

**COMMONWEALTH OF VIRGINIA**  
**Department of Environmental Quality**

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**Subject:** Division of Land Protection and Revitalization Guidance Memo No. 2016-02  
**Permitting, Sampling, Analysis, and Data Reporting associated with Solid Waste Landfill Underdrain Systems**

**To:** Regional Land Protection Program Managers, Regional Solid Waste Permit Writers, Regional Solid Waste Compliance Inspectors, Kathryn Perszyk, Geoff Christe, and Priscilla Fisher

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Director, Office Financial Responsibility & Waste Programs



**Date:** October 18, 2016

**Copies:** Regional Directors, Justin Williams

**Summary:**

In the absence of regulatory requirements specific to underdrains, this guidance document has been developed to provide owner/operators of regulated solid waste management facilities and DEQ solid waste staff with consistent monitoring requirements and permit language for underdrain systems.

**Electronic Copy:**

An electronic copy of this guidance is available on the Virginia Regulatory Town Hall website at: <http://townhall.virginia.gov/L/GDocs.cfm?boardid=119>

**Contact Information:**

Please contact the solid waste permit coordinator, Kathryn Perszyk, at (703) 583-3856 or [kathryn.perszyk@deq.virginia.gov](mailto:kathryn.perszyk@deq.virginia.gov) with any questions regarding the application of this guidance.

**Disclaimer:**

*This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate any particular method nor does it prohibit any alternative method for the analysis of data, unless specifically required by the VSWMR. If alternative proposals are made, such proposals should be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations.*



## Permitting, Sampling, Analysis, and Data Reporting associated with Solid Waste Landfill Underdrain Systems

### **I. Introduction**

Landfills designed under the Virginia Solid Waste Management Regulations (9 VAC 20-81-10 et seq.) must have liners and leachate collection systems installed that are designed to prevent contamination of the groundwater aquifer or cause a discharge to state waters. Those landfills that utilize underdrains, dewatering or gradient control systems, engineered witness zones, piped streams, or seep/spring collection systems, herein referred to generally as underdrain systems, construct those systems below the liner and associated leachate collection system, in some cases to ensure separation of shallow groundwater with the base of the waste mass and in other cases to capture groundwater that was daylighting at the surface in areas that would fall within the soon to be constructed landfill footprint. Landfills that were started prior to the regulatory requirements for installation of liners and leachate collection systems may also have underdrains. The water that is captured in these underdrain systems is typically sampled at the outfall of the system as a performance measure to assess the adequacy of the overlying liner and leachate collection system, if installed, or in place soils in preventing leachate from leaving the base of the waste mass as well as to ensure the discharge does not represent an unpermitted release of contaminants to surface water.

### **II. Background**

The Virginia Solid Waste Management Regulations (9 VAC 20-81-10 et seq.) define the groundwater point of compliance (GWPOC) as a boundary extending vertically from the edge of the waste mass. This definition is consistent with the groundwater point of compliance concept found in the Resource Conservation and Recovery Act (RCRA) Subtitle D rule (40 CFR 258). Landfill owner/operators must remediate the aquifer if groundwater protection standards are exceeded outside (beyond) the GWPOC. Groundwater which exists below the waste footprint is exempt from all monitoring and remediation requirements under 9 VAC 20-81-250 and 260 because it is confined within the GWPOC.

In some cases, landfills permitted in the Commonwealth are required to sample and analyze water that is captured below the waste mass footprint within underdrains, dewatering or gradient control systems, engineered witness zones, piped streams, or seep/spring collection systems. These requirements often stem from pre-existing site conditions recognized during the Part A permit application review. These sampling actions have historically been treated as part of the landfill's routine groundwater monitoring program and the sampling results compared to either site background or groundwater protection standards despite the fact that the media being sampled is not groundwater that would otherwise be regulated since it lies within the defined GWPOC.

Recognizing that these sampling activities fall outside the defined GWPOC, the Department has developed this guidance to ensure consistency across facility permits with such underdrain systems. This guidance addresses the appropriate list of water quality parameters to be sampled,

the relevant standards to compare sampling results against, the appropriate location for underdrain monitoring protocols, and a standardized reporting program for providing sampling results to the Department.

### **III. Authority**

Section [10.1-1408.1](#) of the Code of Virginia specifies that sanitary landfills or other facilities for the disposal, treatment, or storage of nonhazardous solid waste shall not operate without a permit from the Director. This Section also identifies key components of the permit application that shall be submitted for review.

