 CFR 1926 Subpart P](#)).

ii. Daily, Progressive, and Periodic Cover

Indicate situations that would require daily cover and materials to be used. Landfill mining of sanitary landfills requires placement of daily cover or alternate daily cover in accordance with [9 VAC 20-81-140.B.1.c.](#) However, there may be situations that require placement of daily cover at mining operations located at CDD and Industrial Landfills, i.e. to control odors, which should be specified here.

Placement of weekly progressive cover (9 VAC 20-81-140.C.1.b.) and periodic cover (9 VAC 20-81-140.D.1.c.) is required for landfill mining at CDD Landfills and Industrial Landfills, respectively. Indicate situations that would require progressive and periodic cover and materials to be used.

iii. Intermediate Cover

If mining activities are to be suspended for 30 days or more as indicated in the schedule of activities provided in [Section I.B.](#), intermediate cover shall be provided and vegetation established as necessary. Indicate situations and procedures for applying intermediate cover.

iv. Final Cover

When landfill mining activities have reached anticipated final elevations, the landfill must be closed with a final cap in accordance with [9 VAC 20-81-160.](#) Indicate when final cover is to be installed and reference a separate Closure Plan which provides details on the closure cap to be installed. Liner and leachate collection system designs for future landfill expansions should be addressed in a Design Report (see [Submission Instruction No. 2](#)) separate from this plan.

*This section is not applicable if the goal of landfill mining is to remove the landfill and obtain clean closure status from the Department.*

5. *Prevention of releases to Groundwater and Subsurface Environment*

This section shall address the requirements of [9 VAC 20-81-395.C.2.](#) and address the prevention of releases that may have adverse effects on human health or the environment due to migration of waste constituents in the groundwater or subsurface environment. The discussion should address the potential for releases and impacts considering the following:

- The potential for waste constituents to migrate through soil, liners, or other containing structures;
- The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater;
- The quantity and direction of groundwater flow;
- The proximity to and withdrawal rates of current and potential groundwater uses; and

- The potential for deposition or migration of waste constituents into subsurface physical structures, and into the root zone of food-chain crops and other vegetation.

Measures currently in place or to be implemented to prevent releases of waste constituents to groundwater and the subsurface environment should be discussed here.

6. *Prevention of releases to Surface Water, Wetlands, or Soil Surface*

This section shall address the requirements of [9 VAC 20-81-395.C.3.](#) and address the prevention of releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water, wetlands, or the soil surface. The discussion should address the potential for releases and impacts considering the following:

- The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing migration;
- The quantity, quality, and direction of groundwater flow;
- The proximity of the unit to surface waters;
- The current and potential uses of nearby surface waters and any water quality standards established for those surface waters; and
- The existing quality of surface waters and surface soils, including other sources of contamination and their cumulative impact on surface waters and surface soils.

Measures currently in place or to be implemented to prevent releases of waste constituents to surface water, wetlands, or surface soils should be discussed here.

7. *Prevention of releases to Air*

This section shall address the requirements of [9 VAC 20-81-395.C.4.](#) and address the prevention of releases that may have adverse effects on human health or the environment due to migration of waste constituents in the air. The discussion should address the potential for releases and impacts considering the following:

- The potential for the emission and dispersal of gases; aerosols, and particles;
- The effectiveness and reliability of systems and structures to reduce or prevent emissions of waste constituents to the air;
- The operating characteristics of the unit; and
- The existing quality of the air, including other sources of contamination and their cumulative impact on the air.

Measures currently in place or to be implemented to prevent releases of waste constituents to the air should be discussed here.

#### D. Management of Excavated Materials

Provide a thorough discussion of how materials will be handled once excavated. If multiple waste handling areas will be used, provide a flow chart indicating how excavated material will be managed. Describe any on-site sorting procedures, equipment to be used, location of sorting and stockpile areas, etc.

##### 1. *Disposition of recovered materials*

Indicate the disposition of sorted recoverable materials (i.e. sent off site for recycling, further processing, etc.) and provide estimated volumes of each type of recoverable material. If mechanical screeners are to be used to sort excavated wastes, indicate the disposition of each size fraction and anticipated material makeup.

##### 2. *Soils Management Plan*

If the facility anticipates beneficially reusing soils (which may contain residual waste material) recovered from the landfill mining activities, a soils management plan addressing soil sampling, storage and handling of excavated soil, and beneficial use(s) should be included. The plan needs to indicate where soils will be stockpiled, to include untested soils, sampled acceptable soils, and soils exhibiting levels of contamination above set limits, and measures to ensure that only appropriate soils are stockpiled in the designated areas. The plan should also indicate measures that will be taken to control stormwater run off and erosion of stockpiles to ensure that no migration of any potentially hazardous material off the property occurs.

Beneficial use of soils in landfill applications such as alternate daily or intermediate cover may be allowed after a demonstration period. Soil reuse shall be on internal slopes only where run-off can be collected as leachate.

##### 3. *Disposition of unusable materials*

Identify the materials to be excavated that are considered unusable and indicate how these materials will be handled. Indicate waste determination procedures (to include material testing and/or generator knowledge) to be used to ensure unusable materials are non-hazardous. Based on the determination, indicate final disposition of unusable materials, which may include, being returned to the active mining area for disposal, disposal in a separate disposal unit, or sent off-site for further processing and/or disposal. If unusable materials are to be returned to the active mining area, indicate location and timeframes associated with material storage prior to disposal in the landfill.

If unauthorized wastes are encountered, provide details of how they will be managed. If a separate Unauthorized Waste Control Plan is available, reference the existing plan.

## II. DESIGN PLANS

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Submit the following design plans on 11" x 17" paper. A full-size set of Design Plans should also be provided in rolls and/or in pockets for review. The Design Plans shall be prepared and certified by a professional engineer registered to practice in the Commonwealth. [9 VAC 20-81-470.A.1.]

