

APPENDIX H-6

Indiana Department of Environmental Management (IDEM) Office of Land Quality Correspondence

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From: RAMAN, SHYAMALA
To: [Port, Juliet](#)
Cc: [KLESMITH, DANIELA](#); [Prevost, Daniel](#); [Miller, Daniel J](#); [Mathas, Marlene](#)
Subject: RE: I-69 ORX Request to IDEM OLQ Solid Waste
Date: Friday, January 26, 2018 3:58:32 PM
Attachments: [image002.png](#)

Hi Juliet,

Yes, I cannot believe it has been 2 years. Hope everything is going well for you.

We will take a look at your email, discuss internally and get back to you.

Thanks.

Shyamala

Shyamala Raman, Chief

Engineering Section

Indiana Department of Environmental Management
Office of Land Quality
100 North Senate Avenue
Indianapolis, IN 46204-2251
Phone (317) 232-8855
sraman@idem.in.gov

From: Port, Juliet [mailto:Juliet.Port@parsons.com]
Sent: Friday, January 26, 2018 2:12 PM
To: RAMAN, SHYAMALA <SRAMAN@idem.IN.gov>
Cc: KLESMITH, DANIELA <DKLESMIT@idem.IN.gov>; Prevost, Daniel <Daniel.Prevost@parsons.com>; Miller, Daniel J <Daniel.J.Miller@parsons.com>; Mathas, Marlene <MMathas@indot.IN.gov>
Subject: I-69 ORX Request to IDEM OLQ Solid Waste

****** This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. ******

RE: I-69 Ohio River Crossing (ORX)
Request to IDEM OLQ Permitting Branch, Solid Waste Engineering
Former Landfills beneath I-69, Vanderburgh County
AI #s 105743 and 116773

Shyamala,

I hope all is well. It's hard to believe it's been almost 2 years since I sat a few cubicles away from you.

Project Background:

On behalf of the Federal Highway Administration (FHWA), INDOT, and KYTC, we are working on

preparing a Draft Environmental Impact Statement for the I-69 Ohio River Crossing project from Evansville, Indiana to Henderson, Kentucky. Attached is a copy of the invitation letter we submitted to IDEM. IDEM is a Participating Agency, but we've mostly been working with OWQ (Jason Randolph).

This project has a long history. We have narrowed-down the project choices and are currently studying three alternatives which are shown on the attached map.

For more background information, here are links to the project website and initial Screen Report:

[Website\[i69ohiorivercrossing.com\]](http://www.i69ohiorivercrossing.com)

[LINK to Screening Report.\[i69ohiorivercrossing.com\]](#)

Landfills:

I am writing to you regarding the old landfills that exist under the I-69/ US 41 interchange and near I-69 and Weinbach Road in Vanderburgh County. We have a draft Phase I ESA that is still under review. I will send you a copy once it is approved for distribution.

When I-164 (now I-69) was constructed circa 1987, INDOT coordinated with your group. Based on the files from the VFC, dynamic compaction was used to construct the highway over the following landfills:

Table 1. Summary of Landfills

Name	Address	IDEM Agency ID #
BFI Landfill	2401 Lodge Avenue, Evansville, IN	105743
Lambert Landfill	I-69 & US 41 SW, Evansville, IN	116773
Mall Landfill	I-69/164/US 41 S., Evansville, IN	N/A
Vogt Landfill	Off S. Weinbach, Evansville, IN	Records found in Lambert and BFI landfill files.
Huff Landfill	3200 S. Weinbach (North and South sides I-69), Evansville, IN	

Sources:

1984a Virtual File Cabinet (VFC) file 80421320, INDOT and IDEM communications regarding landfill along proposed I-164 (now I-69). [http://www.in.gov/idem/legal/2363.htm\[in.gov\]](http://www.in.gov/idem/legal/2363.htm[in.gov]).

1984b VFC file 80421319, INDOT boring logs for I-164, dated March 23, 1984. [http://www.in.gov/idem/legal/2363.htm\[in.gov\]](http://www.in.gov/idem/legal/2363.htm[in.gov]).

1985 VFC file 80421321, INDOT correspondence and plans for I-164. [http://www.in.gov/idem/legal/2363.htm\[in.gov\]](http://www.in.gov/idem/legal/2363.htm[in.gov]).

1988 VFC file 68399197, land records for BFI Landfill. [http://www.in.gov/idem/legal/2363.htm\[in.gov\]](http://www.in.gov/idem/legal/2363.htm[in.gov]).

2017 VFC file 8049896, Solid Waste Compliance inspection report for BFI Landfill. [http://www.in.gov/idem/legal/2363.htm\[in.gov\]](http://www.in.gov/idem/legal/2363.htm[in.gov]).

At this time, it appears all three build alternatives would impact one or more of these landfills.

We are still developing and analyzing the alternatives, so there are no engineering plans yet.

The project team is seeking a written response from OLQ regarding the anticipated impacts of the proposed project, and what steps, agency coordination, and/or permitting would be required under the following scenarios:

- 1) current pavement over former landfill is replaced,
- 2) current highways are widened, or built-up, over former landfill areas,
- 3) new highway is placed over former landfill that is not currently paved (via right-of-way acquisition), and
- 4) new elevated highway structures are placed near former landfill areas (e.g., dewatering may be needed for foundations/piers).

We are requesting a written response within 45 days. Please let me know what else you need from us. Please let us know if you would like to have a meeting.

Please do not hesitate to call or email me. Our office is only a block away and we can meet with you at your convenience.

We appreciate your prompt attention and assistance in this project.

Thank You,

Juliet Port, LPG
Senior Environmental Planner
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From: RAMAN, SHYAMALA
To: [Port, Juliet](#)
Cc: [Prevost, Daniel](#); [Miller, Daniel J](#); [Mathas, Marlene](#); [KLESMITH, DANIELA](#)
Subject: RE: I-69 ORX Request to IDEM OLQ Solid Waste
Date: Friday, March 09, 2018 3:07:01 PM
Attachments: [image002.png](#)
[I69Ohio river crossing landfill evaluation report 3-09-2018.docx](#)
[ClosureWording_Mar2018.pdf](#)
[nrpd_waste-0026.pdf](#)

Juliet,

Please see the attached evaluation and the anticipated impacts of the proposed project. Any post-closure use of the landfill/open dump sites would require an approval from OLQ/IDEM. I have also attached the Post-closure use guidance (non-rule policy) document and recommended closure guidance that may help you with preparing the post-closure use request and future environmental assessment for these sites. Please let me know if you have any questions.

