



## Ohio Administrative Code

### Rule 3745-27-06 Sanitary landfill facility permit to install application.

Effective: January 1, 2021

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(A) A permit to install application pursuant to section 3734.05 of the Revised Code shall be submitted and approved by the director before the establishment or modification of the sanitary landfill facility is begun. Compliance with this rule shall not exempt any person from compliance with any other permit, license, or other obligation for authorization.

(1) The permit to install application shall contain information in accordance with paragraphs (B) and (C) of this rule so that the director can determine if the criteria set forth in rules 3745-27-02 and 3745-27-07 of the Administrative Code are satisfied. If Ohio EPA determines that additional information is necessary to determine whether the criteria set forth in rules 3745-27-02 and 3745-27-07 of the Administrative Code are satisfied, the applicant shall supply such information as a precondition to further consideration of the permit to install application.

(a) A permit to install application for a new sanitary landfill facility, a new unit, or a permit to install application that is submitted in response to division (A)(3) of section 3734.05 of the Revised Code shall contain information in accordance with paragraphs (B) and (C) of this rule with the exception of paragraph (B)(5)(d) of this rule.

(b) A permit to install application to modify a sanitary landfill facility for a vertical expansion to the upper limits of solid waste placement shall contain the following information:

(i) The plan sheets specified in paragraphs (B)(1), (B)(2), (B)(3)(g), (B)(4), (B)(5) and (B)(6) of this rule.

(ii) The plan sheet showing the location of proposed explosive gas control system structures, if necessary, specified in paragraph (B)(3)(f) of this rule.

(iii) Detail drawings, as necessary, specified in paragraph (B)(7) of this rule.



- (iv) The reports specified in paragraphs (C)(1), (C)(2), and (C)(7) of this rule.
  - (v) The subsurface investigation report, as necessary to provide supporting information for the geotechnical analysis, specified in paragraph (C)(3) of this rule.
  - (vi) Geotechnical analysis for bearing capacity, static stability, seismic stability and settlement specified in paragraphs (C)(4)(b) to (C)(4)(e) and (C)(4)(g) of this rule.
  - (vii) Calculations, as necessary, specified in paragraph (C)(5) of this rule.
  - (viii) The quality assurance/quality control and final closure/post-closure care plans, specified in paragraphs (C)(9)(c) and (C)(9)(d) of this rule.
  - (ix) The letters and list of permits specified in paragraphs (C)(10)(a) and (C)(10)(b) of this rule.
- (c) A permit to install application to modify a sanitary landfill facility for a vertical expansion to the lower limits of solid waste placement shall contain the following information:
- (i) The plan sheets specified in paragraphs (B)(1) to (B)(6) of this rule.
  - (ii) Detail drawings, as necessary, specified in paragraph (B)(7) of this rule.
  - (iii) The reports specified in paragraphs (C)(1), (C)(2), (C)(3), and (C)(7) of this rule.
  - (iv) Geotechnical analysis for hydrostatic uplift, bearing capacity, static stability, seismic stability, settlement, and seepage piping failure specified in paragraphs (C)(4)(a) to (C)(4)(f) of this rule.
  - (v) Calculations, as necessary, specified in paragraph (C)(5) of this rule.
  - (vi) The explosive gas monitoring and quality assurance/quality control plans specified in paragraphs (C)(9)(b) and (C)(9)(c) of this rule.
  - (vii) The letters and list of permits specified in paragraphs (C)(10)(a) and (C)(10)(b) of this rule.



(d) A permit to install application to modify a sanitary landfill facility for a change to the information specified in paragraph (C)(8) of this rule shall discuss the change pursuant to paragraph (C)(8) of this rule in addition to the following:

(i) The summary specified in paragraph (C)(1) of this rule.

(ii) Any variance or exemption requests specified in paragraph (C)(2) of this rule.

(iii) If the change is to the authorized maximum daily waste receipt, the calculations showing gross volume and life specified in paragraph (C)(5)(a) of this rule.

(e) A permit to install application to modify a sanitary landfill facility, other than what is listed in paragraphs (A)(1)(b) to (A)(1)(d) of this rule, shall contain the information specified by paragraphs (B) and (C) of this rule that are affected by the change and shall incorporate any alterations that were previously approved for those components affected by the change.

(2) The permit to install application shall contain detail engineering plans, specifications, and information that follow the format specified in paragraphs (B) and (C) of this rule such that the director can determine if the criteria set forth in rule 3745-27-07 of the Administrative Code are satisfied.

(3) When publicly available information is specified in this rule, the applicant may use written or published information from public or private sources that is reasonably available to the public, and includes but is not limited to visual surveys from public rights-of-way and public lands of the area surrounding the proposed sanitary landfill facility or written or oral surveys of the landowners around the proposed sanitary landfill facility.

[Comment: As long as the applicant can document that a reasonable attempt was made to obtain the information, the application will be considered complete even if information is lacking, such as a lack of response to the written or oral survey.]

(4) Engineering information included in the permit to install application shall be signed and sealed



by a professional engineer registered in Ohio.

(5) For regulatory review purposes, the initial application and any subsequent revisions to the application, shall be submitted in duplicate to Ohio EPA with a third copy sent to the board of health of the health district where the facility is or will be located. Any revisions to the application must be accompanied by an index listing the change and the page where the change occurred. Upon written request from Ohio EPA, the applicant shall submit two additional and identically complete copies of the revised application to Ohio EPA and a notarized statement that, to the best of the knowledge of the applicant, the detail engineering plans, specifications, and information in the permit application are true and accurate.

(6) Concurrent to submitting the permit to install application, the applicant shall also do the following:

(a) For a new sanitary landfill facility, submit a disclosure statement to the office of the attorney general in accordance with rules 109:6-1-01 to 109:6-1-04 of the Administrative Code.

(b) Submit to the division of Ohio EPA regulating air pollution control and water pollution control, written notification of intent to site a sanitary landfill facility and a written request for information pertaining to any regulatory requirements under Chapter 3704. and 6111. of the Revised Code.

(7) The permit to install application, notwithstanding any deficiencies, may be considered and acted upon if sufficient information is provided in the application for the director to determine whether the criteria set forth in rules 3745-27-02 and 3745-27-07 of the Administrative Code are satisfied.

