Kansas Department of Health and Environment
Bureau of Waste Management
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Sampling Analysis Plan Development for Industrial Landfills

Guidance Document

This document provides guidance in the development of a sampling and analysis plan (SAP) for an industrial landfill as required by KDHE, in accordance with the Kansas solid waste regulations, the Resource Conservation and Recovery Act (RCRA) Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), and standard practices developed in other states and industry.

Introduction

The owner or operator of an industrial landfill is required to develop and submit a Sampling and Analysis Plan (SAP) to the Kansas Department of Health and Environment (KDHE) that details groundwater sampling and analysis procedures to be used at the facility. Since this document will be used throughout the active and post-closure life of a facility, an adequate SAP is important to ensure that monitoring results will provide data representative of groundwater quality upgradient and downgradient of the facility.

Authority

Under K.S.A. 65-3402: " 'Solid waste' means garbage, refuse, waste tires as defined by K.S.A. 65-3424, and amendments thereto, and other discarded materials, including, but not limited to, solid, semisolid, sludges, liquid and contained gaseous waste materials resulting from industrial, commercial, agricultural and domestic activities…" Since the Kansas Statutes define industrial waste as solid waste, the solid waste landfill regulations apply to industrial landfills.

General Facility Information

An essential part of the SAP is a summary of the groundwater monitoring network. The number of monitoring wells, when the wells were installed, and the relationship between the monitoring well locations and the landfill cells should be noted. A discussion of the characteristics of the uppermost aquifer is necessary, including the aquifer rate of recharge and groundwater flow direction.

Site description and history. Include when the landfill began to take waste, description of any closed cells, previous hydrogeologic site investigations, and what chemical constituents have been detected that may impact the downgradient groundwater quality.

Site specific and regional hydrogeologic setting.
A detailed description of the underlying geology, geomorphology, and stratigraphy of the facility and surrounding area. A description of the hydrogeology of the uppermost aquifer along with the anticipated groundwater elevation, hydraulic conductivities, groundwater flow direction, groundwater flow velocity, and any other pertinent aquifer characteristics. Also, a description of the hydrology and any surface and subsurface water features including rivers, streams, ditches, ponds, impoundments, wetlands, irrigation, etc., that might affect the groundwater flow and water quality at the facility.

A table should be included summarizing information for all monitoring wells at the facility; such as top of casing (TOC) elevation (MSL), measured depth to groundwater to 0.01 foot, installed total depth, position (upgradient, downgradient, or side-gradient), well casing diameter, screen interval, measured groundwater

elevation, horizontal coordinates, and the geologic formation being monitored. Well logs/boring logs for each monitoring well in the monitoring well network should be included in the appendices.

A site location map that shows the landfill location in reference to the nearest city and directions to the facility. A second map should also be included which identifies facility property lines, active and closed cell boundaries, monitoring well locations, on-site buildings, and other pertinent facility features. Township, Range, and Section numbers should be labeled on the maps along with a North arrow.

Sampling Frequency and Analytes

The SAP should identify which month(s) sampling will take place. Include the site-specific analyte table derived from a Synthetic Precipitation Leaching Procedure (SPLP) of the industrial waste(s) to be disposed of in the landfill. Analytes detected in the SPLP which appear on the KDHE Tier II RSK analyte list will be considered to be the site-specific analytes of interest. The table should include holding times, analytical procedures, maximum contaminant level, and reporting limits for the analytes.

Documentation and Field Procedures

Proper field documentation of each sampling event is vital to the success of the groundwater monitoring program. The SAP should include provisions to properly record all applicable information while performing the field activities. Information can be recorded in a field logbook or on data sheets for each monitoring well prepared prior to the sampling event. If data sheets are used, the SAP should include an example in the appendices.

General site information such as weather conditions (air temperature, wind direction, precipitation), date of activity, list of the field members should be recorded in the field notes. For each monitoring well measured and/or sampled; well location/ ID, well observations (well pad, casing, protective casing, reference mark, identification), locks (protective casing, well), groundwater level measurements (date/time measured, static water level in feet below TOC, and total depth in feet below TOC should be recorded in the field notes.