Thanks.

Shyamala

Shyamala Raman, Chief
Engineering Section

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I-69 Ohio River Crossing (ORX)

IDEM, Office of Land Quality (OLQ) Permits Branch, Engineering Response to Information Request

Former Landfills beneath I-69, Vanderburgh County

AI #s 105743 and 116773

Summary of Landfills

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We reviewed the documents in the Virtual File Cabinet (VFC # 80421320, 80421319, 80421321, 68399197 and 80498696).

Regulatory Requirements for old disposal solid waste sites:

Indiana regulates disposal and management of solid waste under Solid Waste Land Disposal regulations at 329 IAC 10. These regulations also require proper closure and maintenance of old previously closed landfills and open dumps. (329 IAC 10-4 and 10-6.) The owner, operator or the owner of real estate upon which the closed landfill is located is responsible for correcting and controlling any nuisance conditions occurring at the site and for eliminating any threat to human health and the environment. In addition, IDEM has guidelines on post-closure uses of old, closed disposal sites. IDEM requires obtaining an approval of the post-closure uses from IDEM' Office of Land Quality.

General Information regarding old landfills

Waste Composition: Old Landfills/open dumps that operated before the implementation of RCRA Hazardous and Solid Waste Amendments (HSWA) rule (1984) may contain hazardous, toxic waste or waste requiring special handling. Most common waste in these landfills/dumps are industrial sludge and waste containing PCB or regulated asbestos. Waste is generally heterogeneous in nature (garbage from residential sources, cinders, industrial waste generated by the local factories, construction demolition, etc.).

Methods of operation: Prior to 1990, most landfills operated by trench and fill method. This involved excavating narrow trenches with soil separating each trench. Trench depth varied, but generally ranged from 10 to 20 feet deep. Disposed waste was not compacted very well, resulting in large differential settlement after closure. Since late 1970s soil daily cover was required. Most of the old disposal site closed after 1980s were covered by 2 feet of soil at final closure. However, no formal closure certification was required. Solid waste limits may not be clearly defined. Disposal areas and waste limit may need to be reconfirmed when disturbing an old landfill.

Leachate: Leachate (liquid that pass through or emerged from solid waste) was not collected at old disposal sites. Depending on the site geologic conditions, existence of natural or man-made barriers, waste can be saturated and leachate can be a major problem. Leachate seeps may be a major concern. Leachate can contain wide range of pollutants and when collected must be properly disposed at a permitted facility, such as a waste water treatment plant with a valid NPDES permit or other permit.

Landfill Gas: Landfill gas is a product of the ongoing waste decomposition. Even a very old landfill will generate gas that can create explosive condition if not properly vented. Lateral gas migration outside waste disposal limits is a very common occurrence and a health hazard if concentration of methane gas reaches above 100% lower explosive limit (LEL). Methane monitoring and intrinsically safe equipment is recommended while working in location where gas is present.

IDEM's concerns with the four scenarios presented in the January 26, 2018 email:

Please note that any construction activity/post-closure use at landfill/open dump disposal sites will require an approval from IDEM.

Scenario 1 - Current pavement over former landfill is replaced.

This activity is expected to have low impact:

- Landfill cover may be disturbed
- Waste may be exposed.
- Landfill gas and leachate may be present, and require controls.

Scenario 2 - Current highways are widened, or built-up, over former landfill areas.

This activity is expected to have moderate to high impact:

- Need for waste excavation and/or stabilization to prepare a stable road base.
- Waste excavation is not an easy task. Toxic and hazardous waste can be encounter and must be properly handled. Waste must be covered if exposed and left overnight. Excavated waste must be properly stored and disposed of.
- Landfill gas, leachate and any run-off from the open excavation need to be controlled
- Odors, dust blowing litter may be a problem and must be controlled.
- The design must incorporate erosion and run-off control system that minimizes infiltration of water into the landfill.

- All disturbed areas must be re-closed, covered and seeded once the construction is completed.
- Placing conduits or pipes within fill areas is not recommended for pipe's structural integrity reasons.
- Methane gas and leachate may collect and travel along the pipes and conduits. Proper venting of all enclosed structures and manholes in the fill areas will be required.

Scenario 3 - New highway is placed over former landfill that is not currently paved (via right-of-way acquisition).

- Same concerns and impact as Scenario 2.

Scenario 4 - New elevated highway structures are placed near former landfill areas (e.g., dewatering may be needed for foundations/piers).

This activity may have moderate impact

- Groundwater near the landfill may be contaminated. Proper disposal of contaminated groundwater during dewatering must be considered. None of the landfill listed above have a formal groundwater monitoring system at this time so ground water quality is unknown and must be investigated.
- Landfill gas may be present outside the waste limits and pose safety hazards.

Additional Information/guidance for post-closure uses and remediation of old disposal site can be found in these following documents (attached):

- Post-closure Uses of Solid Waste Disposal Facilities (Non-Rule Policy Document).
- Landfill Closure Guidelines

Information Guidelines

In order to assess the current and potential future environmental risks associated with a landfill or open dump, the following information should be submitted with the application to the program or first submitted document to a regulatory program. Portions of the information listed below may not be available, but the RP should make a good faith effort to find the information. If available, initial information submitted for a landfill or open dump should consist of:

- A. Historic information, regarding the following:
 - 1. Ownership;
 - 2. Waste streams;
 - 3. Waste sources;
 - 4. Permit numbers and available permits, if applicable;
 - 5. Groundwater sampling information;
 - 6. Boring logs;
 - 7. Groundwater flow direction (where available);
 - 8. Compliance history;
 - 9. Date of last waste disposal; and
 - 10. Waste boundaries.