(8) Upon issuance of the permit to install, Ohio EPA will send one copy of the permit to install and approved permit application to the board of health where the facility is or will be located, will return one copy to the applicant, and will retain two copies in Ohio EPA's files.

(9) The permit to install shall remain in effect until the director has discontinued the post-closure care period of the sanitary landfill facility, unless the permit has been revoked or terminated in accordance with rule 3745-27-02 of the Administrative Code.



(B) Plan sheets. The following detail engineering plans, specifications, and information for each unit of a sanitary landfill facility shall be shown by means of drawings and narrative descriptions where appropriate. Minimum dimensions of the plan drawings shall be twenty-four inches by thirty-six inches.

(1) The detail engineering plan cover sheet, to be numbered sheet 1, shall contain the following information:

(a) The name of the sanitary landfill facility.

(b) The precise geographic location and boundaries of the sanitary landfill facility and the area within a five-mile radius including any airport runways to be shown on a road map with a scale of one inch equals no greater than one mile.

(c) The name and address of the permit to install applicant for the sanitary landfill facility.

(d) The name and address of the owner and operator of the sanitary landfill facility, if different from the applicant.

(e) The name and address of the person who prepared the plans.

(f) Index of plan sheets.

(2) Plan drawings, showing items located within the facility boundary or within one thousand feet of the limits of solid waste placement or as otherwise specified in this paragraph, shall be on a series of plan drawings numbered consecutively 2A, 2B, 2C, etc. A scale of one inch equals no greater than two hundred feet shall be used. All items specified in an individual subheading shall be shown on the same plan drawing, or a note shall be on the plan sheet stating the item does not exist within the specified distance from the limits of solid waste placement. An individual plan drawing may contain information specified in more than one individual subheading. The plan drawings shall include the following:

(a) Plan drawings pursuant to paragraph (B)(2) of this rule shall include the following:



- (i) The property lines of land owned or leased for the sanitary landfill facility as determined by a property survey conducted by a professional surveyor registered in Ohio.
  - (ii) The limits of solid waste placement, leachate storage structures, and leachate lift stations.
  - (iii) Occupied structures.
  - (iv) Existing topography showing streams, lakes, springs, wetlands, and other surface waters, with a contour interval no greater than five feet.
  - (v) The north arrow.
  - (vi) The location of survey marks.
  - (vii) Each unit of the sanitary landfill facility.
  - (viii) The facility boundary.
- (b) The following based on publicly available information:
- (i) Zoning classifications, property owners, and political subdivisions.
  - (ii) Man-made potential explosive gas migration pathways, including sewers, water lines, electrical cables, and other underground utilities; field tiles; french drains; pipelines; and other potential sources of explosive gas including oil wells, gas wells, and other landfills.
  - (iii) The limits of any regulatory floodplains.
  - (iv) National park or recreation areas, candidate areas for potential inclusion into the national park system, and any state park or established state park purchase areas.
  - (v) State nature preserves, state wildlife areas, national and state scenic rivers, any national wildlife



refuge, special interest areas, research natural areas in the Wayne national forest, outstanding national resource waters, and exceptional coldwater habitats or exceptional warmwater habitats as defined in Chapter 3745-1 of the Administrative Code.

(vi) Public and private water supply wells within two thousand feet of the limits of solid waste placement. A scale insert may be used if necessary.

(vii) The limits of drinking water source protection areas for public water systems using ground water that have been endorsed or delineated by Ohio EPA for a public water supply.

(viii) Faults that have had displacement in Holocene time.

(ix) Surface and underground mining of coal and noncoal minerals with the angle of draw within two thousand feet of the limits of solid waste placement using a scale insert if necessary, and oil and gas wells.

(x) The limits of aquifers declared by the federal government under the "Safe Drinking Water Act", 42 U.S.C 300f et. seq., to be a sole source aquifer.

(c) The limits of disturbance and the facility boundary. The limits of disturbance include but are not limited to the limits of excavation, borrow areas, storage areas, staging areas, areas to be cleared and grubbed, and roadways.

(3) Plan drawings, showing items located within three hundred feet of the limits of solid waste placement shall be on a series of plan drawings numbered consecutively 3A, 3B, 3C, etc. A scale of one inch equals no greater than two hundred feet shall be used. Each plan drawing shall include the items specified in paragraph (B)(2)(a) of this rule. All items specified in an individual subheading shall be shown on the same plan drawing unless specified otherwise. An individual plan drawing may contain information specified in more than one individual subheading. The plan drawings shall include the following:

(a) The location of existing or proposed pipes and conduits, electric lines, french drains, roads, and railroads; and any easements bordering or within the proposed facility boundaries.



(b) The location of subsurface investigation sites, which are any location where subsurface conditions are investigated by data collection or evaluation, including but not limited to borings, test pits, monitoring wells, piezometers, tensiometers, geophysical survey stations, and soil gas survey stations; and proposed ground water monitoring wells.

(c) Potentiometric maps of the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system. More than one plan sheet may be used.

(d) The location of any permanent ground water control structures.

(e) The location of any existing or proposed explosive gas control system.

(f) A diagram showing the phases of the sanitary landfill facility.

(g) The location of any monocells or monofills.

[Comment: Scrap tires and secondary aluminum waste are only authorized for disposal at a sanitary landfill facility in a monofill or monocell. The applicant may opt to segregate other waste streams.]

(h) The land set aside for leachate treatment or pretreatment facilities pursuant to paragraphs (K)(5) and (K)(6) of rule 3745-27-19 of the Administrative Code.

(4) Plan drawings for the entire sanitary landfill facility shall be on plan drawings numbered consecutively 4A, 4B, 4C, etc. A scale of one inch equals no greater than two hundred feet and contour intervals of no greater than five feet for slopes less than or equal to twenty-five per cent and ten feet for slopes greater than twenty-five per cent shall be used. The plan drawings shall show the boundaries and elevation and include the following:

(a) The horizontal and vertical limits of excavation proposed in the permit to install application, including any areas where added geologic material is necessary to comply with the isolation distance requirement in rule 3745-27-07 of the Administrative Code.