### A. Title Sheet

The Title Sheet shall state the project title, preparer of the plans, the person/organization for whom the plans were prepared, a table of contents, and a location map showing the location of the site and area to be served. [9 VAC 20-81-470.A.1.a.]

### B. Existing Site Conditions Plan Sheet

Show conditions existing at the site prior to initiating landfill mining activities. Be sure to identify the proposed landfill mining unit boundary. As defined in guidance memo LPR-SW-2013-02, the "Landfill mining unit boundary" or "LFMUB" means the vertical plane located at the edge of the landfill mining activity. The LFMUB must encompass all excavation, waste storage and salvaging operations and be positioned within or coincident to the waste management boundary. [9VAC20-81-470.A.1.b.]

### C. Phasing Plan Sheets

Provide a series of plan sheets showing the progression of landfill mining through time; a separate plan shall be provided for each major phase or new area where substantial landfill mining will be performed. At least one phasing plan sheet shall be provided to correspond with the midpoint of the landfill mining operation. [9 VAC 20-81-470.A.1.f. and A.2.]

### D. Final Site Topography Plan Sheet

Show final site topography indicating the appearance of the site and final contours of the site at the end of landfill mining, including any detail drawings necessary to prepare the site for long-term care. [9 VAC 20-81-470.A.1.e.]

### E. Site Monitoring Plan

Provide a site monitoring plan showing current and proposed locations of the following:

- Devices for the monitoring of leachate production and detection;
- Groundwater quality monitoring wells;
- Landfill gas probes and vents;
- Odor monitoring stations, if applicable; and
- Stormwater outfalls.

[9 VAC 20-81-470.A.1.g.]

### III. SITE MONITORING PLAN(S)

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If landfill mining is to occur at an active landfill or landfill currently undergoing postclosure care, then the facility's permit should already contain approved site monitoring plans for the management of leachate, landfill gas, and groundwater. If necessary, these plans should be modified to incorporate the details provided below specific to landfill mining.

If landfill mining is to occur at a pre-88 landfill or closed landfill released from postclosure care requirements, site monitoring plan(s) should be developed to address the following requirements as outlined in Part III (9 VAC 20-81-100 *et seq.*) of the VSWMR.

#### A. Leachate Management

Landfill mining activities, especially activities at closed landfills, will subject opened landfill areas to additional precipitation. Landfills originally designed with liners and leachate collection systems should have functioning leachate collection and detection systems (if applicable) in order to handle the precipitation that collects. It is especially important that landfills without liners and leachate collection systems implement operational measures to reduce the volume of precipitation that collects within the excavation area. This section of the site monitoring plan should supplement operating procedures to ensure run-on/run-off control and address the applicable sections of [Submission Instruction No. 7](#) for leachate management plans.

In addition, operators excavating wastes from landfills units have the potential to encounter perched leachate conditions and create leachate seeps. Any leachate encountered shall be managed to prevent discharge of pollutants to surface waters, waters of the United States, and wetlands. The operating plan ([Section I.C.6.](#)) shall address procedures for managing perched leachate in addition to leachate seeps as required by [9 VAC 20-81-210.F.](#)

#### B. Landfill Gas Management

If organic waste materials were previously placed in the landfill, landfill mining activities can result in releases of landfill gas either at the active mining area or cause subsurface movement. This section of the site monitoring plan should address the applicable items identified in [Submission Instruction No. 13](#) for landfill gas management plans. In addition to monitoring landfill gas at the facility boundary, procedures to be followed to monitor levels of landfill gas at the active mining area should also be provided for purposes of worker safety.

#### C. Odor Management

In accordance with [9 VAC 20-81-200.D.](#) odor management plans shall be developed in response to an odor nuisance or hazard created under normal operating conditions and upon notification from the department. Except in the case of certain industrial landfills and possible CDD landfills, landfill mining activities are likely to release odorous compounds that may cause a nuisance or hazard. For this reason, applications for landfill mining should preemptively include an odor management plan outlining procedures to be followed in response to identified odor nuisances or

hazards. [Submission Instruction No. 13](#) has a section devoted to odor management plans and can be used to develop a plan specific to the proposed landfill mining activities.

#### D. Groundwater Monitoring

All landfills shall have a Groundwater Monitoring Plan in accordance with [9 VAC 20-81-250](#). In some cases, Corrective Action Plans may also be required in accordance with [9 VAC 20-81-260](#). If the facility is not currently subject to groundwater monitoring requirements (either because the landfill was closed prior to December 21, 1988, or because the landfill was released from postclosure care requirements), then the landfill mining application should include a Groundwater Monitoring Plan to address monitoring for impacts resulting from the landfill mining activity. [Submission Instruction Nos. 5, 11, and 12](#) are provided to assist with development of a Groundwater Monitoring Plan (select appropriate submission instruction based on type of landfill – new landfill, existing CDD or industrial landfill, or existing sanitary landfill, respectively).

If the facility already has an approved Groundwater Monitoring Plan and Corrective Action Plan, if applicable, then it is likely that the current plan(s) are sufficient. Facilities should review current plans and make any changes deemed necessary to account for the proposed landfill mining activity.

#### E. Storm Water Discharge Monitoring

Landfills that have point-source stormwater discharge(s) are typically covered under a Virginia Pollutant and Discharge Elimination System (VPDES) Permit, which requires the facility to maintain a Stormwater Pollution Prevention Plan (SWPPP) in addition to setting monitoring, limits, and reporting requirements applicable to stormwater discharges. The facility should work with the Regional VPDES permit writer and/or compliance inspector to determine if modifications to the VPDES permit and/or SWPPP are necessary as part of the solid waste permit modification.