- B. Current information, regarding the following:
 - 1. A topographic map;
 - 2. Current groundwater sampling information;
 - 3. Recent boring logs;
 - 4. Current cover information;
 - 5. Groundwater flow direction; and
 - 6. Location and logs of drinking water wells within a quarter mile of the site boundaries.

- C. A map depicting waste boundaries of the landfill or open dump, as established by a combination of any of the following:
 - 1. Historic maps and/or aerial photographs;
 - 2. Test pits, borings, and/or hand auger locations approximately every 200 feet along the perimeter, and at every directional change in landfill or open dump boundary. Each test location should be a minimum of five feet deep, unless waste is encountered at a depth shallower than five feet. Note: The spacing of waste boundary test locations may change due to site conditions;
 - 3. Ground Penetrating Radar/geophysical information; and
 - 4. Changes in topography.

- D. Information submitted under this section should consist of one hardcopy and one PDF digital copy. Any document that is available in IDEM's Virtual File Cabinet (VFC) may be submitted as a VFC document number.

- E. Based on the information provided, the landfill will be considered either an open dump (never permitted) or a permitted landfill (previously permitted). The applicable rules and guidance for a landfill depend on the time when the landfill ceased accepting waste, was certified closed (if applicable), and whether it had a permit. See Topic 2.0 Scope (above) for more information.

5.1 Field Determination of Existing Waste Boundaries

Most old landfills and open dumps lack accurate waste boundary information. The waste limit delineation at these sites is a very important step to properly close and remediate the site. A simple waste delineation can be performed by taking exploratory borings or test pits along the edge of the landfill or open dump to confirm the presence or absence of waste. One test pit per 200 feet is recommended and at every change of direction. The delineated waste boundary should be documented by a survey, which will be necessary later in the process

when the site is ready to have an ERC recorded on the property (Section 5.14). Frequency and location of test pits may be revised based on other available site information.

5.2 Waste Sampling Determination

Enclosed structures on top of decomposing, municipal solid waste are discouraged, due to serious potential for differential settling of waste that will compromise structural integrity of the structure, and due to the potential for accumulation of explosive landfill gas inside the structure. It is possible to receive approval for an enclosed structure on top of municipal solid waste, provided approved engineering controls are in place to mitigate differential settlement, gas migration, and other concerns that may arise during site investigation.

If the landfill or open dump contains non-putrescible, homogeneous waste and placement of an enclosed structure on top of the waste is anticipated, then sampling of waste is recommended. Sampling of waste is intended to obtain information about landfill gas, contents and structural stability. See the NPD "Post-Closure Uses of Solid Waste Disposal Facilities," (NPD # Waste-0026), for more information about building restrictions.

Sampling should include the following:

- A. Submittal of a Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) to OLQ for review.
- B.
- C. A minimum of three borings per acre are suggested to adequately sample the waste. Additional borings may be required, depending on waste heterogeneity. Borings should stay 10 feet above the bottom of the waste and should not exceed 75 to 80% of landfill depth. All borings must be filled in with hydrated bentonite after sampling is completed. Waste removed from the boring must NOT be placed back in the borehole and must be handled and disposed of according to applicable waste disposal regulations. Borings drilled into waste may encounter explosive gases, such as methane. A HASP should be submitted prior to drilling through waste. The HASP should include safety precautions such as an explosimeter, smoking prohibitions and removal of all sparking equipment from the immediate area of the boring.
- D. One sample for every 10 feet of waste thickness from each boring should be collected, along with field screening measurements, including methane. If the field screening measurements show methane detections, then more frequent sampling should be performed. Samples should be collected at the interval with the highest field measurement per boring. Each sample should include a description of the type of material/waste encountered.
- E. Analyses of waste samples for the following list of constituents, unless it can be demonstrated that a shorter list is appropriate, due to prior knowledge of the waste contents:
 1. Volatile organic compounds (VOCs);
 2. Semi-volatile organic compounds (SVOCs);
 3. Polychlorinated biphenyls (PCBs);
 4. Total arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver;
 5. Cyanide;
 6. Toxicity Characteristic Leaching Procedure (TCLP) method for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver; and
 7. Neutral Leaching Method Test (NLMT) method for the following constituents:
 - a. Barium;
 - b. Chloride;
 - c. Copper;
 - d. Total cyanide;
 - e. Fluoride;
 - f. Iron;
 - g. Manganese;
 - h. Nickel;

- i. Phenols;
 - j. Sodium;
 - k. Sulfate;
 - l. Total sulfide;
 - m. Total dissolved solids; and
 - n. Zinc.
- F. Each boring should be monitored for landfill gas, unless it can be demonstrated that landfill gas monitoring is unnecessary, based on waste contents. The monitoring of landfill gas should follow the applicable portions of the NPD "Methane Monitoring Program", (NPD # Waste-0056).
- G. Waste sampling should continue through standing liquid (leachate) in the waste. The top of the leachate column should be recorded. Borings should stay 10 feet above the bottom of the waste and should not exceed 75 to 80% of landfill depth.
- H. A liquid grab sample should be collected, if leachate is encountered.
- I. Leachate samples should be analyzed for the following constituents:
- 1. VOCs;
 - 2. SVOCs;
 - 3. PCBs;
 - 4. Total Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver;
 - 5. Ammonia;
 - 6. Boron (total);
 - 7. Chloride;
 - 8. Copper (total);
 - 9. Cyanide (total);
 - 10. Fluoride;
 - 11. Iron (total);
 - 12. Manganese (total);
 - 13. Nickel (total);
 - 14. Nitrate;
 - 15. Phenols;
 - 16. Sodium (total);
 - 17. Sulfate;
 - 18. Zinc (total); and
 - 19. Field pH.