(b) The horizontal limits and top and bottom elevations of the recompacted soil liner proposed in the permit to install application.

(c) The top elevation of the leachate collection layer, pipe inverts, and layout of the leachate collection and management system, including any leachate storage structures and leachate lift stations proposed in the permit to install application.

(d) The horizontal limits and top and bottom elevations of existing waste and waste placement proposed in the permit to install application. Limits and elevations of existing waste can be determined by surveys. If a sanitary landfill facility does not have survey results, the applicant shall provide justification of the limits shown in the permit to install application. If the authorizing document does not show limits of existing waste placement, then the elevation of final waste placement shall be deemed to be two feet below the final grade shown, unless alternative limits are satisfactorily demonstrated to Ohio EPA.

(e) If a separatory liner/leachate collection system is necessary, its horizontal limits and top and bottom elevations.

(f) The horizontal limits and top and bottom elevations of the composite cap system the surface water control structures including permanent ditches to control run-on and runoff and sedimentation ponds showing the inlet and outlet, and any permanent ground water control structures proposed in the permit to install application.

(g) An established grid system with northings and eastings not more than five hundred feet apart.

(5) Cross sections on plan drawings numbered consecutively 5A, 5B, 5C, etc. shall clearly show the horizontal and vertical scale used and include the following:

(a) The hydrogeology at a sanitary landfill facility intercepted by borings or other subsurface investigation methods that show the following:

(i) Existing topography.



- (ii) The horizontal and vertical limits of excavation proposed in the permit to install application.
  - (iii) The horizontal limits and top and bottom elevations of any added geologic material.
  - (iv) The horizontal limits and bottom elevations of the recompacted soil liner.
  - (v) The bottom of any subsurface leachate storage structures or leachate lift stations.
  - (vi) Geologic stratigraphy and significant zones of saturation corresponding to information from the subsurface investigation.
  - (vii) The uppermost aquifer system and saturated stratigraphic units above the uppermost aquifer system.
  - (viii) Subsurface investigation logs, monitoring well construction diagrams, and piezometer construction diagrams intercepted by the cross-section.
  - (ix) Any permanent ground water control structures.
- (b) The perimeter of the property showing the natural potential explosive gas migration pathways.
- (c) The length and width of the sanitary landfill facility dividing the facility into quarters (i.e. three cross-sections in each direction) showing the following:

[Comment: Additional cross-sections may be submitted.]

- (i) Existing topography.
- (ii) The proposed horizontal and vertical limits of excavation.
- (iii) The horizontal limits, top elevations, and bottom elevations of existing waste and proposed areas of waste placement.



(iv) The horizontal limits, top elevations, and bottom elevations of the proposed composite cap system.

(d) If the permit to install application is for a vertical expansion, the following at an interval no greater than every three hundred feet of length and width of the vertical expansion:

(i) Limits of existing waste with the date of the survey.

(ii) Approved and proposed limits of waste placement.

(iii) Separatory liner/leachate collection systems.

(6) Plan drawings showing the systematic development of each phase of the unit of the sanitary landfill facility. Each plan drawing numbered consecutively 6A, 6B, 6C, etc. shall show the phase, previously operated phases, the grid system established in accordance with paragraph (B)(4)(g) of this rule, and the following:

(a) The location of the following to be installed prior to accepting waste in the depicted phase.

(i) Ground water monitoring wells.

(ii) Piezometers.

(iii) Explosive gas permanent monitors, punch bar stations, and alarms.

(iv) Leachate collection and management structures.

(v) Surface water control structures.

(b) The extent of waste placement for that phase.

(c) The contours of any previously filled phases.



- (d) The limits of final cover, transitional cover, and intermediate cover on the previously filled phases.
- (e) The contours of the bottom limits of solid waste placement for the depicted phase.
- (f) The location of access roads for the depicted phase.
- (g) The permanent and temporary measures to be utilized to control surface water run-on and runoff, erosion, and any temporary or permanent ground water control structures.
- (7) The following detail drawings shall be on plan drawings numbered consecutively 7A, 7B, 7C, etc.:
- (a) Recompacted soil liner, flexible membrane liner, and geosynthetic clay liner if applicable, liner cushion layer, leachate collection layer, and filter layer; any engineered components that are constructed through the composite liner system; and the interface between phases.
- (b) Composite cap system, including any engineered components that are constructed through the composite cap system, and surface water control structures.
- (c) Relationship of the composite cap system to the leachate collection and management system and to the composite liner system.
- (d) Leachate collection and management system elements including but not limited to the following:
- (i) Leachate collection layer.
- (ii) Collection pipes, including bedding media and boots.
- (iii) Filter layer.
- (iv) Sumps.



- (v) Conveyance apparatus, including leachate lift stations.
  - (vi) Storage tanks and leachate ponds.
  - (e) Permanent ground water control structures, if applicable.
  - (f) Ground water monitoring well and piezometer construction.
  - (g) Explosive gas control system elements.
  - (h) Separatory liner/leachate collection systems, if applicable.
  - (i) Monocell or monofill separatory structures, if applicable.
  - (j) Sedimentation pond and discharge structures and surface water run-on and runoff control structures.
  - (k) Other necessary details including but not limited to structural fill for berms and subbase, gas collection layer, and transitional cover.
- (C) Reports. The following information shall be presented in narrative form in a report with a table of contents and divided and labeled according to paragraphs (C)(1) to (C)(10) of this rule.
- (1) Summary. Summary of the facility environs and a demonstration that the sanitary landfill facility will meet the criteria for permit approval as specified in rules 3745-27-02 and 3745-27-07 of the Administrative Code. The demonstration shall include a discussion of the current and previous owner's and current and previous operator's compliance with any authorizing document applicable to the facility, the facility's limits of waste placement, the location restriction demonstrations, and operational criteria.
  - (2) Variance and exemption requests. Any variance or exemption requests from the requirements contained in rules 3745-27-07 to 3745-27-12, 3745-27-14 to 3745-27-16, 3745-27-19, or 3745-27-20 of the Administrative Code.