Section [10.1-1408.4](#) of the Code of Virginia specifies that the Director shall determine, in writing, that the site on which the proposed new municipal solid waste landfill is to be constructed is suitable for the construction and operation of such a landfill.

The permit application required by the Code is addressed in Part V of the VSWMR [9 VAC 20-81-450 through 9 VAC 20-81-600]. The permit application for a proposed new solid waste management facility will contain a Notice of Intent (NOI), a Part A Application and a Part B Application. The Part A Application must address the applicable siting requirements of 9 VAC 20-81-120. Subsection F. of those requirements identify certain site characteristics, such as springs, seeps, or other groundwater intrusion into the site and the presence of transmission lines under the site, that may prevent approval of the site; require substantial limitations on site use; or require installation of sound engineering controls. Construction and monitoring of underdrain systems, as defined below, to manage springs, seeps, and groundwater intrusion are an established engineering control for managing such site characteristics and ensuring protection of human health and the environment.

### **IV. Definitions**

The definitions in § [10.1-1400](#) of the Code of Virginia and [9 VAC 20-81-10](#) of the VSWMR apply to the implementation of these procedures. Key definitions applicable to this guidance from the VSWMR are identified below. Additional definitions specific to this guidance are also provided.

*False negative* is a test result which incorrectly indicates that a particular condition or attribute is absent.

*False positive* is a test result which incorrectly indicates that a particular condition or attribute is present.

*Groundwater point of compliance* or *GWPOC* is the vertical plane at the disposal unit boundary as defined under 9 VAC 20-81-10.

*Leachate* means a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials from such waste. Leachate and any material with which it is mixed is solid waste and must be managed in accordance with 9 VAC 20-81-210.

*LOQ or Limit of Quantitation* is the smallest detectable concentration of analyte greater than the detection limit where the required accuracy (precision & bias) is achieved for the intended purpose the level above which quantitative results may be obtained. Samples that do not bear residues at or above the LOQ are often referred to as “nonquantifiable.”

*Statistically Significant Increase or SSI* is any release of a monitoring constituent that exceeds the upper bound of the reported normal range of the upgradient value of that constituent.

*Underdrain* is a term used generally to describe any collection system for the purpose of collecting groundwater or surface water below the landfill and includes, but is not limited to:

- Drain systems that collect perched or seasonal high groundwater water;
- Dewatering or gradient control systems that collect groundwater prior to its contact with the base of liner;
- Witness zone systems that collect liquids between the primary and secondary liner in accordance with 9 VAC 20-81-130.J.2.d.;
- Piped streams that collect surface water and allow it to pass below the base of the landfill; and
- Seep/Spring collection systems that collect surface water that day-lighted prior to landfill construction.

## V. Guidance Document

This guidance and its attachments are applicable to all solid waste management facilities operating or conducting post-closure care under the Virginia Solid Waste Management Regulations (VSWMR), originally promulgated by the Virginia Waste Management Board December 21, 1988; as amended, that include underdrain systems as defined above.

### V.A. Underdrain Design

The design of the underdrain system should be reflected in the Design Report. Construction Quality Assurance procedures and Technical Specifications for the components of the underdrain system shall also be provided in the permit. An Underdrain Monitoring Plan shall also be developed as a stand alone plan or addendum to the Design Report. Details on the information to be addressed in the Underdrain Monitoring Plan can be found in Section V.F.

### V.B. Underdrain Sampling & Analysis

#### 1. Monitoring Network

Type of Underdrain System	Upgradient Sampling Point	Downgradient Sampling Point
Piped Stream	Upstream Pre-inlet	Downstream End of Pipe (Outfall)
Drain Systems, Dewatering Systems and Seep/Spring Collection Systems	Upgradient GW Monitoring Well	Outfall of System
Witness Zones	Upgradient GW Monitoring Well	Witness Zone monitoring Point(s)

In the case of piped streams, end of pipe (outfall) sampling data should be compared to upstream (pre-inlet) sampling data.

In the case of drain systems, dewatering or gradient control systems, seep/spring collection systems, and witness zones, sampling data from the outfall or witness zone should be compared to data from the upgradient monitoring well in the groundwater compliance network.