5.3 Recommended Waste Boundary Setbacks

To facilitate a post-closure use, it is acceptable to regrade, remove, or reconsolidate waste from within the waste boundary, provided the project has an approved HASP for such an undertaking. Waste removed needs to be disposed at an approved solid waste land disposal facility. It is not acceptable to expand the footprint of the existing waste boundary. Due to the risks associated with landfill gas, and possible surface and groundwater contamination, the following setbacks are suggested for sites that wish to develop the on- or off-site property surrounding or adjacent to the waste:

- A. NEW potable water wells, to be used as a water supply for a dwelling or dwellings, should not be installed within 600 feet of the waste boundary;
- B. NEW dwellings should not be constructed within 600 feet of the waste boundary;
- C. The revised waste boundary should not be within 100 feet of the normal water line of any pond, lake, reservoir, or continuously flowing stream. If the waste boundary is closer than 100 feet to surface water, then waste removal and/or regrading may be needed to achieve the proper setback;

- When amending waste boundaries, waste should not remain in the following areas;
- D. In a wetlands in violation of Section 404 of the Clean Water Act, as amended;
 - E. In any floodplain, unless provisions are made to prevent washout of the waste;
 - F. In floodways of drainage areas greater than one square mile, unless approval is obtained from the department of natural resources;
 - G. Within areas of karst topography, unless:
 - 1. Provisions are made to collect and contain all of the leachate generated; and
 - 2. A demonstration that the integrity of the landfill will not be damaged by subsidence is submitted and approved;
 - H. Over mines, unless it is demonstrated that the integrity of the landfill will not be damaged by subsidence;
 - I. Within 600 feet of a potable water well, in use as a water supply for a dwelling or dwellings, unless written consent is obtained from the owner of the well;
 - J. Within 600 feet of any dwelling, unless written consent has been obtained from the occupant and owner of the dwelling;
 - K. Within 100 feet of the normal water line of any lake, reservoir, or continuously flowing stream;
 - L. Within the floodplain unless the waste is protected from floodwater inundation by a dike with a top elevation not less than three feet above the base flood elevation;
 - M. Within 100 feet of the real property boundaries of the facility; and
 - N. Within 1,200 feet of any public water supply well, unless written consent is obtained from the owner of the well. (329 IAC 2-10-1(1))

5.4 Cover Evaluation Guidelines

Landfill and open dump cover will depend on site conditions, intended use and the need for groundwater remediation. A proper landfill cover minimizes the amount of surface water that percolates through the waste, which prevents generating additional leachate, which may enter groundwater. The type of cover material and landfill grade are both crucial in preventing surface water from infiltrating the landfill or open dump. The two landfill cover guidelines are listed below:

- A. Permitted landfills that ceased taking waste after September 1, 1989. These landfills must follow 329 IAC 2 (if certified closed before April 14, 1996) or 329 IAC 10 (if certified closed after April 14, 1996).
- B. Permitted landfills that ceased taking waste before September 1, 1989, all unpermitted landfills, and all open dumps. These waste sites need a cover that consists of the following:
 - 1. Two feet of clay-type soil (i.e., ML, CL, MH, CH, or OH) with six inches of top soil to establish vegetation. A thicker cover may be required, depending on slope steepness; and
 - 2. Final cover shall have a slope of not less than two percent (2%) and be without depressions that will cause ponding of water. (329 IAC 1.5-5-13(3))

The entire fill area should have sufficient cover to prevent direct contact with waste and to generally retard infiltration of rain water, regardless of existing vegetation on the landfill. Alternative cover systems and slopes may be considered and will depend on the following:

- a. Waste age;

- b. Waste composition;
- c. Landfill or open dump condition;
- d. Groundwater monitoring results; and
- e. Proposed post-closure use of the site.

5.5 Obtaining Final Cover Certification

To certify final landfill or open dump closure with a soil cover, a certification report should be submitted. The certification report should be signed by both the property owner and a registered professional engineer, and should indicate that the facility has been closed in accordance with the applicable rules and/or IDEM requirements, and the approved final grading plan (submitted to and approved by IDEM prior to regrading and/or cover work). The report should be submitted after application of final cover and establishment of vegetation. The report should document the following:

- A. Thickness of final cover should consist of a minimum of two feet of clay-type soil (i.e., unified soil classification ML, CL, MH, CH, or OH). The thickness of cover may be verified by probes, hand auger or test pitting. The minimum number of borings or holes should be two per acre for the first 100 acres, plus one additional boring or hole for each five acres of fill area beyond 100 acres. Borings or holes should be evenly distributed over the fill area.
- B. Thickness of top soil should consist of a minimum of six inches. The thickness of top soil may be verified by the method described in A. above.
- C. Final slopes of the fill area should be less than 33% and more than 2%. Verification of proper slopes and final contours should be accomplished by providing as-built drawings depicting landfill or open dump final contours and elevations. Contour maps should be drawn with the following contour intervals:
 - 1. Two feet for sites smaller than 80 acres; or
 - 2. Five feet for sites larger than 80 acres.Elevations should be referenced to USGS mean sea level (MSL).
- D. Established vegetation.
- E. The confirmation that soil used in the final cover system is of unified soil classification ML, CL, MH, CH, or OH, or the soil meets specifications previously agreed on. In order to verify the soil classification, grain size distribution and Atterberg limits should be tested. At a minimum, soil samples to be tested for grain size distribution and Atterberg limits should be collected from the following locations:
 - 1. At least one boring or auger hole per acre, taken at mid-depth, of the in-place final cover;
 - 2. Every 3,000 cubic yards; or
 - 3. Whenever the soil type changes.
- F. In areas where additional soil cover material will **not** be added, surface soil sampling within the upper two feet of cover material should be conducted to verify that the existing cover material is suitable for the intended use of the site. For sites where the intended use includes residential development, green space, or a public park/trail a minimum of three surface soil samples per acre is required. Samples should be analyzed for the following constituents:
 - 1. VOCs;
 - 2. SVOCs;
 - 3. PCBs;
 - 4. Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver; and
 - 5. Cyanide.

Cover areas with contaminated soil may be corrected by one of the following approaches:

- a. Application of additional cover to the contaminated areas; or

- b. Excavation of contaminated areas and reburial of the excavated material within the existing fill area.
- G. Cover should be applied over disturbed areas of the fill, as specified in 5.6.E. Cover construction and other landfill activities may be subject to 327 IAC 15-5 and/or 327 IAC 15-6 for storm water run-off associated with construction activities and storm water discharges exposed to industrial activity.

The final cover certification will be reviewed by IDEM and may include a site visit. A response letter will be issued by IDEM indicating whether the certification is adequate or inadequate. If the cover certification is deemed inadequate, the response letter will include suggestions for actions necessary to correct the deficiency.

