



Remediation Program Landfills and Open Dumps Guidance

Office of Land Quality

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Disclaimer: *This guidance is being established by the Indiana Department of Environmental Management consistent with its authority under IC 13-14-1-11.5. It is intended solely as guidance and shall be used in conjunction with applicable rules or laws. It does not replace applicable rules and laws, and if it conflicts with these rules or laws, the rules or laws shall control.*

PURPOSE

This guidance is for parties seeking an IDEM Remediation Program Closure for a landfill or open dump.

The procedures in this guidance are intended for the remediation of landfills and open dumps throughout Indiana that are subject to regulation by IDEM's Office of Land Quality (OLQ). The regulatory framework of this guidance is based on laws and regulations regarding solid waste land disposal facilities found at IC 13 and 329 IAC 10. Specific prohibitions on open dumps are found under IC 13-30-2-1 and 329 IAC 10-4. Pertinent Non-Rule Policy Documents (NPDs), including the OLQ Remediation Closure Guide (RCG) (NPD # Waste-0046-R1), were also consulted in developing this guidance.

For purposes of this guidance, please note the following terms in the glossary:

"LANDFILL" refers to either an approved or permitted facility for solid waste disposal.

"OPEN DUMP" refers to property where solid waste has been deposited without a landfill permit or approval.

The subject of "CLOSED" and "CLOSURE" occurs in the following contexts:

A closed open dump is an open dump that stopped taking waste,

A closed landfill is a landfill that stopped taking waste prior to September 1, 1989,

A certified closed landfill is a permitted facility with a cover certification,

Remediation Site Closure refers to an officially issued IDEM Notice of Closure, such as a No Further Action Letter, Covenant Not to Sue, etc.

Use of the processes and guidelines provided in this guidance will enable a more prompt review of a proposed remediation work plan and other applicable documents by OLQ staff. While other procedures may be proposed for review, deviations from this guidance will be evaluated on a case by case basis. The procedures in this guidance may be used at applicable sites of all sizes.

APPLICABILITY

This guidance applies to properties containing a landfill or open dump that are reviewed by a Remediation Services Branch Program for an approved Closure consistent with the remediation objectives set forth in IC 13-25-5-8.5 and the RCG. Specifically, this guidance applies to all landfills and open dumps addressed through the following programs:

Indiana Brownfields,
State Cleanup, and
Voluntary Remediation Program (VRP).

Solid Waste Land Disposal Facilities and open dumps are regulated under IC 13-20 *et seq.* and the current solid waste disposal facilities rule, 329 IAC 10. Landfills and open dumps are also subject to the regulatory requirements for closure that were in effect at the time that they ceased accepting waste (see “Applicability of Rules and Permits by Historical Era” below).

This guidance is not applicable to landfills or open dumps regulated through the Federal Programs Superfund Section under the federal Comprehensive Environmental Response Compensation and Liability Act (CERCLA) 42 U.S.C. §9601 *et seq.* or those to which corrective action under the Resource Conservation and Recovery Act (RCRA) Subtitle C at 42 U.S.C. §9601 *et seq.* and IC 13-22-2 and IC 329 IAC 3.1 applies.

WASTE

“Solid waste”, for purposes of IC 13-19, IC 13-21 and IC 13-22, means any garbage, refuse, sludge from a waste treatment plant, sludge from a water supply treatment plant, sludge from an air pollution control facility, or other discarded materials, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations or from community activities (IC 13-11-2-205(a)). The definition and examples of “solid waste” at 329 IAC 10-2-174 include, but are not limited to: Industrial Process Waste (329 IAC 10-2-95) and Pollution Control Waste (329 IAC 10-2-137).

The following are examples of regulated waste that may not be recognized as such:

“**Foundry sand**” is usually more accurately described by the term “foundry waste,” when found at a clean-up or historic disposal site. Non-hazardous foundry sand and non-hazardous foundry waste are both solid wastes regulated by Indiana’s Land Disposal Facilities Rule at 329 IAC 10. If a facility wishes to construct and operate a restricted waste site, which is a permitted landfill, testing must be completed in accordance with 329 IAC 10-9-4. Specific requirements for foundry waste classifications can be found at 329 IAC 10-9-4(e) and Table 4. Please note that IDEM cannot issue a waste classification for mixed foundry wastes [329 IAC 10-9-4 (m)].

“**Black sand**” is usually foundry sand, but can also be coal combustion residuals or residual grit from decomposed sewage treatment plant sludge. These materials are regulated solid waste.

Unused/discarded coal is regulated waste (IC 13-11-2-205(a)). Coal that is no longer being used as a fuel is a discarded material, and therefore, a solid waste.

Coal cinders and ash are Coal Combustion Residuals (CCR), which is a regulated waste (329 IAC 10-9-4(d)).

Construction/Demolition waste is a regulated solid waste, defined at 329 IAC 10-2-37. A construction/demolition site is a permitted landfill under 329 IAC 10. The waste criteria for a permitted construction/demolition site can be found at 329 IAC 10-9-3. Note: The term “construction and demolition” or “C&D” materials is sometimes used to describe unpainted, uncontaminated rocks, rubble, soil, concrete and other road demolition materials. Those items are not included in the definition of construction/demolition waste in Indiana’s Solid Waste Land Disposal Facilities Rule at 329 IAC 10 and do not require a solid waste landfill permit for disposal (see below).

Contaminated sediments are a solid waste. Please see the list of examples in 329 IAC 10-2-174.

Please note the following regarding waste placement, storage, exclusions, and legitimate use.