(3) Site investigation. A hydrogeologic and geotechnical site investigation report, which shall include at a minimum the following:

(a) Sufficient information to allow the director to determine the suitability of the site for solid waste disposal through the following:

(i) Identification and characterization of the hydrogeology of the uppermost aquifer system and stratigraphic units that exist above the uppermost aquifer system.

(ii) Characterization of the site geology and hydrogeology to allow for the evaluation of the proposed design of the sanitary landfill facility and to ensure that it will be in compliance with the requirements of rules 3745-27-07 and 3745-27-10 of the Administrative Code.

[Comment: The narrative portion of the hydrogeologic and geotechnical report focuses on the siting and ground water monitoring issues. The subsurface investigation portion of the report also addresses geotechnical and design issues.]

(b) A description, based on publicly available information, of the regional geology and hydrogeology within one mile of the proposed sanitary landfill facility. At a minimum, the description shall include the following:

[Comment: Publicly available information regarding unstable areas is placed in a separate section located in the geotechnical analysis in paragraph (C)(4) of this rule.]

(i) The identification and average yield of the regional aquifer system.

(ii) The direction of ground water flow in the regional aquifer system.

(iii) The identification of recharge and discharge areas of the regional aquifer system.

(iv) Regional stratigraphy, including any regional stratigraphic or structural features, such as the bedrock surface, bedrock dip, or joint systems, that may influence the ground water flow system.



(v) A description of the regional geomorphology, including the location of surface water bodies, floodplains, and a description of any topographic features that may influence the ground water flow system.

(c) The following documents:

(i) If any surface or underground mines were identified in accordance with paragraph (B)(2)(b)(ix) of this rule, a letter from the Ohio department of natural resources, division of mineral resources management or other appropriate agency verifying the type, mining method, location, depth, and status of the mine.

(ii) Documentation of who owns the mineral rights below the sanitary landfill facility.

(iii) If any oil or gas wells were identified in accordance with paragraph (B)(2)(b)(ix) of this rule, a letter from the Ohio department of natural resources or other appropriate agency verifying the type, location, depth, and status of the well.

(iv) A letter from the United States army corps of engineers agreeing with the wetland delineation, depicted on the plan drawing with the information pursuant to paragraph (B)(2)(a)(iv) of this rule, including confirmation of any isolated wetlands or if no wetlands are present.

(d) A detailed description and analysis of the geology and hydrogeology under the proposed sanitary landfill facility. This description shall be based on data collected using appropriate subsurface investigatory methods such as borings, piezometers, monitoring wells, tensiometers, geophysical surveys, soil gas surveys, dutch cone penetrometers, and test pits. At a minimum, the description and analysis shall include the following:

[Comment: This information may also be used in the geotechnical analysis pursuant to paragraph (C)(4) of this rule.]

(i) The consolidated and unconsolidated stratigraphic units from the ground surface down to the base of the uppermost aquifer system including the following:



- (a) The following characteristics, composition, and features:
- (i) For unconsolidated stratigraphic units, the textural classification in accordance with ASTM D2487.
  - (ii) For consolidated stratigraphic units, the rock type such as limestone, dolomite, coal, shale, siltstone, or sandstone.
  - (iii) Color.
  - (iv) Moisture content.
  - (v) Stratigraphic features such as layering, interbedding, or weathering.
  - (vi) Structural features such as fracturing or jointing.
  - (vii) Visible accessory minerals such as pyrite, calcite, or gypsum.
  - (viii) Hydraulic conductivity.
- (b) Thickness.
- (c) Lateral extent.
- (d) Depth and elevation.
- (e) Variations in texture, saturation, stratigraphy, structure, or mineralogy exhibited by each stratigraphic unit that could influence the ground water flow or quality in the uppermost aquifer system or any overlying zones of saturation.
- (ii) The local geomorphology at the proposed sanitary landfill facility including surface water bodies or topographic features that may influence the ground water flow in the uppermost aquifer system or any overlying significant zones of saturation.





(iii) Any local structural geology features under the proposed sanitary landfill facility that may influence the ground water flow in the uppermost aquifer system or any overlying significant zones of saturation.

(iv) The uppermost aquifer system and significant zones of saturation above the uppermost aquifer system. This description shall include the depth to, and lateral and vertical extent of, the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system. This description and analysis shall include but not be limited to the following:

(a) Temporal fluctuations in ground water levels over a period of time to determine the seasonal effects on ground water flow directions.

(b) An interpretation of the ground water flow system including hydraulic conductivity, rate of flow, direction of flow, vertical and lateral components of flow, and interconnections between and within the uppermost aquifer system and any significant zones of saturation above the uppermost aquifer system. This interpretation shall be described in both narrative and map form.

(c) Identification and characterization of recharge and discharge areas within the boundaries of the proposed sanitary landfill facility. This shall include any relationships of ground water with seeps, springs, streams, and other surface water features.

(d) Yield of any significant zones of saturation and of the uppermost aquifer system.

(v) If the applicant chooses, a site specific justification based on evidence gathered in accordance with paragraph (C)(3)(b) of this rule, that an unconsolidated aquifer system capable of sustaining a yield of one hundred gallons per minute for a twenty-four-hour period is not located beneath the facility.

(e) A description and quantification of the ground water quality of the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system. The description and quantification of ground water quality shall describe and quantify the rate, extent, and concentration of any ground water contamination located under the facility.



(f) Subsurface investigation information used to prepare the site investigation report narrative in accordance with paragraphs (C)(3)(b), (C)(3)(d) and (C)(3)(e) of this rule and the geotechnical analyses in accordance with paragraph (C)(4) of this rule. The submitted information shall be adequate to satisfy the performance standards of paragraphs (C)(3)(a) and (C)(4) of this rule. At a minimum, the information shall include the following:

[Comment: The narrative portion of the hydrogeologic and geotechnical report focuses on the siting and ground water monitoring issues. The subsurface investigation portion of the report also addresses geotechnical and design issues.]

(i) Publicly available information collected and used to prepare the site investigation report narrative in accordance with paragraph (C)(3)(b) of this rule and the plan sheets in accordance with paragraph (B)(2) of this rule. At a minimum, publicly available information includes the following:

(a) Well logs and, where applicable, the decommissioning records for public and private water supply wells within one mile of the proposed sanitary landfill facility.