5.6 Landfill Gas Monitoring Guidelines

Landfill gas can be concentrated in enclosed structures, and can exceed explosive limits, both on and off the landfill or open dump property. Due to the risk associated with landfill gas, all landfills and open dumps should monitor for landfill gas, unless it can be adequately demonstrated that the waste does not produce, or is no longer producing landfill gas. All gas monitoring and screening should follow the NPD "Methane Monitoring Program" (NPD # Waste-0056).

5.7 Groundwater Monitoring Guidelines

If the landfill was permitted pursuant to 329 IAC Article 2 or Article 10, those rules take precedence over this guidance. Nothing in this guidance should be interpreted to conflict with the groundwater monitoring and corrective action requirements of 329 IAC Article 2 or 10, or previous solid waste rules.

If the clean cover has been certified, then post-closure reuse may begin prior to completing groundwater monitoring requirements.

This section provides a general approach for monitoring. Alternate approaches may be proposed and will be considered on their merits. In some cases, site-specific circumstances may make it necessary to employ alternate approaches or to deviate from the timeframes suggested, to provide for a timely response to a completed or potentially completed exposure pathway.

A. Landfill Contents and Conceptual Site Model (CSM)

The contents of landfill or open dumps with municipal solid waste (MSW) are extremely varied. It is not possible or cost-efficient to sample for all possible constituents of interest (e.g. PFAS, PFOAS, pesticides, herbicides, pathogens, etc.) related to MSW fill material. Groundwater contaminated with MSW leachate will often exhibit a "fingerprint" of constituents that do not have associated MCLs and often do not exceed their respective Risk-Based Screening Levels. However, the presence of these fingerprint constituents at concentrations exceeding background levels indicates:

1. MSW leachate is likely present in groundwater; and
2. Other, non-analyzed constituents may also be present.

As a result, groundwater containing MSW constituents at concentrations exceeding background levels may not be fit for human consumption.

This concept forms an important part of the CSM and evaluation of groundwater exposure pathways for MSW fill sites.

B. Monitoring Well Placement and Construction

A monitoring plan with details about well placement and construction; monitoring frequency and duration; and monitoring parameters should be submitted for review by IDEM. The monitoring well network should meet these general criteria:

1. A minimum of four wells, one upgradient and three downgradient, placed in the uppermost aquifer system, is recommended. For sites without a defined up- and downgradient flow direction, additional wells may be necessary.
2. A maximum horizontal spacing of 500 feet between monitoring wells around the waste boundary, where possible. Horizontal well spacing greater than 500 feet should be justified in the monitoring plan.
3. Wells should be located within 50 feet of the waste boundary, and *should not be installed through any type of waste, including foundry waste.*
4. Screen lengths should not be less than two feet and not greater than 10 feet, unless approved otherwise. 329 IAC 10-21-4(c)(5)(C)
5. Additional wells may be necessary in the following circumstances:
 - a. Groundwater elevations indicate that groundwater flow directions are other than as anticipated.
 - b. Groundwater contamination exceeds appropriate risk-based criteria and extends beyond the existing monitoring well network. Additional wells may then be necessary to characterize the nature and extent of soil or groundwater contamination and evaluate the risks.
6. Additional monitoring may include the sampling of public or private water supply wells.

C. Monitoring Frequency and Duration

The post-closure period for landfills and open dumps is a minimum of 30 years, beginning from the date that the landfill ceased accepting waste. If 30 years have passed since waste was accepted, then groundwater monitoring should occur semi-annually for a minimum of four years, after receiving cover approval under this guidance.

If less than 30 years have passed since waste was accepted, then semi-annual monitoring is recommended until 30 years have passed since waste was accepted. Once 30 years have passed since waste was accepted, then the semi-annual sampling data may be used to accomplish item D. below.

B. Monitoring Parameters

Groundwater samples should be collected and analyzed in accordance with an approved SAP and QAPP. (RCG, Pages 42 and 43). Samples should be analyzed for the following constituents:

1. VOCs;
2. SVOCs;
3. PCBs;
4. Total Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver;
5. Ammonia;
6. Boron (total);
7. Chloride;
8. Copper (total);
9. Cyanide (total);
10. Fluoride;
11. Iron (total);
12. Manganese (total);
13. Nickel (total);
14. Nitrate;
15. Phenols;
16. Sodium (total);
17. Sulfate;
18. Zinc (total); and
19. Field pH.

After a minimum of two quarterly or semi-annual sampling events, an amended sampling list may be proposed to eliminate constituents that have not been detected in previous sampling events.

C. Evaluating Monitoring Results

After eight quarterly or semi-annual groundwater sampling events, the following should be evaluated:

1. Do concentrations of nitrate, ammonia, sulfate, chloride, iron, manganese, copper, boron, sodium, fluoride, and field pH exceed any of the following?
 - a. The maximum contaminant level (MCL), or two times the background concentration, whichever is higher;
 - b. Two times the secondary maximum contaminant level (SMCL), or two times the background concentration, whichever is higher; or
 - c. More than 10 or less than five for field pH.An exceedance of these constituents over the criteria above may indicate a release from the waste.
2. Do all detected concentrations indicate a statistically stable or decreasing trend? If concentrations do not indicate a statistically stable or decreasing trend, then contaminated groundwater should be evaluated to determine if groundwater concentrations will constitute an unacceptable risk to human health and the environment.
3. Do groundwater concentrations exceed remediation objectives on- or off-site? If groundwater concentrations exceed remediation objectives, then a remedy should be implemented. Acceptable remedies include:
 - a. Engineered barriers to prevent exposure and/or minimize infiltration of precipitation into the waste;
 - b. An Institutional Control, such as an ERC or environmental restrictive ordinance restricting groundwater use on the affected property(s), and
 - c. Lines of Evidence (LOE) to demonstrate that contaminants left in place are not a risk to human health or the environment. (RCG, Pages 51, 27, and 132). LOE should include the following topics, at a minimum:
 1. The municipal solid waste CSM, where applicable
 2. Constituent concentrations;
 3. Proximity to residential wells;
 4. Proximity to municipal wells or other sources of public drinking water;
 5. Subsurface permeability;
 6. Effects on nearby surface water.