Waste cannot be placed in or left in water. Indiana's Acts prohibited specifically states solid waste cannot be disposed in or adjacent to a lake or stream (13-30-2-1 (6)). It should also be noted that restricted waste type IV is specifically excluded from solid waste regulation but even type IV waste cannot be place in standing water (329 IAC 10-3-4).

Waste storage is defined at 329 IAC 10-2-181, which requires that solid waste be stored in a manner that does not pose a threat to human health or impact the environment. After 6 months of storage, IDEM assumes disposal has occurred.

Excluded waste types are typically uncontaminated materials such as rock, brick, concrete, road demolition materials, "dirt", or untreated natural growth. Some materials and/or activities are excluded by statute, but are typically regulated by another rule or program such as land application activities, regulated under 327 IAC 6.1 and 327 IAC 7.1. Please see 329 IAC 10-3-1 for the complete list. It should also be noted that this list does not exempt a material from the definition of solid waste, only from the provisions of 329 IAC 10.

LEGITIMATE USE

Indiana Statute contains exclusions for coal combustion residuals, iron or steel slag, and foundry sand. Each of those exclusions has different requirements and allowances. The exclusion at 329 IAC 10-3-1 (16) requires a written Commissioner's approval for legitimate use prior to use. Please contact OLQ's Industrial Waste Compliance Section with any questions regarding a statutory use or to request a commissioner's legitimate use approval. The request must that adequately support that the use is legitimate and does not pose a threat to public health or the environment. That information typically includes analytical results, project location(s), engineering plans and specifications, and materials testing results. IDEM reserves the right to request any additional information necessary to make a legitimate use decision.

APPLICABILITY OF RULES AND PERMITS BY HISTORICAL ERA.

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. Applicable regulations are those regulations in effect at the time that the facility ceased accepting waste, and current regulations (329 IAC 10-4 or 329 IAC 10-6), and applicable remediation requirements of the relevant Remediation Program. Below are the relevant regulations and associated closure dates (Summary of the History of the Solid Waste Rules - 2004).

Prior to August 15, 1974:

Approved landfills and open dumps that ceased accepting waste before August 15, 1974, are subject to the following: Minimum Requirements for the Selection and Operation of a Sanitary Landfill," dated May 1971; A facility approval letter in effect on the day of facility closure, if such document exists; and 329 IAC 10-4 or 329 IAC 10-6.

August 15, 1974 to September 1, 1989:

Permitted landfills and open dumps that ceased accepting waste on or after August 15, 1974, but before September 1, 1989, are subject to the following: Applicable rules found in SPC-18, 330 IAC 4, 320.1 IAC 5, or 329 IAC 1.5; A facility permit in effect on the day of facility closure, if such document exists; and 329 IAC 10-4 or 329 IAC 10-6.

September 1, 1989 to April 14, 1996:

Permitted landfills and open dumps that ceased accepting waste on or after September 1, 1989, but before April 14, 1996, are subject to the following: Applicable rules and regulations listed in 329 IAC 2; 329 IAC 10-4 or 329 IAC 10-6; and a facility permit in effect on the day of facility closure, for permitted landfills (329 IAC 2-7-6(b)).

Certified Closed After April 14, 1996:

Permitted landfills that were certified closed and open dumps that ceased accepting waste after April 14, 1996, are subject to the following: Applicable rules and regulations listed in 329 IAC 10; and a facility permit in effect on the day of facility closure, for permitted landfills.

LAND CONTAINING A PERMITTED LANDFILL

The following responsibilities apply to the owner of land that contains a permitted landfill and the owner, operator and/ or permittee:

The owner, operator, or permittee of a closed landfill must continue to monitor and provide maintenance to the landfill in accordance with the rules under which the permit was granted to the landfill and in effect at the time the landfill was closed, and in accordance with the facility permit. (329 IAC 10-6-2(a))

The owner, operator, or permittee of a closed landfill or the owner of real estate upon which a closed landfill is located, shall be responsible for correcting and controlling any nuisance conditions occurring at the landfill. (329 IAC 10-6-2(b))

The owner, operator, or permittee of a closed landfill or the owner of real estate on which a closed landfill is located shall be responsible for eliminating any threat to human health or the environment. (329 IAC 10-6-3)

If the commissioner determines that the closed landfill is or may be a threat to human health or the environment, due to a release or threat of release of contaminants from the landfill into the environment, the commissioner may proceed under IC 13-25-4 and rules adopted under IC 13-25-4-7 that require the owner, operator, or permittee of a closed landfill or the owner of real estate upon which a closed landfill is located, or any other responsible person under IC 13-25-4-8, to perform remedial action, including the installation and monitoring of groundwater monitoring wells or other devices and corrective action under 329 IAC 10-21-13. (329 IAC 10-6-4)

Active landfills must follow requirements in 329 IAC 10.

LAND CONTAINING AN OPEN DUMP

The following responsibilities apply to the owner of property that contains an open dump:

Correcting and controlling any nuisance conditions that occur as a result of the open dump, including removal of all solid waste from the area of the open dump and disposal of such wastes in a solid waste land disposal facility permitted to accept the waste; or other methods as approved by the commissioner.

Eliminating any threat to human health or the environment.

“If the commissioner determines that the open dump is or may be a threat to human health or the environment due to a release of contaminants from the open dump into the environment, the commissioner may proceed under IC 13-25-4 and rules adopted under IC 13-25-4-7 that require the owner of real estate upon which an open dump is located or any other responsible persons under IC 13-25-4-8, to perform remedial action, including the installation and monitoring of groundwater monitoring wells or other devices.” (329 IAC 10-4-4)

CLOSURE GUIDANCE

Suggested Information for Preparing a Closure Plan for a Historical Disposal Site

Information submitted under this section should be submitted in a format compatible with IDEM recordkeeping systems. Any document that is available in IDEM's digital library may be submitted as a document reference number. In order to assess the current and potential environmental risks associated with a landfill or open dump, the following information should be submitted, if available.