(b) The Ohio department of natural resources county ground water resource maps or other appropriate regional hydrogeological data.

(c) Other publicly available information.

(ii) Information collected at the site for each stratigraphic unit from the surface to the bottom of the uppermost aquifer system or to one hundred and fifty feet below the proposed composite liner system, whichever is shallower. The information shall be used to prepare the site investigation report narrative in accordance with paragraph (C)(3)(d) of this rule. This information shall be presented on logs appropriate for the subsurface investigatory method used. At a minimum, the information shall include the following:

[Comment: The subsurface investigation conducted to provide the information pursuant to this paragraph may be combined with the subsurface investigation conducted to provide the information pursuant to paragraph (C)(3)(f)(v) of this rule.]



- (a) The northing and easting location coordinates of the subsurface investigation site.
- (b) Surface elevation surveyed to the nearest tenth of a foot.
- (c) Depth interval for each stratigraphic unit.
- (d) Field descriptions of the consolidated and unconsolidated units. At a minimum, the information shall include the following:
  - (i) Textural classification for each unconsolidated stratigraphic unit in accordance with ASTM D2487.
  - (ii) Color.
  - (iii) Moisture content.
  - (iv) Stratigraphic features such as layering, interbedding, or weathering.
  - (v) Structural features such as fracturing or jointing.
  - (vi) Visible accessory minerals such as pyrite, calcite, or gypsum.
  - (vii) Rock type such as limestone, dolomite, coal, shale, siltstone or sandstone.
  - (viii) Thickness.
  - (ix) Variations in texture, saturation, stratigraphy, structure or mineralogy in each stratigraphic unit.
- (e) Depth to saturation.
- (f) Hydraulic conductivity, including the following:
  - (i) For saturated unconsolidated stratigraphic units, at least one field measurement of hydraulic



conductivity per saturated unconsolidated unit and one additional measurement per saturated unconsolidated unit for each twenty acres.

(ii) For unconsolidated stratigraphic units, from which an undisturbed sample can be collected, at least one laboratory measurement of vertical hydraulic conductivity per unconsolidated unit and one additional measurement per unconsolidated unit for each twenty acres.

(iii) For saturated consolidated stratigraphic units, at least one field measurement of hydraulic conductivity per saturated consolidated unit and one additional measurement per saturated consolidated unit for each twenty acres.

[Comment: Most field methods for measuring hydraulic conductivity primarily evaluate lateral hydraulic conductivity, but also account for at least some effects of vertical hydraulic conductivity over the tested interval. In cases where laboratory measurements of vertical hydraulic conductivity are obtained for unconsolidated saturated units which are wholly or partially saturated, the vertical hydraulic conductivity should be compared to the field hydraulic conductivity to help evaluate the extent to which near-vertical fractures may be contributing to ground water flow through the unit. Hydraulic conductivity data should be interpreted with respect to the primary and secondary porosity features that are observed or are reasonably expected to occur in the investigated units, as well as the stratigraphic and structural features of the investigated units.]

(g) Yield of any significant zones of saturation and of the uppermost aquifer.

(h) If an unconsolidated aquifer system capable of sustaining a yield of one hundred gallons per minute for a twenty-four-hour period is suspected beneath the facility based on evidence gathered in accordance with paragraph (C)(4)(b) of this rule, and the applicant proposes to revise that finding, the applicant must provide adequate site-specific information on the suspected aquifer system to justify any requested revision including but not limited to the yield of any aquifer systems below the uppermost aquifer system.

(iii) A construction diagram of each monitoring well and piezometer. At a minimum, the diagram shall include the following:



- (a) The top-of-casing elevation used for water level measurement reference surveyed to the nearest hundredth foot.
  - (b) The boring diameter and the inside diameter of the well casing.
  - (c) The total depth of the boring and the total depth of the well.
  - (d) The screened interval depth and elevation, and the screen slot size.
  - (e) A description of construction materials and depth intervals for construction materials.
- (iv) Data gathered by sampling and analyzing the ground water from the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system. These samples shall at a minimum be analyzed for compounds 1 to 78 listed in appendix I to rule 3745-27-10 of the Administrative Code.
- (v) Information collected at the site and used to prepare the geotechnical analysis in accordance with paragraph (C)(4) of this rule. This information shall be presented on logs appropriate for the subsurface investigatory method used. The subsurface investigatory method and frequency must be adequate to find the unconsolidated stratigraphic units susceptible to bearing capacity failure, static stability failure, seismic stability failure, or settlement at the site. The information shall be collected for each unconsolidated stratigraphic unit under the facility down to fifty feet below the proposed depths of excavation. At a minimum, the information shall include the following:
- [Comment: Ohio EPA recommends a frequency of one subsurface investigatory site for every four acres on a more or less uniform grid across the site. However, for sites which are located in areas where landslides or mass movements of unconsolidated material have occurred, or are underlain by complex geology with multiple unconsolidated stratigraphic units, more borings may be necessary pursuant to paragraph (A)(1) of this rule. Sites that are located in areas with a consistent stratigraphy, which is supported by comprehensive and reliable information from previous studies, may use a lower frequency of borings. Ohio EPA recommends against boring through cap, existing waste, or liner to obtain this information. Other methods or increased borings around the landfill footprint should be used.]



[Comment: Given the objective of finding thin unconsolidated stratigraphic units susceptible to bearing capacity failure, static stability failure, seismic stability failure, or settlement, the unconsolidated stratigraphic units should be logged continuously, and the subsurface investigation may also need to go deeper if publicly available data gathered pursuant to paragraph (C)(4)(h) of this rule or if field data gathered pursuant to paragraph (C)(3)(d)(i) of this rule indicate that deeper susceptible units exist.]

[Comment: The subsurface investigation conducted to provide the information pursuant to this paragraph may be combined with the subsurface investigation conducted to provide the information pursuant to paragraph (C)(3)(f)(ii) of this rule.]

(a) Northing and easting location coordinates.

(b) Surface elevation surveyed to the nearest tenth of a foot.

(c) Depth interval for each stratigraphic unit.

(d) Field descriptions of the unconsolidated units. At a minimum, the information shall include the following:

(i) Textural classification for each unconsolidated stratigraphic unit in accordance with ASTM D2487.