5.8 Program Closure

A request for Program Closure may be submitted, when the following has been completed:

- A. Cover certification, as outlined in Sections 5.5 and 5.6; and
- B. Groundwater conditions meet the items in Section 5.8.E.3.
 1. If groundwater concentrations meet the items listed in Section 5.8.E.3 and more than 30 years have passed since waste was accepted, then a request for Program Closure may be submitted.
 2. If groundwater concentrations do not meet Section 5.8.E.3, then additional monitoring may be required. Possibility for Additional Investigation and Potential Remediation

IDEM may request additional investigation and possible implementation of a remedy prior to completion of the eight (8) sampling events, if sampling results at any time indicate that contaminants are leaving the property boundary or Exposure Control Area at concentrations that exceed risk-based levels or suggest the presence of MSW leachate in groundwater. An area requiring exposure control may be defined by groundwater, soil, vapor, or methane sampling results.

5.9 Sampling Results Format (EDD and Coordinates):

All sampling results (soil, groundwater, surface water, sediment, waste, landfill gas) should also include a digital copy, formatted according to the OLQ guidelines, as specified at: <http://www.IN.gov/idem/5384.htm>. Digital data should be submitted to olqdata@idem.IN.gov.

Locations for all sample points should be submitted. Permanent sample points or facility locations only need to be reported once. Locations of temporary sample points should be submitted when samples are collected. See OLQ Spatial Data Collection Standards (<http://www.in.gov/idem/6839.htm>) for information on acceptable data collection methods and file formats. Data locations reported in site-specific coordinate systems are not acceptable.

5.10 Post-Closure Use Guidelines

All Post-Closure Use proposals should follow the NPD "Post-Closure Uses of Solid Waste Disposal Facilities", (NPD # Waste-0026), and should be approved by OLQ before any alternative use of the landfill or open dump.

Enclosed structures on top of decomposing, municipal solid waste are discouraged, due to serious potential for differential settling of waste that will compromise structural integrity of the structure, and due to the potential for accumulation of explosive landfill gas inside the structure. It is possible to receive approval for an enclosed structure on top of municipal fill, provided approved engineering controls are in place to mitigate differential settlement, gas migration, and other concerns that may arise during site investigation.

5.11 Post-Closure Duties – Long-Term Stewardship Plan

Landfill and open dump cover must be maintained in perpetuity to protect human health and the environment. A Post-Closure Plan or Long-Term Stewardship Plan (LTSP) should be submitted to IDEM for review and approval. The LTSP must identify the activities which will be carried on after closure, and should include at least the following:

- A. A description of the planned groundwater monitoring activities and the frequency with which they will be performed (when applicable);
- B. A description of the planned maintenance activities and the frequency at which they will be performed; and
- C. The name, address, and phone number of the party(s) with responsibility for maintaining the site after closure whom the Commissioner may contact about the landfill or open dump during the post-closure period.

Post-closure maintenance to the landfill or open dump should take place in accordance with the following:

- D. Requirements in force at the time the landfill or open dump was closed;
- E. The landfill permit, where applicable; and/or

Post-closure maintenance activities typically consist of the following:

- F. Semi-annual mowing of the landfill cover.
- G. Annual inspections, which should be documented in a report and submitted to IDEM. Inspection reports should be submitted by March 1 of each year to document conditions recorded during the previous calendar year. Inspection reports should include descriptions of the following:
 1. Maintenance of final cover;
 2. Maintenance of contours to prevent ponding of water on the cover;
 3. Maintenance of access control; and
 4. Maintenance and monitoring of the following items, where applicable:
 - a. Monitoring wells;

- b. Gas wells;
 - c. Gas venting system;
 - d. Leachate collection system; and/or
 - e. Remediation system, such as:
 - i. Perimeter gas system;
 - ii. Extraction wells;
 - iii. Slurry wall; or
 - iv. Other systems.
- H. Groundwater monitoring sampling results and evaluations, if applicable. Sampling results should follow the Data Submittal Guidelines, as specified at <http://www.in.gov/idem/5384.htm>.
- I. The existing and future owner of a landfill or open dump is responsible for the following after receipt of a Program Closure document:
1. Correcting and controlling of any nuisance conditions occurring at the landfill or open dump;
 2. Eliminating any threat to human health or the environment; and
 3. Preventing the grazing of domesticated animals.

5.12 Institutional Controls

The owner of a landfill or open dump should provide to IDEM for approval and record with the county land recording authority an ERC for the landfill or open dump property. A copy of the recorded instrument must be provided to IDEM. The ERC should in perpetuity notify any potential purchaser of the property that the land has been used as a landfill or open dump. The ERC must meet the requirements of IC 13-11-2-193.5, and should, at a minimum, contain the following, due to buried waste remaining at the site:

- A. The general types and location of waste;
- B. The depth of fill;
- C. A plot plan, with surface contours at intervals of two feet, which should indicate:
 1. Surface water run-off directions;
 2. Surface water diversion structures after completion of the operation; and
 3. Final grade contours.
- D. A statement that no agricultural activities, construction, installation of groundwater wells, pipes, conduits, septic systems, or any other excavation will be constructed on the property without approval of the commissioner; and
- E. A statement that post-closure maintenance will be conducted according to the most current approved LTSP.
- F. A statement to prohibit the use or extraction of groundwater on the property for any purpose, including, but not limited to, human or animal consumption, gardening, industrial processes, or agriculture, without prior Department approval, except that groundwater may be extracted in conjunction with environmental investigation and/or remediation activities.