Historic information:

- Ownership,
- Waste streams,
- Waste sources,
- Permit numbers and available permits, if applicable,
- Groundwater sampling information,
- Boring logs,
- Compliance history,
- Date of last waste disposal, and
- Waste boundaries.

Current information:

- A topographic map;
- Current groundwater sampling information, if available;
- Current landfill or dump cover information;
- Groundwater flow direction (where available); and
- Location and logs of drinking water wells within a quarter mile of the site boundaries.

A map depicting waste boundaries of the landfill or open dump, as established by a combination of any of the following:

- Historic maps, aerial photographs, and/or Light Detection and Ranging (LIDAR) data;
- Test pits, borings, and/or hand auger locations, as outlined in "Field Determination of Existing Waste Boundaries" below;
- Ground Penetrating Radar/geophysical information; and/or
- Changes in topography.

Based on the information provided, the landfill will be considered either an open dump (never permitted) or a permitted landfill (previously permitted).

Future proposed use information (if applicable):

- A post-closure use plan,
- A regrading plan;
- Storm water and erosion controls;
- Cover installation Quality Assurance (CQA) and Cover Quality Control (CQC) (329 IAC 10-2-38 and 329 IAC 10-2-39);
- A Post-Closure Plan or Long-Term Stewardship Plan (LTSP); and

Field Determination of Existing Waste Boundaries

Most old landfills and open dumps lack accurate waste boundary information. A simple waste delineation can be performed with exploratory borings or test pits along the apparent edge of the waste to confirm the presence or absence of waste. One test pit per 200 feet is recommended and at every change in boundary direction. Each test location should be a minimum of five feet deep, unless waste is encountered at a depth shallower than five feet. The delineated waste boundary should be documented by a survey, which will assist with recording an Environmental Restrictive Covenant

(ERC) on the property. Frequency and location of test pits may be revised based on other available site information.

Waste Evaluation

Drilling through waste and sampling of waste is **NOT** recommended. However, sampling and analysis should be done if there is sufficient information to show the landfill or open dump contains only non-putrescible, homogeneous waste **AND** placement of a structure on top of the waste is anticipated. A waste evaluation in that case 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.

A waste evaluation should include the submittal of a Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) to OLQ for review. The SAP, QAPP, and HASP should follow the recommendations outlined in the Remediation Closure Guide. (RCG, Pages 42 and 43). Borings drilled into waste may encounter explosive gases, such as methane. A HASP should be submitted prior to drilling through waste and should include provisions for intrinsically safe equipment. The HASP should include safety precautions such as an explosimeter and smoking prohibitions.

A minimum of three borings per acre are suggested to adequately evaluate the waste. Each boring should be monitored for landfill gas, unless it can be demonstrated that landfill gas monitoring is unnecessary, based on waste contents. Methane should be measured every five feet through the waste column in each boring. The monitoring of landfill gas should follow the applicable portions of the NPD "Methane Monitoring Program", dated March 28, 2005, and listed on the IDEM website at <https://www.in.gov/idem/7113.htm>

Boring logs should include a description of the type of material/waste encountered (foundry waste, Municipal Solid Waste (MSW), etc.).

Borings should continue through standing liquid (leachate) to the bottom of the waste. The top of the leachate column should be recorded.

A liquid grab sample should be collected, if leachate is encountered, to refine the Conceptual Site Model (CSM). Leachate sampling results can provide a screening level understanding of waste composition and constituent mobility. Sampling results may also be used to direct groundwater monitoring constituents and may be able to support a request for an alternative cover. Leachate samples should be analyzed for the following constituents (based on 329 IAC 10-21-15, 329 IAC 10-21-16). Some constituents may be excluded, if sufficient justification is provided:

- Volatile Organic Compounds (VOCs),
- Semi-Volatile Organic Compounds (SVOCs),
- Polychlorinated Biphenyls (PCBs),
- Total Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver,
- Ammonia,
- Boron (total),
- Chloride,
- Copper (total),
- Cyanide (total),
- Fluoride,
- Iron (total),
- Manganese (total),
- Nickel (total),
- Nitrate,
- Phenols,

Sodium (total),
Sulfate,
Zinc (total), and
Field pH.

All borings must be filled in with hydrated bentonite after sampling is completed, per 312 IAC 13-10-2. 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.

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 must be disposed at an approved solid waste land disposal facility. It is not acceptable to expand the footprint of the existing waste boundary or relocate the waste elsewhere onsite outside of the existing waste footprint.

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 property surrounding or adjacent to the waste:

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.

NEW dwellings should not be constructed within 600 feet of the waste boundary.

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 to a smaller area, waste should NOT remain in the following areas;

Within a wetlands in violation of Section 404 of the Clean Water Act, as amended, or within isolated wetlands as defined in IC 13-11-2-112.5,

Within any floodplain, unless provisions are made to prevent washout of the waste and the waste is protected from floodwater inundation by a dike with a top elevation not less than three feet above the base flood elevation,

Within floodways of drainage areas greater than one square mile, unless approval is obtained from the Indiana Department of Natural Resources,

Within 100 feet of the normal water line of any lake, reservoir, or continuously flowing stream,

Within areas of karst topography, unless provisions are made to collect and contain all of the leachate generated, and a demonstration that the integrity of the landfill will not be damaged by subsidence is submitted and approved,

Within areas over mines, unless it is demonstrated that the integrity of the landfill will not be damaged by subsidence,

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,

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)),

Within 600 feet of any dwelling, unless written consent has been obtained from the occupant and owner of the dwelling,

Within 100 feet of the real property boundaries of the facility, or

Within the water table.