## **2. Monitoring Frequency**

At a minimum, the sampling of underdrain systems shall be consistent with the frequency assigned to the groundwater monitoring wells, which is typically semi-annual, unless proximity to wetlands requirements are applicable to the site. Sampling requirements will be defined in the facility's solid waste permit based on site specific characteristics including, at a minimum, the type of system constructed, waste types managed, volume of discharge captured, and frequency of groundwater sampling. Sampling shall be performed throughout the life of the facility and during the post-closure care period until such time that the facility is no longer required to monitor the underdrain based on approval from the DEQ based on site-specific factors or in response to a full or partial termination of post-closure care request.

## **3. Monitoring Constituents**

In existing solid waste permits, underdrain sampling likely includes groundwater constituents found in 9 VAC 20-81-250 Table 3.1. Since Table 3.1 is only applicable to the GWPOC, underdrain samples at existing facilities and new (proposed) landfills should instead be analyzed for the following constituents:

### **CDD and Industrial Landfills**

These landfill underdrain systems should be sampled for leachate indicator parameters including chloride, alkalinity, total suspended solids (TSS), total Kjeldahl nitrogen (TKN), biochemical oxygen demand (BOD), and chemical oxygen demand (COD). The Owner/Operator may request additional indicator parameters such as total organic carbon (TOC), total dissolved solids (TDS), sodium, iron II, and sulfate if applicable based on the waste accepted on site. At sites which have historically accepted coal combustion by-products (CCB) or coal combustion residuals (CCR) as waste, cover material, or structural fill, the underdrain should also be sampled for boron. In all cases, the sampling lists at CDD and industrial landfills should include any metals specific to the wastes disposed in the landfill as these would act as tracers of potential leachate impact within the underdrain system.

CCR landfills, a specific type of industrial landfill, must sample underdrain monitoring points for the same list of metals and water quality parameters as required in their solid waste permit for groundwater monitoring. This landfill type is the only one where

underdrains and groundwater monitoring wells will be subject to a common list of sampling parameters.

### **Sanitary Landfills**

These landfill underdrain systems should be sampled for Table 3.1 Column A Volatile Organic Compounds (VOCs). Please note that VOCs, by definition, are volatile; therefore, if the sampling location is in open air, sampling for VOCs may lead to the collection of false negative analytical data. To the extent feasible, the collected water should be sampled internally before the end of pipe, if the system design permits. The Department may consider using a sampling list of non-volatile leachate indicator parameters (chloride, alkalinity, TSS, TKN, BOD, and COD) for those sanitary landfills that lack internal sampling options.

On a case-by-case basis, leachate indicator parameters should be added to the constituent list where deemed appropriate. Sampling for the Table 3.1 Column A constituent metals should be avoided in order to reduce the potential for false positive results and the need for Alternate Source Demonstrations.

#### **4. Analytical Requirements**

Underdrain sample analysis conducted to meet solid waste permit requirements must be completed by a certified or accredited laboratory in accordance with the Virginia Environmental Laboratory Accreditation Program (VELAP).

### ***V.C. Underdrain Sampling Standards***

The sampling results must be compared to applicable values:

- In the case of piped streams, at any type of landfill, end of pipe (outfall) results should be compared to upstream (pre-inlet) results. Upgradient and downgradient sampling should take place within the same day. Because the flow (volume) of surface water entering the system can be significant and variable, at a minimum, four independent upstream samples should be obtained during each end-of-pipe sampling event. Sampling of inflow and outflow volumes may also be required.
- In the case of drain systems, dewatering or gradient control systems, seep/spring collection systems, and witness zones:
  - For sanitary landfills, analytical results showing any VOC above its respective LOQ would be evidence that leachate has entered the system.
  - For CDD and industrial landfills (including CCR landfills), underdrain analytical results showing a statistically significant increase (SSI) for any of the indicator parameters, compared to results from the site's upgradient groundwater sampling point(s) would be evidence leachate has potentially entered the sampled water.

In any of the scenarios noted above, verification sampling, as defined under 9 VAC 20-81-250.A., may be used to refute a suspected exceedance. In the case of piped streams, the owner/operator may request secondary statistical analysis using historical trends in the sampled constituents to assess the potential effects of temporal (natural) variation.

## ***V.D. Underdrain Reporting Requirements***

### **1. Written Notifications**

If the sampling and analysis actions noted above lead to recognition of a SSI over site background or upstream monitoring point(s) or a detection at or above the respective LOQ, the permittee shall notify the appropriate DEQ regional office in the timeframe set forth in the permit. In those cases where the permit does not specify a reporting timeframe, the notification shall take place within 14-days of laboratory result receipt consistent with timeframes already defined under 9 VAC 20-81-530.C.2. The written notification must include either:

- a plan to obtain a single verification sample;
- a plan to submit an Alternate Source Demonstration; or
- a statement that the underdrain discharge containing landfill constituents will be handled in a manner consistent with the requirements of 9 VAC 20-81-210.D.