4.0 REFERENCES

- 4.1 2012 U.S. EPA Standards:
- A. National Primary Drinking Water Standards and Maximum Contaminant Levels (MCLs): <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100N01H.PDF?Dockey=P100N01H.PDF>
 - B. National Secondary Drinking Water Standards and Secondary Maximum Contaminant Levels (SMCLs): <https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards->

[guidance-nuisance-chemicals](#)

- 4.2 Indiana Administrative Codes and Statutes,
- A. Stream Pollution Control Rule 18
 - B. 320 IAC 5;
 - C. 320.1 IAC 5; Refuse Disposal Act; Solid Waste Management Permits; Industrial Waste, Hauler Permits
 - D. 329 IAC 1.5; Refuse Disposal Act; Solid Waste Management Permits, Industrial Waste Hauler Permits
 - E. 329 IAC 2; Solid Waste Rules
 - F. 329 IAC 10; Solid Waste Land Disposal Facilities; <http://www.in.gov/legislative/iac/T03290/A00100.PDF>
 - G. 330 IAC 4; Refuse Disposal Act; Solid Waste Management Permits; Industrial Waste Hauler Permits (Transferred)
 - H. IC 13-11-2, Definitions
 - I. IC 13-12-3-2; Remediation and Closure Goals, Objectives, and Standards for Certain Remediation Projects.
 - J. IC 13-25-5; <http://iga.in.gov/legislative/laws/2016/ic/titles/013/articles/025/chapters/005/>
- 4.3 Agency Policies, Guidelines, and Requirements:
- A. Data Submittal Guidelines for Map Data, Monitoring and Sampling Data, Field Data, Sample Point Data and Facility/Site Location Data; <http://www.in.gov/idem/5384.htm>
 - B. Drilling Procedures and Monitoring Well Construction Guidelines, dated March 17, 2009, NPD 0053; http://www.in.gov/idem/files/nrpd_waste-0053.pdf
 - C. Final Cover and Closure Certification Requirements for Solid Waste Disposal Facilities, dated January 2000;
 - D. Methane Monitoring Program, dated March 17, 2005, NPD 0056; <http://www.in.gov/idem/4811.htm>
 - E. Minimum Requirements for the Selection and Operation of a Sanitary Landfill”, dated May, 1971
 - F. OLQ Spatial Data Collection Standards; <http://www.in.gov/idem/6839.htm>
 - G. “Post-Closure Uses of Solid Waste Disposal Facilities”, February 25, 1998, NPD 0026: http://www.in.gov/idem/files/nrpd_waste-0026.pdf
 - H. Remediation Closure Guide, 2012; <http://www.in.gov/idem/4153.htm>
 - I. Remediation Program Guide, 2012; http://www.in.gov/idem/cleanups/files/remediation_program_guide.pdf

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Nonrule Policy Document

Title: Post-Closure Uses of Solid Waste Disposal Facilities

Identification Number: WASTE-0026-NPD

Date Originally Adopted: February 25, 1998

Dates Revised: None

Other Policies Repealed or Amended: None

Citations Affected: 329 IAC 10-23-3

Brief Description of Subject Matter: To provide guidance for parties interest in beneficial post-closure use of solid waste facilities. Activities such as agricultural, recreational and industrial activities which would include ball fields, hay production and light structures are discussed.

This nonrule policy document is intended solely as guidance and does not have the effect of law or represent formal Indiana Department of Environmental Management (IDEM) decisions or final actions. This nonrule policy document shall be used in conjunction with applicable laws. It does not replace applicable laws, and if it conflicts with these laws, the law shall control. A revision to this nonrule policy document may be put into effect by IDEM once the revised nonrule policy document is made available for public inspection and copying. IDEM will submit revisions to the Indiana Register for publication.

Post-Closure Uses of Solid Waste Disposal Facilities

Introduction

This guidance presents the current criteria developed by the Indiana Department of Environmental Management (IDEM) to evaluate demonstrations for post-closure use of solid waste disposal facilities as required by 329 IAC 10-23-3. This guidance presents the criteria that IDEM currently considers necessary to ensure that “disturbance of the final cover, liner, or other component of the containment system, including any removal of waste, will not increase the potential threat to human health or the environment.”

This guidance is intended to provide the public and regulated community with a framework of regulatory requirements, technical considerations, and other relevant information for the approval, design, construction, and operation of post-closure activities on solid waste facilities. This guidance is also intended to assist IDEM in the review of proposed post-closure uses of solid waste facilities. When reviewing such proposals, IDEM will reference this guidance and follow all applicable laws or rules. Applicants who do not comply with this guidance will be required to demonstrate that the post-closure use they seek approval for meets the requirements of 329 IAC 10 and all other applicable laws or rules.

General Requirements for Post-Closure Use

- A. Post Closure activities shall not increase the potential threat to human health and the environment. [329 IAC 10-23-3]

- B. If not already designated within the existing Permit and Approved Post-Closure Plan the Name and Address of the Responsible Party for Post-Closure Activities must be submitted to IDEM prior to any post closure use of the site. [329 IAC 10-23-3(c)(4)]
- C. Twice annually, or as specified in the site approved post-closure plan, impacted landfill areas must be inspected by the responsible party or designated personnel for the requirements of 329 IAC 10-23-2 which include but are not limited to the following:
 - a. disturbance below the vegetative soil layer,
 - b. erosion,
 - c. leachate seeps,
 - d. ponding, and
 - e. additional negative impacts caused by activity.
- D. Any deficiencies noted in the twice annual inspection or noted by the IDEM Solid Waste Inspectors must be immediately controlled. [329 IAC 10-23-2]
- E. The Office of Land Quality (OLQ) may require an increase in post closure funding or an extension of the funding period of the post-closure plan to insure continued landfill integrity. Post closure funds can only be used for landfill maintenance, any degradation of improvements which could impact the landfill integrity must be maintained by the responsible party to insure continued landfill integrity. [329 IAC 10-23-2(c) & 10-39-9]
- F. The applicant shall comply with all local, state and federal laws, regulations and ordinances.
- G. Additional information may be requested by IDEM to demonstrate compliance with 329 IAC 10-23-3.

Practice Specific Requirements for Post-Closure Use

1. Biosolid Land Application to Landfill Cover

All Solid Waste Facilities must obtain approval per 329 IAC 10-23-3(c)(3) from OLQ before starting a Biosolid Land Application Program. Generators of biosolids must be permitted under 327 IAC 6. A proposed landfill must be added to the Generator's list of approved sites before the biosolid application program is implemented. Landfills are not exempt from any of the conditions required in the Generator's Land Application Permit. Incorporation of biosolids into the cover soils shall be performed in a manner which does not penetrate below the landfill vegetative soil layer.