All field meter calibration data of each individual meter used; temperature, pH, conductivity, dissolved oxygen, oxidation reduction potential (ORP), should be recorded in the field notes. Calibration procedures must be performed according to manufacturer's specifications for all equipment and measuring devices. A copy of the user manual of each meter used must be included in the appendices. The total depth measurement of each monitoring well must be collected at least once per year. KDHE/BWM should be notified at least two weeks before the sampling event so that KDHE personnel may be on-site to collect split samples and perform other quality assurance/quality control tasks.

Purging and Sampling Procedures

Purging activities for each monitoring well sampled; (purged by, purge date, purge start time, and purge stop time), purge method (bailer, dedicated pump, non-dedicated pump), and specific purge parameters (purge time in minutes, temperature F° or C°, specific conductivity in µS, dissolved oxygen in mg/L, ORP in mV, purge rate in milliliters per minute, and purge volume in gallons) should be recorded in the field notes.

Monitoring wells may be purged by the following techniques: submersible pump (Grundfos Rediflo™, QED Sample Pro®, or equivalent); or dedicated or non-dedicated bailer; or low-flow bladder pump (QED Sample Pro MicroPurge Pump® or equivalent). No-purge samplers may be used (HydraSleeve™ sampler, QED Snap Sampler®, or equivalent) for collecting a no-purge sample. KDHE/BWM

discourages the submersible pump and bailer methods. Low-flow and no-purge sampling methods are the preferred methods of collecting groundwater samples.

Submersible pump and bailer methods. The minimum amount of water to be purged is three well casing volumes. The SAP should contain the formula used for calculating the well casing volume. In addition to the minimum three well casing volumes, water must be purged until the temperature, pH, and conductivity parameters have stabilized. Turbidity and ORP parameters may also be used. These purge parameters should be recorded at a frequency no greater that once per well casing volume. Three consecutive sets of parameter readings must fall within 10% variance prior to sample collection.

Low-flow method. To purge a well using low-flow purging, the well shall be purged until the stabilization of the water level within the well and water quality purge parameters (temperature, pH, conductivity, ORP) measured during purging. Consecutive readings of all the purge parameters must be within 10% ± of each other prior to sample collection. Pump flow rates should not exceed 500 ml/minute and should be selected not to exceed the yield of the well such that minimal drawdown of the water level in the well is observed or so that a stabilized pumping water level is achieved as quickly as practical, thus expediting the stabilization of the purge parameters. The purge parameter measurements should begin with purging and continue at regular intervals until stabilization is achieved. Once stabilization has been achieved, sampling should be conducted at a rate of 100 to 500 ml/minute. The flow rate for sampling cannot be increased over the purging rate because this will increase drawdown of the water surface, which could affect the sample chemistry.

No-purge method. The no-purge sampler collects a representative sample without purging the well. It collects a whole water sample from a user-defined interval within the well screen without mixing water from other intervals. One or more samplers are placed within the screen interval of the well and a minimum of 24 hours are required for the well to re-equilibrate. Three to six days are recommended for full equilibration of the well. No-purge samplers may be placed after each sampling event until the following sampling event.

Sampling activities for each well sampled; (sampled by, sampling method including bailer, dedicated pump, non-dedicated pump, or no-purge sampler, sample date and time, and order of sample collection either detection or assessment monitoring), Qualitative information on well recharge rate, observations/comments (such as equipment malfunctions, possible sample contamination sources, unusual monitoring well recharge rates, or sampling difficulties) should be included in the field notes. Samples should be collected from the monitoring well within 24 hours of measuring the static water level and within 2 hours of purging the well. If samples are not collected within 2 hours of purging, an explanation must be included (low-yield wells, slow recovering wells, etc.). Samples should be collected in the order from the least contaminated monitoring well to the most contaminated, based on prior analyses.
If one or more purging and sampling methods are used, a detailed purging and sampling method must be included in the SAP. The SAP needs to identify the equipment and procedures used at each well to obtain a representative groundwater sample. An equipment manual used for purging and sampling must be included in the appendices. Samples must be collected in the proper order: VOCs then total metals.

A table should be included in the SAP listing the preservation procedures (ice, hydrochloric acid, etc.), the parameters to be analyzed, and the analytical method to be used, containers used for sample collection, and holding time of the samples. The Practical Quantitation Limit (PQL) of the analytical method for each chemical constituent sampled must be lower than the U.S. EPA Maximum Contaminant Level (MCL) or Kansas Risk-Based Standards for Kansas (RSK).