The notification shall also outline any interim steps the facility is taking to minimize risk to human health or the environment.

- a. If the permittee elects to undertake verification sampling to refute a suspect SSI or LOQ detection, the verification sampling event shall take place within 15 days of the date of the notification to DEQ. Verification sampling results shall be submitted to the DEQ regional office within 14 days of receipt of laboratory analyses.
- b. If the permittee elects to undertake an alternate source demonstration (ASD) to refute the recognized SSI or LOQ detection, the permittee must contact the DEQ regional office immediately to discuss the discharge options during the 90-day ASD period. Undertaking an ASD does not relieve the permittee from meeting the requirements (or equivalent performance standards) of items 1 and 2 noted herein.

Please note, if it is determined that leachate components are entering into the underdrain collection system or piped stream via recognition and reporting of an SSI or LOQ detection, the leachate impacted water must NOT be allowed to discharge from the end-of-pipe unless: (1) the discharge is allowed pursuant to an existing industrial VPDES permit or (2) the discharge is captured and piped into the facility's leachate collection system.

The Department understands that in some cases, time may be needed to address a leachate impacted discharge. An interim measures type of mitigation may be required by your Regional Office to cover the interval between the recognition of the release from the sampled outfall, and the final mechanism being put in place to address the release.

In those cases where the sampling results yield no SSI or LOQ detection, Department notification is NOT required and the data shall be included in the annual report described below.

## **2. Annual Reports**

By December 31<sup>st</sup> of each year, facilities with underdrain systems shall complete and submit an Annual Landfill Underdrain Monitoring Summary (ALUMS) Report to the appropriate regional office. The ALUMS Report, form provided as Attachment 1, shall summarize the underdrain sampling activities completed during the calendar year and include lab analyses sheets, data interpretation, and other specified attachments.

Instructions for each line item of the form are also provided in Attachment 1 to assist facilities in their completion of the report.

## **3. DEQ Report Review Procedures**

Written notifications, annual reports with required attachments, and DEQ correspondence regarding the underdrain shall be stored in ECM under the Permitting file series (200088) using the Underdrain Monitoring Data and Correspondence Document Type.

DEQ compliance staff will be responsible for the initial review of written notifications and annual reports for their assigned facilities. Receipt and timeliness of written notifications and annual reports will be documented on the next compliance inspection report or documented on a Records Review inspection report using the checklist item for 20-81-100.B. for compliance with the facility's permit. Failure of a facility to submit written notifications or their annual report on time or failure to perform the required monitoring will be grounds for appropriate action based on the Solid Waste Inspection Manual.

In response to written notifications identifying a SSI over site background or upstream monitoring point(s) or a detection at or above the respective LOQ, DEQ staff will reply with specific correspondence to address the acceptance of verification sampling, approve/disapprove a proposed alternate source demonstration, or address changes to the underdrain discharge system.

### ***V.E. Specific Permit Conditions***

With the understanding that the sampling of the water collected below the waste footprint serves as a performance tool to assess the adequacy of the landfill liner and leachate collection system design and operation, or as an indicator for the potential need for a VPDES permit or permit modification associated with the discharge, the department is revising the organization of these facility permits. Going forward, the requirements of the underdrain monitoring program will no longer be placed in the groundwater monitoring Permit Modules X or XI as these modules describe actions required under 9 VAC 20-81-250.

Instead, these activities will be defined in:

- Module I – General Conditions (for existing, ‘old format’ permits) or

- Module III, IV, or V – Landfill Design (for new or existing ‘streamlined’ permits)

Example boilerplate permit conditions specific to underdrain monitoring are provided in Attachment 2 and should be incorporated in the final approved permit modification for the landfill. Based upon facility specific factors, additional conditions may be added as well. For landfills in post-closure care, underdrain conditions specified in Attachment 2 for Module III, IV, or V, shall be placed in Module XIII – Post-Closure Care. The revisions to these existing Modules may take place upon request of the Permittee in accordance with [9 VAC 20-81-600.F.](#), upon initiation by the DEQ Regional Office in accordance with [9 VAC 20-81-600.E.](#), or be postponed until the next time the Permit in question is open for modification for other reasons. It is possible that the facility may reduce the analytical sampling costs associated with underdrain monitoring once the permit is modified to reflect the new sampling requirements.