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. Emplacement of a new cover needs to follow the guidelines below and applicable rule requirements in 329 IAC 2 or 329 IAC 10.

Previously certified cover: Permitted landfills with a previously certified cover, that ceased taking waste after September 1, 1989 must follow cover requirements and maintenance per 329 IAC 2. Permitted landfills with a previously certified cover, that ceased taking waste after April 14, 1996 must follow cover requirement and maintenance per 329 IAC 10. Application to a Remediation program for these facilities should include the most recent landfill cover inspection report, to evaluate cover integrity as detailed in 329 IAC 10-23-2 or 329 IAC 2-15-7, whichever is applicable.

Permitted landfills, all unpermitted landfills, and all open dumps without cover certification need a cover that at a minimum consists of the following:

Two feet of clay-type soil (i.e., Unified Soil Classification designation ML, CL, MH, CH, or OH) with an additional six inches of top soil to establish vegetation. A thicker cover may be required, depending on slope steepness; and

A final cover with a slope of not less than two percent (2%) and not more than 33%, and 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 waste age; waste composition; landfill or open dump condition; groundwater monitoring results; and proposed post-closure use of the site.

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:

Thickness of final cover, consisting of a minimum of two feet of clay-type soil (i.e., Unified Soil Classification designation ML, CL, MH, CH, or OH), unless an alternative cover has been approved by IDEM. 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.

Thickness of top soil, consisting of a minimum of six inches. The thickness of top soil may be verified by the method described above for final cover.

Final slopes of the fill area, less than 33% and more than 2%. Other slopes may be acceptable, if warranted by the approved post-closure use. Verification of proper slopes and final contours should be accomplished by providing as-built drawings depicting landfill or open dump final contours and elevations. Elevations should be referenced to USGS mean sea level (MSL). Contour maps should be drawn with the two foot contour intervals for sites smaller than 80 acres; or five foot contour intervals for sites larger than 80 acres.

Confirmation of Soil Cover Material

The confirmation that soil used in the final cover system is of Unified Soil Classification designation ML, CL, MH, CH, or OH, or the soil meets specifications previously agreed on with IDEM. 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 at least one boring or auger hole per acre, taken at mid-depth of the in-place final cover; every 3,000 cubic yards; or whenever the soil type changes.

Clean cover should be applied over disturbed areas of the fill. 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.

In areas where additional soil cover material will **not** be added and cover certification is **not** available, surface soil sampling within the upper two feet of cover material should be conducted to verify that the existing cover material meets soil specifications listed above. Additionally, a minimum of three surface soil samples per acre is recommended to verify that potential soil contaminant concentrations are suitable for the intended post-closure use of the site.

Samples should be analyzed on a dry weight basis for the following constituents, unless sufficient justification is provided to exclude some of the constituents below:

VOCs;

SVOCs;

PCBs;

Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver; and

Cyanide.

If surface sampling of existing cover material identifies areas with cover soil contamination above applicable screening levels, then this may be corrected by application of additional clean cover material to the contaminated areas; or by replacing contaminated cover material with clean soil. Contaminated cover soil may be reburied within the existing fill area.

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.

Landfill Gas Monitoring Guidelines

Landfill gas can become 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 OLQ's NPD "Methane Monitoring Program" (NPD # Waste-0056).

Landfill Contents and Conceptual Site Model (CSM)

The contents of a landfill or open dump 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. pesticides, herbicides, pharmaceuticals, pathogens, per - and polyfluoroalkyl substances (PFAS) 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 OLQ risk-based Screening Levels. However, the presence of these fingerprint constituents at concentrations exceeding background levels (see 329 IAC 10-21-6) indicates that MSW leachate is likely present in groundwater **and** that 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 due to the presence of leachate. This concept forms an important part of the CSM and evaluation of groundwater exposure pathways for MSW fill sites.

Groundwater Monitoring Guidelines

If the landfill was permitted under 329 IAC 2 or 329 IAC 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 2 or 329 IAC 10, or applicable previous solid waste rules.

The purpose of groundwater monitoring is to evaluate the measurable risks to human health, natural resources, and the environment associated with contaminants leaching from the landfill or open dump into groundwater. Key objectives are to evaluate whether contaminant concentrations are stable, whether a contaminant plume may move beyond the property boundaries, and evaluate current and potential risks.

A groundwater monitoring plan should be submitted to IDEM for review. The plan should contain details about well placement and construction, monitoring frequency and duration, and monitoring parameters.

This guidance 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 a timely response to a completed or potentially completed exposure pathway.

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

Monitoring Well Placement and Construction

The monitoring well network should meet the following general criteria:

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.

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.

Wells should be located within 50 feet of the waste boundary, and should not be installed through waste.

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)).

Additional wells may be necessary if groundwater elevations indicate that groundwater flow directions are other than as anticipated or 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. Additional monitoring may include the sampling of public or private water supply wells.

Monitoring Frequency and Duration

The post-closure period for landfills and open dumps in Remediation Programs 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**. Eight quarterly sampling events is an acceptable substitute for eight semi-annual events.

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 sampling data may be used to accomplish the groundwater sampling evaluation outlined below.

