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

Technical Guidance Document SW-1997-G3

This document describes the information required in Sampling and Analysis Plans developed for monitoring groundwater at Small Arid Municipal Solid Waste Landfill facilities in Kansas.

Introduction

The Kansas Department of Health and Environment (KDHE), in conjunction with the regulated community of Kansas, has promulgated regulations which allow a Small Arid Landfills (SAL) flexibility from some of the requirements placed on a Municipal Solid Waste Landfill (MSWLF), if the criteria detailed in Kansas Administrative Regulation (K.A.R.) 28-29-103(b) are met. Additionally, Groundwater monitoring requirements may also be modified or suspended provided the owner or operator demonstrates there is no potential for migration of hazardous constituents from the MSWLF during the active life and the post-closure care period of the landfill in accordance with K.A.R. 28-29-103(f).

To acquire the data to demonstrate that there is no potential for groundwater contamination from a SAL through groundwater modeling, owners or operators must install and operate a groundwater monitoring system in accordance with K.A.R. 28-29-111 through K.A.R. 28-29-113. K.A.R. 28-29-112 requires owner or operators to develop a sampling and analysis plan (SAP) that ensures monitoring results provide consistent data representative of groundwater quality at the facility. Proper design and operation of a groundwater monitoring system is essential for ensuring groundwater protection throughout the active and post-closure life of the landfill. This guidance describes the standard methods acceptable to meet the minimum information requirements for groundwater monitoring at SALs by KDHE. This guidance is based on the Kansas solid waste regulations, EPA's RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), and standard practices specified by KDHE.

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, what kind of cells are present (closed cells, compost, asbestos, etc.), 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 conductivity, groundwater flow direction, groundwater flow velocity and any other pertinent aquifer characteristics. Also, a description of the hydrology and any surface water features such as lakes, rivers, streams, wetlands, irrigation, or any other water features that might affect the

groundwater flow and water quality at the facility.

The plan should contain a table summarizing information for all monitoring wells at the SAL. The summarized information should include: top of casing (TOC) elevation above Mean Sea Level (MSL), measured depth to groundwater to 0.01 foot, installed well total depth, position (upgradient, downgradient, or side-gradient), well casing diameter, screen interval, measured groundwater elevation, horizontal coordinates, and the geologic information of each 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 SAL 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, such as closed cells, HHW, compost pads, etc. Township, Range, and Section numbers should be labeled on the maps along with a North arrow.

The SAP should include Table 1 from Kansas Administrative Regulation (K.A.R.)28-29-103. The SAP should also identify which month(s) the sampling will take place. Exemptions from semi-annual groundwater monitoring under K.A.R. 28-29-103(f)(4) require the exemption approval to be attached in the appendix.

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 (i.e. air temperature, wind direction, precipitation), date/time of activity, and a 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 (condition of well pad, casing, protective casing, reference mark, identification, and protective casing locks), groundwater level measurements, 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.

Each monitoring well must have the total depth of the well measured at least once a year. KDHE-BWM shall be notified at least two weeks before the sampling event so that KDHE personnel may be on-site to collect split quality assurance/quality control samples.

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, temp 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 water quality indicator parameters have stabilized. When purging wells with a submersible pump, a flow thru cell with a multimeter probe should be used to take measurements of temperature, pH, conductivity, turbidity, and ORP until these parameters have stabilized. When purging with a bailer, only temperature, pH, and turbidity measurements can be practically collected and reliable for evaluating water quality stabilization. These purge parameters should be analyzed at a frequency no greater than one per well casing volume. Consecutive readings of all the purge parameters must be within 10% ± of each other. If a submersible pump is used for purging and sample collection, the discharge rate of the pump should be reduced during volatile organic compound sample collection.

Low-flow Method: To purge a well using low-flow method, the well should be purged until the stabilization of the water level within the well and water quality purge parameters (temperature, pH, conductivity, ORP, and turbidity) measured during purging. Consecutive readings of all the purge parameters must be within 10% ± of each other. 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 above 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 at a minimum of 24 hours prior to sampling. This 24-hour period is required to allow the groundwater within the well screen to re-equilibrate following sampler placement. 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 should be recorded in the field notes. Documented sampling activities including the name of the person collecting the sample, sampling method (e.g., bailer, dedicated pump, non-dedicated pump, or no-purge sampler), sample date and time, order of sample collection, and identification of monitoring program (i.e., detection or assessment monitoring). Qualitative information such as well recharge rate, observations/comments (such as equipment malfunctions, possible sample contamination sources, unusual monitoring well recharge rates, or sampling difficulties) should also be included in the field notes. Samples should be collected from a monitoring well within 24 hours of measuring the static water level and within two hours of purging the well. If samples are not collected within two 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 description of each 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 analytes 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 US EPA Maximum Contaminant Level (MCL) or Kansas Risk-Based Standards for Kansas (RSK).

Redevelopment of Monitoring Wells: During the service life of a monitoring well, the well must be checked to confirm that the well is still intact, and silt and clay particles have not accumulated inside the well screen. If sediments have accumulated in the well, results of sample analyses may be biased due to interference by turbidity or the screen and casing can become plugged. At minimum, a well should be redeveloped when 20% of the well screen is occluded by sediments, or records indicate a significant change in yield and turbidity has occurred.

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 needs to 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 shall 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 needs 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 should 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 needs to summarize the laboratory quality assurance/quality control (QA/QC) program. The laboratory QA/QC procedures, analytical methods, and the appropriate sample holding times must be noted. The summary should include 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 SAL 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

Report of Analytical Results: 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 explain what information will be presented in these reports. If more than one geologic formation is being monitored, a potentiometric surface map must be made for each formation monitored. 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;
- Any deviations from the SAP during the sampling event and reasons for the deviations; and
- Certification from a qualified groundwater scientist (as defined under K.A.R. 28-29-3(yy), a professional geologist or professional engineer who has sufficient training and experience in groundwater hydrology and related fields).

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