(ii) Color.

(iii) Moisture content.

(iv) Stratigraphic features such as layering, interbedding, or weathering.

(v) For fine-grained unconsolidated units, field descriptions of consistency and plasticity or dilatancy.

(vi) Thickness.



(vii) Variations in texture, saturation, stratigraphy, structure, or mineralogy in each stratigraphic unit.

(e) Identification of the depth interval of any samples collected including those submitted for laboratory testing.

(f) Depth to phreatic and piezometric surfaces.

[Comment: "Phreatic surface" is synonymous with the term "water table" and "piezometric surface" is synonymous with the term "potentiometric surface." Hydrogeologic investigations generally use "water table" for a water level surface in an unconfined saturated unit and "potentiometric surface" for the pressure head surface associated with a confined saturated unit. In hydrogeologic applications, the "water table" is considered a special type of potentiometric surface where the head pressure is equal to atmospheric pressure.]

[Comment: Any piezometric surfaces associated with bedrock that may affect the facility during excavation or construction may also be identified.]

(g) Results from penetration testing in accordance with ASTM D1586, plus the corrected and normalized standard penetration number or results from mechanical cone penetration testing in accordance with ASTM D3441.

(vi) Laboratory analysis on representative samples of each unconsolidated stratigraphic units under the facility down to a minimum of fifty feet below the proposed depths of excavation. The information shall be used to prepare the geotechnical analysis in accordance with paragraph (C)(4) of this rule. At a minimum, the information shall include the following:

[Comment: Undisturbed samples from at least ten per cent of the borings passing through each susceptible unit or a minimum of three, whichever is greater, should be collected to provide representative data.]

(a) Grain size distribution.

(b) Atterberg limits.



- (c) Specific gravity.
- (d) In situ unit weight.
- (e) In situ moisture content.
- (f) Dry unit weight.
- (g) For unconsolidated stratigraphic units susceptible to bearing capacity failure, the effective drained or undrained peak shear strength parameters, as appropriate, in accordance with ASTM D2850, ASTM D4767, or ASTM D6467.
- (h) For unconsolidated stratigraphic units susceptible to static stability failure or seismic stability failure, the effective shear strength in accordance with ASTM D4767 or ASTM D6467.
- (i) For unconsolidated stratigraphic units susceptible to static stability failure or seismic stability failure due to excessive increase in pore pressures from construction and operation activities, the undrained shear strength using fully saturated samples determined in accordance with ASTM D2850.
- (j) For unconsolidated stratigraphic units susceptible to settlement, the following parameters:
  - (i) The coefficient of consolidation.
  - (ii) The over consolidation ratio.
  - (iii) The pre-consolidation pressure.
  - (iv) The compression index.
  - (v) The swelling index.
  - (vi) The in situ void ratio.





(vii) The effective porosity.

(vii) Representative samples of each unconsolidated stratigraphic units susceptible to seepage piping failure be tested in accordance with ASTM D4647. Units susceptible to seepage piping failure include those located within fifteen feet of the proposed depths of excavation and those located where the piezometric surface of an aquifer or a zone of significant saturation is higher than the depth of excavation.

(viii) Any other data generated.

(g) A detailed description of how the subsurface investigation was conducted including the following:

(i) The subsurface investigatory and sampling methods used in characterizing the geologic and hydrogeologic properties of the consolidated and unconsolidated stratigraphic units at the proposed sanitary landfill facility and an explanation of why the particular subsurface investigatory method was chosen.

(ii) The analytical procedures and methodology used to characterize the unconsolidated and consolidated materials obtained from test pits and borings.

(iii) The methodology, equipment, and procedures used to define the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system, including the following:

(a) Well and piezometer construction specifications.

(b) Water level measurement.

(iv) The methodology, equipment, and procedures used to determine the ground water quality in the uppermost aquifer system and any significant zones of saturation above the uppermost aquifer system, including the following:

(a) Detection of immiscible layers.



(b) Collection of ground water samples, including the following:

(i) Well evacuation.

(ii) Sample withdrawal.

(iii) Sample containers and handling.

(iv) Sample preservation.

(c) Performance of field analysis, including the following:

(i) Procedures and forms for recording data and the exact location, time, and facility-specific considerations associated with the data acquisition.

(ii) Calibration of field devices.

(d) Decontamination of equipment.

(e) Analysis of ground water samples.

(f) Chain of custody control, including the following:

(i) Standardized field tracking reporting forms to record sample custody in the field prior to and during shipment.

(ii) Sample labels indicating a unique sample number, date, time, sample media, sample type, analytical methods, any preservatives, and any other information necessary for effective sample tracking.

(g) Field and laboratory quality assurance and quality control including the following, the number of which shall be enough to adequately demonstrate the accuracy of the analysis results:



(i) Collection of duplicate samples.

(ii) Submission of field-bias blanks.

(iii) Potential interferences.

(4) Geotechnical analysis. The following analyses shall provide sufficient information to allow Ohio EPA to characterize the facility geology to allow for the evaluation of the proposed design of the sanitary landfill facility.

(a) The hydrostatic uplift analysis shall include the following:

(i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule, as it pertains to hydrostatic uplift.

(ii) A narrative description of the rationale used for the selection of the analysis input parameters.

(iii) A description of the method used to calculate hydraulic uplift.

(iv) A description of the assessed failure modes and conditions.

(v) A narrative description of the rationale used for the selection of the critical cross section that at a minimum shall consider the worst case intersection of the highest phreatic or piezometric surface with the maximum excavation depth.

(vi) A plan drawing showing the temporal high phreatic and piezometric surfaces derived in accordance with paragraph (B)(3)(c) of this rule and the horizontal and vertical limits of excavation derived in accordance with paragraph (B)(4)(a) of this rule.