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 (based on 329 IAC 10-21-15, 329 IAC 10-21-16), unless sufficient justification is provided to exclude some of the constituents below:

- VOCs;
- SVOCs;
- PCBs;
- Total Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver;
- Ammonia;
- Boron (total);
- Chloride;
- Copper (total);
- Cyanide (total);
- Fluoride;
- Iron (total);
- Manganese (total);
- Nickel (total);
- Nitrate;
- Phenols;
- Sodium (total);
- Sulfate;
- Zinc (total); and
- Field pH.

Ground water samples for coal ash waste should be analyzed for the constituents below:

- Chloride, fluoride, and sulfate;
- Total Arsenic, barium, cadmium, chromium, lead, mercury, and selenium;
- Total Antimony, boron, beryllium, cobalt, lithium, molybdenum, and thallium;
- Radium 226 and 228 combined (40 CFR Part 257, App III and IV);

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

Evaluating Monitoring Results

After eight groundwater sampling events, the following should be evaluated, because an exceedance of the constituents below over their respective criteria may indicate a release from the waste.

Do concentrations of nitrate or fluoride exceed the maximum contaminant level (MCL), **or** two times the background concentration, whichever is higher?

Do concentrations of chloride, copper, iron, manganese, or sulfate exceed two times the secondary maximum contaminant level (SMCL), **or** two times the background concentration, whichever is higher?

Do concentrations of ammonia, boron, or sodium exceed two times the background concentration, whichever is higher?

Is field pH more than 10 or less than 5?

Additional monitoring criteria to be evaluated are:

Do all detected concentrations indicate a statistically stable or decreasing trend? If not, then additional groundwater sampling and/or investigation may be required.

Do groundwater concentrations exceed remedial objectives on- or off-site? If groundwater concentrations exceed remedial objectives, then a remedy should be implemented. Acceptable remedies include:

- Engineered barriers to prevent exposure and/or minimize infiltration of precipitation into the waste;

- Institutional Controls (IC), such as an ERC or environmental restrictive ordinance restricting groundwater use on the affected property(s), and

- 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:

- The municipal solid waste CSM, where applicable,
- Constituent concentrations,
- Proximity to residential wells,
- Proximity to municipal wells or other sources of public drinking water,
- Subsurface permeability, and
- Effects on nearby surface water.

Remediation Program Closure

A request for Remediation Program Closure may be submitted, when a cover certification, as outlined above in “Obtaining Final Cover Certification” has been completed; and a groundwater evaluation, as outlined above has been completed; and more than 30 years have passed since waste was accepted.

If groundwater concentrations do not meet the criteria listed in “Evaluating Monitoring Results,” then additional monitoring may be required. Additional monitoring and other requirements may be included in the Remediation Program Closure document, to be performed after receipt of the document.

Remediation Program Closure documents will vary by program as follows:

- Landfills and open dumps in the Indiana Brownfields Program may receive a Comfort Letter or Site Status Letter.

- Landfills and open dumps in the State Cleanup Program may receive a No Further Action Letter.

The Voluntary Remediation Program will make site-by-site decisions on what constitutes appropriate Remediation Program Closure, based on information provided during site characterization and remedy evaluation phases of the project. In some cases, a Certificate of Completion and Covenant Not to Sue may include conditions in a Long-Term Stewardship Plan that must be maintained or performed after issuance of the Certificate or Covenant.

All Remediation Program Closure determinations may include conditions that must be maintained or performed after the closure document has been issued. Such conditions will be listed in the Post-Closure Plan or Long-Term Stewardship Plan. See “Post-Closure Use Guidelines” and “Institutional Controls” below.

Possibility for Additional Investigation and Potential Remediation

IDEM may request additional investigation and possible implementation of a remedy prior to completion of the required number of 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 at levels that suggest the presence of MSW leachate in groundwater. An area requiring exposure control may be defined by groundwater, soil, vapor, or methane sampling results.

Sampling Results Format and Validation

All sampling results (soil, groundwater, surface water, sediment, waste, gas) submitted to OLQ should also include a digital copy, formatted according to the OLQ guidelines, as specified at: <https://www.in.gov/idem/landquality/2369.htm>. Digital data should be submitted to olqdata@idem.IN.gov.

Sampling results submitted to OLQ Chemistry Services Section for validation should include full QA/QC documentation (RCG, Pages 42-46).

Locations for all sample points should also 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.

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.

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 performed after closure, and should include at least the following:

A description of groundwater monitoring activities and the frequency with which they will be performed (if applicable),

A description of maintenance activities and the frequency at which they will be performed, and

The name, address, and phone number of the Participant with responsibility for maintaining the site after closure whom the OLQ may contact about the landfill or open dump during the post-closure period.

Post-Closure Duties – Maintenance

Post-closure maintenance to the landfill or open dump should take place in accordance with requirements in force at the time the landfill or open dump was closed; the landfill permit, where applicable; and/or any requirements or conditions included in the Remediation Program Closure document.

Post-closure maintenance activities typically consist of semi-annual mowing of the landfill cover, submittal of groundwater sampling results and evaluations (if applicable), and 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:

- Maintenance of final cover,

- Maintenance of contours to prevent ponding of water on the cover,

- Maintenance of access control, if applicable, and

- Maintenance and monitoring of monitoring wells; gas wells; gas venting system; leachate collection system; and/or remediation system, such as a perimeter gas system; extraction wells; slurry wall; or other systems.

The existing and future owner of a landfill or open dump is responsible for correcting and controlling of any nuisance conditions occurring at the landfill or open dump, and eliminating any threat to human health or the environment, after receipt of a Remediation Program Closure document:

Institutional Controls

The owner of a landfill or open dump should provide a draft ERC for the landfill or open dump property to IDEM for review and approval. After IDEM approval, the owner should record the finalized ERC with the county land recording authority and provide a copy of the recorded instrument 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 on the property:

A plot plan, with surface contours at intervals of two feet, which should indicate surface water run-off directions; surface water diversion structures after completion of the operation; and final grade contours.