Redevelopment of monitoring wells. During the active lives of monitoring wells, the wells should be checked to confirm that the well is still intact, and silt and clay particles have not accumulated. If sediments have accumulated in the well, the casing and screen can become plugged, thus causing a loss of hydraulic connection. At minimum, wells should be redeveloped when 20% of the well screen is occluded by sediments, or records indicate a change in yield and turbidity.

Field Quality Control Samples. Collection and preparation of several types of quality control samples are necessary. The SAP should describe the protocol and frequency for preparing trip blanks, blind field duplicates, and decontamination rinsate blanks.

Equipment Decontamination Procedures. Some field equipment may be dedicated to an individual monitoring well. For non-dedicated equipment used at multiple wells, decontamination of the equipment is necessary between use at monitoring wells. The SAP shall describe the materials and procedures used for decontamination of equipment. All equipment must be decontaminated by washing with a non-phosphate detergent, followed by a thorough rinse with deionized water. After cleaning, the equipment must be wrapped or bagged to prevent contamination while not in use. The SAP must contain detailed decontamination procedures for all field equipment. Provisions for the containment and disposal of equipment decontamination rinsate should also be included in the SAP.

Sample Labels and Chain of Custody Procedures. Proper sample labeling, and chain of custody are necessary for the tracking of each sample from the time of sample collection to laboratory analysis. An explanation of all procedures necessary to label a sample and ship it to the laboratory is required in the SAP.

Each sample container must have a label which notes the facility name, sample identification (monitoring well) number, date and time of sample collection, and any other data required by the laboratory. The labels may be printed prior to sampling.

Once labeled, a sample must be transported to the laboratory for analysis. Proper chain of custody procedures is to be followed and documented. The SAP should include the method of sample transport and an example of the chain of custody form to be used. Chain of custody forms should include the sample identification, date and time of sample collection, sample collector, any preservative used, analyses requested, and provisions for the transfer of sample custody.

Laboratory Analyses

The SAP should include a summary of the laboratory quality assurance/quality control (QA/QC) program. The analytical methods must be noted, as well as the appropriate holding times. It is necessary to discuss the practical quantification limits for the constituents of concern, which must be at or below the maximum contaminant level (MCL) or Risk-Based Standards for Kansas (RSK). A table of the parameter names, reporting limits, units (mg/L or µg/L), and MCL or RSK of each parameter must be included. All analyses must be performed by a laboratory certified by KDHE for the analytical methods used.

Owners and operators of facilities are responsible for the validation of analytical results from laboratories. Upon receipt of laboratory data, the owner/operator needs to review the laboratory's QA/QC information and determine if the analytical results are valid. The SAP should include provisions for this review.

Data Interpretation and Reporting

The analytical results of each sampling event must be submitted to KDHE as part of a comprehensive report that summarizes the entire sampling event within 45 days of the receipt of the test results. The SAP should contain details regarding the content of these reports. If more than one geologic formation is being monitored, a potentiometric surface map must be made for each formation monitored.

Report of Analytical Results. Reports of sampling events must include, but not limited to, the following:

- Purpose of sampling, detection or assessment monitoring;
- A copy of the field notes and/or field data sheets;
- A copy of the raw laboratory analytical results;
- Compilation of the analytical results; text summary and table;
- A laboratory data validation summary;
- Rate and direction of groundwater flow, including a potentiometric surface map;
- Statistical analysis results including the identification of any statistically significant increase over background levels;
- Any deviations from the SAP during the sampling event and reasons for the deviations; and
- Certification from a qualified groundwater scientist (a professional geologist or professional engineer who has sufficient training and experience in groundwater hydrology and related fields).

Reminder: Please give KDHE at least two weeks advance notice of each approaching sampling event so that split samples may be collected.

For additional information regarding proper management of solid or hazardous waste in Kansas, you may contact the Bureau of Waste Management at (785) 296-1600 or the address at the top of this document, or visit the Bureau's website at www.kdheks.gov/waste/.

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This guidance supersedes BWM Technical Guidance Document SW 03-01 dated 09/08/2008.