(vii) A profile view of the critical area that fully depicts the analysis input model including the following:



- (a) The material boundaries.
- (b) The applicable dimensions, including but not limited to the depth of excavation, and depth to the temporal high phreatic and piezometric surfaces.
- (c) The material types.
- (d) The in situ unit weights and saturated unit weights.
- (viii) The actual calculations or computer output.
- (b) The bearing capacity analysis for any vertical sump risers on the composite liner system shall include the following:
  - (i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule, as it pertains to bearing capacity.
  - (ii) A narrative description of the rationale used for the selection of the analysis input parameters.
  - (iii) A description of the method used to calculate bearing capacity.
  - (iv) A description of the assessed failure modes and conditions.
  - (v) A profile view of the critical cross section that fully depicts the analysis input model including the following:
    - (a) The material boundaries.
    - (b) The temporal high piezometric surface.
    - (c) The material types.
    - (d) The in situ unit weights and saturated unit weights.



(vi) The plan view of the critical cross section including northings and eastings for the endpoints of the section.

(vii) The actual calculations or computer output.

(c) The static stability analysis shall include the following:

(i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule, and earthen materials testing program as it pertains to static stability.

(ii) A narrative description of the rationale used for the selection of the analysis input parameters.

(iii) A description of the method used to calculate static stability.

(iv) An assessment of failure modes and conditions that at a minimum should include the following:

(a) Deep-seated translational and rotational failure mechanisms of internal slopes, interim slopes, and final slopes for drained conditions and, as applicable, undrained conditions.

(b) Shallow translational and rotational failure mechanisms of internal slopes and final slopes for saturated conditions and drained conditions.

(v) For each of the failure modes and conditions assessed, a narrative description of the rationale used for the selection of the critical cross sections for the internal slopes, interim slopes, and final slopes.

(vi) A profile view of the critical cross sections that fully depicts the analysis input model including the following:

(a) The material boundaries.



- (b) The temporal high phreatic and piezometric surfaces.
- (c) The material types.
- (d) The in situ unit weights and, where applicable, the in situ saturated unit weights.
- (e) The material shear strengths.
- (vii) The plan view of the critical cross sections that includes the northings and eastings for the endpoints of the sections.
- (viii) A summary of the results using two dimensional limit equilibrium methods or other methods acceptable to Ohio EPA for each of the critical cross sections.
- (ix) The actual calculations or computer output.
- (d) The seismic stability analysis shall include the following:
  - (i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule, and earthen materials testing program as it pertains to seismic stability.
  - (ii) A narrative description of the rationale used for the selection of the analysis input parameters.
  - (iii) A description of the method used to calculate the seismic stability.
  - (iv) An assessment of failure modes and conditions that at a minimum include the following:
    - (a) Deep-seated translational and rotational failure mechanisms of final slopes for drained conditions.
    - (b) Deep-seated translational and rotational failure mechanisms of internal slopes and interim slopes for drained conditions, if required by Ohio EPA.
    - (c) Shallow translational and rotational failure mechanisms of final slopes for drained conditions.



- (d) Liquefaction failure mechanisms of internal slopes, interim slopes, and final slopes.
  
- (v) For each of the failure modes and conditions, a narrative description of the rationale used for the selection of the critical cross sections for the internal slopes, interim slopes, and final slopes.
  
- (vi) The profile views of the critical cross sections that fully depict the analysis input model including the following:
  - (a) The material boundaries.
  
  - (b) The temporal high phreatic and piezometric surfaces.
  
  - (c) The material types.
  
  - (d) The in situ unit weights and, where applicable, the in situ saturated unit weights.
  
  - (e) The material shear strengths.
  
  - (vii) The plan views of the critical cross sections that include the northings and eastings for the endpoints of the sections.
  
  - (viii) A summary of the results using two or three dimensional limit equilibrium methods or other methods acceptable to Ohio EPA for each of the critical cross sections.
  
  - (ix) The actual calculations or computer output.
  
- (e) The settlement analyses of the composite liner system shall include the following:
  - (i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule, and earthen materials testing program as it pertains to settlement.
  
  - (ii) A narrative description of the rationale used for the selection of the analysis input parameters.



- (iii) A description of the method used to calculate the settlement.
  - (iv) A description of the assessed failure modes and conditions.
  - (v) A summary of the results.
  - (vi) The actual calculations of settlement or computer output.
- (f) The seepage piping failure analyses where the piezometric surface of an underlying aquifer or zone of saturation is above the in situ foundation, added geologic material, and recompacted soil liner shall include the following for the relevant layer:
- (i) The scope, extent, and findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule pertaining to seepage piping failure through in situ foundation.
  - (ii) A narrative description of the rationale used for the selection of the analysis input parameters.
  - (iii) A description of the method used to calculate likelihood of seepage piping failure through in situ foundation or added geologic material or recompacted soil liner.
  - (iv) A description of the assessed failure modes and conditions.
  - (v) A narrative description of the rationale used for the selection of the critical cross section that at a minimum considers the worst-case intersection of the highest phreatic or piezometric surface with the maximum excavation depth.
  - (vi) A plan drawing showing the temporal high phreatic and piezometric surfaces derived in accordance with paragraph (B)(3)(d) of this rule and the horizontal and vertical limits of excavation derived in accordance with paragraph (B)(4)(a) of this rule.
  - (vii) A profile view of the critical area that fully depicts the analysis input model including the following:





- (a) The material boundaries.
- (b) The applicable dimensions including but not limited to the depth of excavation, and depth to the temporal high phreatic and piezometric surfaces.
- (c) The material types.
- (d) The in situ unit weights and saturated unit weights.
- (viii) The actual calculations or computer output.
- (g) If a separatory liner is used and is designed with a slope other than that specified by rule 3745-27-08 of the Administrative Code, the settlement analysis of the separatory liner shall include the following:
  - (i) A narrative description of the rationale used for the selection of the analysis input parameters.
  - (ii) A description of the method used to calculate the settlement.
  - (iii) A description of the assessed failure modes and conditions.
  - (iv) A summary of the results.
  - (v) The actual calculations of settlement or computer output.
  - (h) A description, based on publicly available information, of any of the following unstable areas within one mile of the limits of solid waste placement. If the sanitary landfill facility is located in an unstable area, the applicant shall provide an analysis that the structural components will maintain their integrity based on the findings of the subsurface investigation conducted in accordance with paragraph (C)(3) of this rule.
  - (i) Regional stratigraphic or structural features that are susceptible to bearing capacity failure, static



stability failure, seismic stability failure, or settlement.