A description of the general types and location of waste,

The depth of fill,

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 prior IDEM approval; and

A statement that post-closure maintenance will be conducted according to the most current IDEM approved LTSP.

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 IDEM approval, except that groundwater may be extracted in conjunction with environmental investigation and/or remediation activities.

GLOSSARY

“Acts Prohibited” – No person shall cause or allow the storage, containment, processing, or disposal of solid waste in a manner which creates a threat to human health or the environment, including the creating of a fire hazard, vector attraction, air or water pollution or other contamination (329 IAC 10-4-2).

“Approved Landfill” – Landfill approved for operating by Indiana State Board of Health during the period 1969 through 1974 (Refuse Disposal Act, IC 1971, 19-2-1).

“Atterberg Limits” – Test methods to determine the liquid limit, plastic limit, and the plasticity index of soils, as described in ASTM D4318 - 10 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

“Certified Landfill Closure” – Those activities to be completed at the end of waste acceptance at a solid waste land disposal facility or units of a facility, including landfill cover certification required by 329 IAC 10-22-8, 329 IAC 10-30-7, 329 IAC 10-37-7, or 329 IAC 2-15-5, but not including those activities required after certification (329 IAC 10-2.5-1(22)).

“Closed Landfill” – Landfill that ceased accepting waste prior to September 1, 1989. Landfills that ceased accepting waste after September 1, 1989, must be certified closed (see definition 5).

“Conceptual Site Model (CSM)” – A comprehensive description of a site and the processes by which contamination may move from source(s) to receptor(s) (RCG, Page 195).

“Construction/Demolition Waste” – Solid waste resulting from the construction, remodeling, repair, or demolition of structures (329 IAC 10-2-37). Such waste may include any of the following:

1. Scrap lumber.
2. Bricks.
3. Concrete.
4. Stone.
5. Glass.
6. Wallboard.
7. Roofing.
8. Plumbing fixtures.
9. Wiring.
10. Nonasbestos insulation.

“Contaminant” – For purposes of the *Remediation Closure Guide (RCG)*, a chemical present at a concentration that exceeds the chemical’s remediation objective (RCG, Page 195).

“Contaminant” is also defined in IC 13-11-2-42 as any solid, semi-solid, liquid, or gaseous matter, or any odor, radioactive material, pollutant (as defined by the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as in effect on January 1, 1989), hazardous waste (as defined in the federal Solid Waste Disposal Act (42 U.S.C. 6901 et seq.), as in effect on January 1, 1989), any constituent of a hazardous waste, or any combination of the items described in this section, from whatever source, that:

- 1) Is injurious to human health, plant or animal life, or property;
- 2) Interferes unreasonably with the enjoyment of life or property; or
- 3) Otherwise violates:

- A. Environmental management laws; or
- B. Rules adopted under environmental management laws.

“Construction Quality Assurance (CQA)” – Construction quality assurance” or “CQA” means a planned system of activities that provides assurance that the solid waste land disposal facility was constructed as specified in the approved construction plan. Construction quality assurance includes inspections, verifications, audits, and evaluations of material and workmanship necessary to determine and document the quality of the constructed facility. Construction quality assurance refers to measures taken by a project engineer to assess if the installer or contractor is in compliance with the approved construction plan (329 IAC 10-2-38).

“Construction Quality Control (CQC)” – Construction quality control” or “CQC” means a planned system of inspections that is used to directly monitor and control the quality of a construction project. Construction quality control is normally performed by the geosynthetics manufacturer or installer, or for natural soil materials by the earthwork contractor, and is necessary to achieve quality in the constructed or installed system. Construction quality control refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the approved construction plan (329 IAC 10-2-39).

“Environmental Restrictive Covenant” or “ERC” – A legal and administrative measure to protect human health and the environment at sites where contamination is left in place. ERCs limit human exposure by restricting activity, use, and access to properties with contamination. Restrictive covenants can be enforced by the state against current and future property owners. For the purpose of this guidance, the term “ERC” is used interchangeably with the IC 13-11-2-193.5 definition of “Restrictive covenant” (RCG, Pages 17, 147, 196).

“Exposure Control Area” – An area over which a remedy reduces exposure to an acceptable level. An exposure control area can be the same as an area of property control, if the contamination is confined to the source property. However, an exposure control area may also include off-site areas with multiple properties and owners. An area requiring exposure control may be defined by groundwater, surface water, soil, vapor, or methane sampling results (RCG, Page 197).

“Exposure Pathway” – The course a chemical takes from a source to the point of contact with an exposed organism (RCG, Page 197).

“Flame Ionization Detector (FID)” – A gas detector used for detecting hydrocarbons and other easily flammable components (Drilling Procedures and Monitoring Well Construction Guidelines – NPD 0053).

“Groundwater” – Such accumulations of underground water, natural and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this state, but excluding manmade underground storage or conveyance structures (329 IAC 10-2-85). For purposes of the RCG – Water occurring beneath the surface of the ground, regardless of location or form (RCG, Page 198).

“Health and Safety Plan (HASP)” – A site safety plan as outlined and required under 29 CFR 1910.120.

“Institutional Control” – Administratively or legally enforceable measures that limit human exposure to chemicals at concentrations that exceed residential remediation objectives (RCG, Page 17, 198).

“Landfill” – Landfill means a solid waste disposal facility at which solid waste is deposited on or beneath the surface of the ground as an intended place of final location (IC 13-11-2-116)

“Land Disposal Facility” - A permitted or approved facility that accepts or accepted solid waste for deposit and covering in or on the ground surface (329 IAC 10-2-176).