2. Animal Manure Application to Landfill Cover

All Solid Waste Facilities must obtain approval per 329 IAC 10-23-3(c)(3) from OLQ before starting an Animal Manure Application Program. Any program that does not meet the minimum standards must demonstrate that the program will not increase the potential threat to human health and the environment or disrupt post closure duties. The minimum standards for animal manure application on a landfill are as follows:

- A. A record of the source of material, amount, location, method and date applied shall be kept and made available upon request.
- B. Manure is only to be applied in a solid form.

- C. Manure application has a minimum setback of 200 feet from any monitoring or water well.
- D. Manure application has a minimum setback of 50 feet from any public road, 100 feet from any open sink hole, surface opening to any subsurface drainage system, intermittent stream, drainage ditch, or other body of water.
- E. Incorporation of manure into the cover soils shall be performed in a manner which does not penetrate below the landfill vegetative soil layer.
- F. Manure applications will occur at or below the current rates recommended by the Land Use Section of IDEM:

<u>Type of Livestock</u>	<u>Solid Animal Waste (Cubic Yards/Acre/Year)</u>
Swine	
Nursery Pigs	27.0
Grower/Finishing	23.7
Farrowing	39.7
Breeding/Gestation	35.2
Dairy	
Dairy Calves	50.9
Heifers	46.2
Cows	74.2
Veal Calves	37.8
Beef	
Feeder Calves	47.5
Fattening Cattle	36.5
Mature Cows	55.8
Poultry	
Broilers	14.0
Pullets	14.6
Layers	9.7
Turkeys	16.3
Ducks	17.9
Sheep	
Lambs	21.6
Ewes	22.9

Manure Management Information

Land application methods affect the amount of nutrients available for crop uptake. Most losses occur within 24 hours of application.

Manure analysis is recommended for combinations of wastes from different animal classes to determine the application rate required to meet crop nitrogen requirements. Soil analyses are recommended to help optimize nutrient management.

Rotation of manure application among sites is recommended to prevent Phosphorus(P) and Potassium(K) buildup. Nearly 100 percent of total phosphorus and potassium from manure application are considered available the first growing season.

3. Intensive Agricultural Use of Landfill Area

All Solid Waste Facilities must obtain approval per 329 IAC 10-23-3(c)(3) from OLQ prior to the landfill areas being used for intensive agricultural uses, this would include but not be limited to grazing/pasturing, crop production and silviculture. The submittal should contain the following information:

A. Provide a narrative that thoroughly describes the proposed use of the landfill cover soils. This narrative should discuss, at a minimum, the following:

- 1) crops or cover to be planted;
- 2) thickness of additional soils required and provide information supporting the adequacy of the depth of soil to support the root zone requirements;
- 3) required plowing depths;
- 4) planting application rates;
- 5) fertilization rates;
- 6) time required to establish crop production;
- 7) erosion control measures;
- 8) equipment required;
- 9) storage facilities required and location if on site;
- 10) source and amount of irrigation water (if applicable);
- 11) livestock grazing schedules;
- 12) soil management plan/crop rotation schedule; and
- 13) other information needed to completely describe all aspects of the intended land use that will affect/change the facility from its current condition.

B. Provide IDEM with a plot plan showing the proposed location(s) of the land use, the proposed areal delineation of the portion of the landfill receiving additional cover soil, and any other proposed alterations/additions to the facility necessary to implement the land use.

4. Intensive Recreational Use of Landfill Area

All Solid Waste Facilities must obtain approval per 329 IAC 10-23-3(c)(3) from OLQ prior to the landfill areas being used for intensive recreation, this would include but not be limited to recreational sporting fields, golf courses or ranges. The submittal should contain the following information:

A. Provide a narrative that thoroughly describes the proposed use of the landfill. This narrative should discuss, at a minimum, the following:

- 1) cover to be planted;
- 2) thickness of additional soils required and information supporting the adequacy of the depth of soil;
- 3) maintenance plan;
- 4) erosion control measures;
- 5) equipment required;
- 6) storage facilities required and location if on site;
- 7) utilities required;
- 8) source and amount of irrigation water (if applicable);
- 9) methods employed to protect groundwater monitoring wells and methane monitoring and extraction wells from damage from the proposed use of the facility; and
- 10) other information needed to completely describe all aspects of the intended land use that will affect/change the facility from its current condition.

B. Provide IDEM with a plot plan showing the proposed location(s) of the land use, the proposed areal delineation of the portion of the landfill receiving additional cover soil, and any other proposed alterations/additions to the facility necessary to implement the land use.

5. Construction of Structural Improvements

All Solid Waste Facilities must obtain approval per 329 IAC 10-23-3(c)(3) from OLQ before beginning any structural improvements, including but not limited to buildings, parking lots, and communication towers. Construction improvements on the facility shall maintain the integrity of the final cover, the liner, all components of the containment system(s) and the functions of the monitoring system(s).

A. Construction of structural improvements on a landfill, designed in accordance with 329 IAC 10, will be considered only if they prevent the penetration, deterioration, or stress increases on the geomembranes and drainage layers.

B. The submittal should include the following, if applicable:

1. A written narrative, plans, design calculations, revisions to closure and post-closure plans and any further information necessary to completely describe and explain the proposed use of the landfill;

2. A demonstration that the proposed structure will maintain the integrity of the final cover and liner systems of the landfill and will not increase the potential threat to human health or the environment. (due to the potential threat to human health, **approval of residential construction is highly unlikely;**)
 3. A geotechnical and structural engineering analysis to design a foundation system to support the building/structure;
 4. Structural fill requirements for foundation purposes;
 5. Requirements for in-place wastes densification;
 6. Additional soil requirements to create an installation zone for all underground utilities;
 7. Pilings and foundations need to be accompanied by a demonstration that they will not introduce a conduit for contamination to enter the natural substrates;
 8. Building construction requirements to mitigate the effects of methane and carbon monoxide accumulations. This may include an active collection and/or vent system;
 9. Automatic methane sensor requirements for enclosed buildings, designed to trigger an audible alarm when methane concentrations are detected; and
10. Utility connection requirements for flexible connections and utility collars.