(ii) Areas susceptible to liquefaction.

(iii) Areas susceptible to mass movement such as landslides, debris slides and falls, and rock falls.

(iv) Areas impacted by natural and human induced activities such as cutting and filling, draw down of ground water, rapid weathering, heavy rain, seismic activity and blasting.

(v) Presence of karst terrain.

(vi) Presence of underground mining.

(vii) Areas susceptible to coastal and river erosion.

(5) Calculations. The following design calculations with references to equations used, showing site-specific input and assumptions that demonstrate compliance with the design requirements of rule 3745-27-08 of the Administrative Code:

(a) Calculations showing gross volume of the sanitary landfill facility in cubic yards, the anticipated life of the sanitary landfill facility in years, the gross volume of each unit in cubic yards, and the anticipated life of each unit in years.

(b) If a geotextile cushion layer is necessary to protect the flexible membrane liner from puncture and excessive strain due to the force exerted on the granular drainage layers, calculations for mass per unit area of the geotextile cushion layer accounting for the weight of the overlying waste mass.

(c) Calculations for leachate head and flow.

(d) If leachate is to be recirculated, calculations for amount of leachate to be recirculated and the leachate head and flow.

(e) Calculations for sizing any leachate storage tanks based on the volume of leachate generated after



final closure.

(f) Pump size and pipe size calculations based on paragraphs (C)(5)(c) and (C)(5)(d) of this rule.

(g) Pipe strength and pipe deflection calculations for the leachate collection and management system.

(h) An itemized written final closure cost estimate, in current dollars, based on the following:

(i) The cost of final closure of a sanitary landfill facility in accordance with rule 3745-27-11 of the Administrative Code.

(ii) A third-party conducting the final closure activities, assuming payment to employees of not less than the applicable prevailing wage.

(i) An itemized written post-closure care cost estimate, in current dollars, based on the following:

(i) The cost of post-closure care of the unit of the sanitary landfill facility in accordance with rule 3745-27-14 of the Administrative Code.

(ii) A separate estimate for each noncontiguous unit of the sanitary landfill facility.

(iii) A third-party conducting the post-closure care activities, assuming payment to its employees of not less than the applicable prevailing wage.

(j) Soil erosion calculations.

(k) Calculations for sizing surface water control structures and verifying that scouring and crushing is minimized.

(l) Sedimentation basin calculations.

(m) Other relevant calculations.



(6) Location restriction demonstrations. For a proposed new unit, the location restriction demonstrations in accordance with rule 3745-27-20 of the Administrative Code.

(7) Construction information. A discussion of the following construction information:

(a) Installation of the items specified in rule 3745-27-10 of the Administrative Code.

(b) Demonstration of physical and chemical resistance pursuant to paragraphs (D)(10) and (D)(13) of rule 3745-27-08 of the Administrative Code.

(c) Compaction equipment slope limitations.

(8) Operational information. The following statements, which if modified, could require a permit:

(a) The authorized maximum daily waste receipt requested for the sanitary landfill facility.

(b) The technique of waste receipt including but not limited to acceptance of baled waste or loose waste.

(c) The type of waste to be received including but not limited to municipal solid waste, industrial solid waste, residual solid waste, asbestos or asbestos containing waste that is subject to the provisions of NESHAP, 40 CFR Part 61, subpart M or construction and demolition debris.

(d) The type of equipment to be used to construct, operate, and maintain the sanitary landfill facility.

[Comment: A change in equipment that decreases the capability of the owner or operator to handle the waste received may be considered to endanger human health and may require a permit.]

(9) Plans. The following plans:

(a) The ground water monitoring plan for detection monitoring in accordance with rule 3745-27-10 of the Administrative Code.



(b) The explosive gas monitoring plan in accordance with rule 3745-27-12 of the Administrative Code.

(c) The quality assurance/quality control plan for the engineered components addressing the following:

(i) Surveying.

(ii) Calibration of testing equipment.

(iii) Sampling and testing procedures to be used in the field and in the laboratory and the testing frequency, parameters, and sample locations. Sampling and testing procedures shall include but not be limited to the following:

(a) Testing pursuant to rule 3745-27-08 of the Administrative Code.

(b) Testing necessary due to design requirements.

(c) Voluntary testing.

(iv) Installation procedures and installer qualifications.

[Comment: Installer qualifications for flexible membrane liner are found in paragraph (D)(10)(e) of rule 3745-27-08 of the Administrative Code.]

(v) Procedures to be followed if a test fails.

(d) The "final closure/post-closure plan" as detailed in paragraph (B) of rule 3745-27-11 of the Administrative Code.

(10) Notifications and certification. The application shall include the following:

(a) Letters of intent to establish or modify a sanitary landfill facility, which include a description of



property and facility boundaries, shall be sent via certified mail or any other form of mail accompanied by a receipt to the following entities (copies of these letters of intent with copies of the mail receipts shall be included with the application):

- (i) The governments of the general purpose political subdivisions where the sanitary landfill facility is located, e.g., county commissioners, legislative authority of a municipal corporation, or the board of township trustees.
  - (ii) The single county or joint county solid waste management district.
  - (iii) The owner or lessee of any easement or right-of-way bordering or within the proposed facility boundaries that may be affected by the proposed sanitary landfill facility.
  - (iv) The local zoning authority having jurisdiction, if any.
  - (v) The airport administrator and the federal aviation administration, if the placement of solid waste will occur within five miles of any airport runway.
  - (vi) The park system administrator, if any part of the sanitary landfill facility is located within or shares the park boundary.
  - (vii) The conservancy district, if any part of the sanitary landfill facility is located within or shares the conservancy district boundary.
- (b) A list of the permits, licenses, plan approvals, authorizations or other approvals that have been applied for and the local, state, or federal office or agency where application has been made.
- (c) Wetland demonstration. Applications that propose to locate the sanitary landfill facility in wetlands shall include a copy of a certification and permit approved in accordance with section 401 and 404 of the "Clean Water Act" or other permit or certification authorizing the discharge of dredge or fill material under state law.
- (d) Proof of property ownership or lease agreement to use the property as a sanitary landfill facility.