“Leachate” – A liquid that has passed through or emerged from solid waste and contains soluble, suspended, immiscible, or miscible material removed from such waste (329 IAC 10-2-103).

“Legitimate Use” – A commissioner’s approval for use of a solid waste based on the determination that the use is legitimate and does not pose a threat to public health or the environment (329 IAC 10-3-1(16)). Note: IC 13-11-2-118.4 defines “legitimate use.” IC 13-19-3-1.3 directs the agency to write rules establishing procedures and standards for legitimate use. This rule has not been written as of the time of writing this guidance.

“LIDAR” – A surveying method that produces high resolution digital topographic maps. LIDAR stands for *Light Detection and Ranging* and is a [remote sensing](#) method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth to generate precise, three-dimensional information about the shape of the Earth and its surface characteristics (NOAA).

“Long-Term Stewardship Plan” or “Post-closure plan” – A document that details all monitoring and cover maintenance activities required after closure of a landfill or open dump (329 IAC 10-23-3).

“Maximum Contaminant Level (MCL)” – The levels developed under Section 1412 of the Safe Drinking Water Act, codified under 40 CFR 141 (329 IAC 10-2-110).

“Municipal Solid Waste (MSW)” – Any solid waste generated by community activities or the operation of residential or commercial establishments. The term includes household or residential waste and commercial waste (329 IAC 10-2-115).

“Neutral Leaching Method Test (NLMT)” – A test to determine the Industrial Waste Classification of the waste deposited into the landfill (329 IAC 10-9-4(b)(2)(B)).

“Open dump” – The consolidation of solid waste from one or more sources or the disposal of solid waste at a single disposal site that does not fulfill the requirements of a solid waste land disposal facility or other land disposal method as prescribed by law or regulations and that is established and maintained without cover and without regard to the possibilities of contamination of surface or subsurface water resources (329 IAC 10-2.5-1(44)).

“Operator” – Except as provided below, means the person or persons responsible for the overall operation of a solid waste land disposal facility or part of a solid waste land disposal facility. In:

329 IAC 10-20-30;

329 IAC 10-28-22 through 329 IAC 10-28-24; and

329 IAC 10-36-17 through 329 IAC 10-36-19;

the term has the meaning as set forth in IC 13-11-2-148(c) (329 IAC 10-2-130).

“Owner” – The person who owns a landfill or open dump, or part of a landfill or open dump (329 IAC 10-2-131).

“Participant” - The individual, agency, political subdivision, corporation, Limited Liability Company, partnership, association or other entity that voluntarily investigates or remediates a site under a program of the Indiana Department of Environmental Management (RPG, Page 258).

“Permit” – Means a permit, a determination related to a permit, license, registration, certificate, or other type of authorization required before construction or operation, that may be issued by the commissioner under IC 13-15 or IC 13-20 (329 IAC 10-2-133).

“Permittee” – Means the person who applies for and receives a permit from the department (329 IAC 10-2-134).

“Per - and polyfluoroalkyl substances (PFAS)” - A complex family of more than 3,000 manmade fluorinated organic chemicals, although not all are in current use or production. PFAS have been

extensively manufactured and used worldwide. Some PFAS are environmentally stable, mobile, persistent, and bioaccumulative (ITRC).

“Quality Assurance Project Plan (QAPP)” – A formal technical document describing detailed quality assurance/quality control and other technical procedures to ensure that the quality of environmental data will satisfy performance criteria for the data collection activity (RCG, Page 201).

“Registered Professional Engineer” – A professional engineer registered by the state under IC 25-31 (329 IAC 10-2-152).

“Remediation Site Closure” – IDEM’s written recognition that a party has demonstrated attainment of remediation objectives in a particular area. The written instrument for this decision varies by remedial program (see Remediation Program Guide) (RCG, Page 194).

“Restricted Waste Site” – A solid waste disposal facility designed and operated to accommodate specific types of waste as specified in 329 IAC 10-9-4 (329 IAC 10-2-159).

“Sampling and Analysis Plan (SAP)” – A site-specific plan detailing sampling rationale, protocols, and analyses. The protocols provide for documentation of all field work (RCG, Page 202).

“Screening levels” – A chemical-specific concentration level that IDEM has determined to be sufficiently protective at any site, provided it is applied under appropriate land use scenarios (RCG, Page 203).

“Secondary Maximum Contaminant Levels (SMCLs)” – The level or concentration that has been established under Section 1412 of the Safe Drinking Water Act, as codified under 40 CFR 143.3 (329 IAC 10-2-165).

“Semi-volatile Organic Compounds (SVOCs)” – Organic compounds that volatilize slowly under standard conditions (RCG, Page 203).

“Solid Waste” – has the meaning set forth in (IC 13-11-2-205(a)). Per 329 IAC 10-2-174, the following are examples of other discarded material:

1. Ash residue,
2. Contaminated sediments,
3. Commercial solid waste,
4. Construction/demolition waste,
5. Hazardous waste,
6. Household waste,
7. Infectious waste,
8. Liquid waste,
9. Pollution control waste,
10. Municipal solid waste,
11. Regulated hazardous waste,
12. Residential waste,
13. Industrial process waste.

“Solid waste land disposal facility” -- A permitted or approved facility that accepts or accepted solid waste for deposit and covering in or on the ground surface (329 IAC 10-2-176).

“Top Soil” – Any of the following (329 IAC 10-2-188.1):

The dark-colored surface layer, or a horizon, of a soil. When present, it ranges in depth from a fraction of an inch to three feet,

Surface soil equivalent to the plow layer of cultivated soils,

Any surface layers enriched in organic matter and having textural and structural characteristics favorable to plant growth.

“Toxicity Characteristic Leaching Procedure (TCLP)” SW-846 method 1311 – A method to determine if a solid waste exhibits any of the characteristics of a hazardous waste. It is also used to determine a restricted waste site type (I, II, III, or IV), as described in 329 IAC 10-9-4.

“Volatile Organic Compounds (VOCs)” – Compounds that tend to evaporate at low to moderate temperatures (usually less than 200°F) due to their low vapor pressure (RCG, page 205).

Waste “Storage” – The retention, containment, or accumulation of solid waste on a temporary basis in such a manner that it does not threaten or potentially threaten human health or impact or potentially impact the environment, for a period of more than twenty-four (24) hours, in such a manner as not to constitute disposal of the waste. It must be a rebuttable presumption that storage of waste for more than six (6) months constitutes disposal is defined at 329 IAC 10-2-181, which requires that solid waste be stored in a manner that does not pose a threat to human health or impact the environment. After 6 months of storage, IDEM assumes disposal has occurred (329 IAC 10-2-181).

REFERENCES

U.S. EPA Standards

National Primary Drinking Water Standards and Maximum Contaminant Levels (MCLs):
<https://nepis.epa.gov/Exe/ZyPDF.cgi/P100N01H.PDF?Dockey=P100N01H.PDF>

National Secondary Drinking Water Standards and Secondary Maximum Contaminant Levels (SMCLs): <https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals>

40 CFR 257, Federal Register Vol. 80, No.74, April 17, 2015: <https://www.govinfo.gov/app/details/FR-2015-04-17>

Indiana Solid Waste History Compilation

“Summary of the History of the Solid Waste Rules” (March 5, 2004).

Indiana Administrative Codes and Statutes

State Stream Pollution Control Rule 18 (SPC-18) (Effective August 15, 1974):
https://www.in.gov/idem/waste/files/laws_rules_1974_SPC-18.pdf

State Rule 320 IAC 5; Refuse Disposal Act (August 15, 1974):
https://www.in.gov/idem/waste/files/laws_rules_1974_320-IAC-5.pdf

State Rule 320.1 IAC 5 (September 30, 1983); Refuse Disposal Act; Solid Waste Management Permits; Industrial Waste Hauler Permits:
https://www.in.gov/idem/waste/files/laws_rules_1986_April_320_1-IAC-5.pdf

State Rule 329 IAC 1.5 (July 1, 1988); Refuse Disposal Act; Solid Waste Management Permits, Industrial Waste Hauler Permits: https://www.in.gov/idem/waste/files/laws_rules_1988_1_July_329-IAC-1-5.pdf

State Rule 329 IAC 2; Solid Waste Rules (December 10, 1988):
https://www.in.gov/idem/waste/files/laws_rules_1988_Dec_329-IAC-2.pdf

State Rule 329 IAC 10 (April 13, 1996); Solid Waste Land Disposal Facilities;
<http://www.in.gov/legislative/iac/T03290/A00100.PDF>

State rule 330 Indiana Administrative Code (IAC) 4, (Effective August 25, 1983); Refuse Disposal Act; Solid Waste Management Permits; Industrial Waste Hauler Permits (Transferred):

https://www.in.gov/idem/waste/files/laws_rules_1983_Aug_330-IAC-4.pdf

State Statute IC 13-11-2, Definitions: IC 13-11-2-146 and -147 (Open Dump and Open Dumping);
http://iga.in.gov/static-documents/2/c/9/9/2c991753/TITLE13_AR11_ch2.pdf

IC 13-12-3-2; Remediation and Closure Goals, Objectives, and Standards for Certain Remediation Projects: <https://statecodesfiles.justia.com/indiana/2016/title-13/article-12/chapter-3/chapter-3.pdf>

IC 13-25-5;

<http://iga.in.gov/legislative/laws/2016/ic/titles/013/articles/025/chapters/005/><https://www.epa.gov/coal-ash/sh/coal-ash-rule>

Agency Policies, Guidelines, and Requirements

Data Submittal Guidelines for Map Data, Monitoring and Sampling Data, Field Data, Sample Point Data and Facility/Site Location Data; <https://www.in.gov/idem/landquality/2369.htm>

Drilling Procedures and Monitoring Well Construction Guidelines, dated March 17, 2009, NPD 0053; https://www.in.gov/idem/files/nrpd_waste-0053.pdf

Final Cover and Closure Certification Requirements for Solid Waste Disposal Facilities, dated January 2000; https://www.in.gov/idem/landquality/files/sw_resource_cover_closure.pdf

Methane Monitoring Program, dated March 17, 2005, NPD 0056; <https://www.in.gov/idem/7113.htm>

Minimum Requirements for the Selection and Operation of a Sanitary Landfill”, dated May, 1971; https://www.in.gov/idem/landquality/files/sw_resource_landfill_min_reqs.pdf

OLQ Spatial Data Collection Standards; <http://www.in.gov/idem/6839.htm>

“Post-Closure Uses of Solid Waste Disposal Facilities”, February 25, 1998, NPD 0026: https://www.in.gov/idem/files/nrpd_waste-0026.pdf

Remediation Closure Guide, 2012; <https://www.in.gov/idem/cleanups/2343.htm>

Remediation Program Guide, 2012;

http://www.in.gov/idem/cleanups/files/remediation_program_guide.pdf

Interstate Regulatory and Technology Council (ITRC)

Per- and polyfluoroalkyl substances (PFAS): <https://www.itrcweb.org/Team/Public?teamID=78>