### ***V.F. Underdrain Monitoring Plan***

As mentioned in Section V.A., facilities with underdrain systems need to have an Underdrain Monitoring Plan. This plan can be an addendum to the Design Report or a stand-alone plan which will be incorporated into the solid waste permit. The Underdrain Monitoring Plan should include the following information as addressed in Sections V.B. through V.D. of this guidance.

- Underdrain Design
  - General description of the underdrain system and media collected (e.g., perched water, groundwater, surface water, mix of groundwater and surface water, other)
  - Discharge information (Where does the collected media discharge to? Is the outfall covered by a VPDES permit?, etc.)
- Sampling and Analysis
  - Monitoring Network (List of upgradient and downgradient sampling points)
  - Monitoring Frequency
  - Monitoring Constituents
- Reporting Procedures (Required reporting timeframes for notifications and reports)
- Corrective Actions: Tentative plan to address exceedances
- Operations and Maintenance
  - Description of underdrain operations and periodic maintenance, if applicable to design
  - Types of potential problems that may be observed and any maintenance activities required as a result
- Inspection Plan:
  - Schedule/frequency for inspecting the underdrain system and monitoring points. Underdrain systems should be visually inspected at a rate consistent with the system’s monitoring frequency.
  - Inspection Log. Results of the inspection should be documented and maintained for review by DEQ staff upon request. Underdrain Inspection Log can be included as part of existing Facility Self-Inspection Log.

These requirements should no longer be contained in the facility’s groundwater monitoring plan (GWMP).

## **VI. Collaboration Process**

No formal project team was formed to develop this guidance. DEQ Central Office and Regional staff were given opportunity to comment during guidance development.

## **VII. Attachments**

1. Annual Landfill Underdrain Monitoring Summary (ALUMS) Report Form and Instructions
2. Boilerplate Permit Conditions Specific to Underdrain Monitoring

## Annual Landfill Underdrain Monitoring Summary (ALUMS) Report

		1] DEQ Region: Choose an item.	
		2] DEQ Regional Contact:	
		3] Submittal Date: <a href="#">Click here to enter a date.</a>	
4] Permit Number:		5] Landfill Name:	
6] GW Program Status: Choose an item.		7] Landfill Operational Status: Choose an item.	
8] Underdrain Details: 8-a] Type of Underdrain: Choose an item. 8-b] Sampled Media: Choose an item. 8-c] Description of Discharge:			
9] Monitoring Frequency: Choose an item.		10] Is Sampled Discharge Covered by VPDES: <input type="checkbox"/> Yes <input type="checkbox"/> No	
11] # of Monitoring Points Sampled:		12] # of Upgradient Monitoring Points Sampled:	
Sampling Specifics			
13] Date Samples were collected?	E1: <a href="#">Click here to enter a date.</a>	E2: <a href="#">Click here to enter a date.</a>	E3: <a href="#">Click here to enter a date.</a>
14] Were any monitoring points unable to be sampled?			<input type="checkbox"/> Yes <input type="checkbox"/> No
For monitoring points not sampled during the sampling event; provide the reason below and note whether this was a first time occurrence, or whether it has been observed on site before at that particular location.			
14-a] Damage (Initial occurrence? <input type="checkbox"/> )			<input type="checkbox"/> Yes <input type="checkbox"/> No
14-b] Failure to yield sufficient sampling volume (Initial occurrence? <input type="checkbox"/> )			<input type="checkbox"/> Yes <input type="checkbox"/> No
14-c] Totally Dry, could not be sampled (Initial occurrence? <input type="checkbox"/> )			<input type="checkbox"/> Yes <input type="checkbox"/> No
14-d] Other, please explain:			
15] Were sampling parameters measured in field? If yes, include data in Attachment VI			<input type="checkbox"/> Yes <input type="checkbox"/> No
Analytical Lab Information			
16] Dates samples were sent to analytical lab:	E1: <a href="#">Click here to enter a date.</a>	E2: <a href="#">Click here to enter a date.</a>	E3: <a href="#">Click here to enter a date.</a>
17] Were samples submitted under Chain of Custody?			<input type="checkbox"/> Yes <input type="checkbox"/> No
18] Dates samples were received at analytical lab:	E1: <a href="#">Click here to enter a date.</a>	E2: <a href="#">Click here to enter a date.</a>	E3: <a href="#">Click here to enter a date.</a>
19] Were samples submitted to a VELAP accredited facility?			<input type="checkbox"/> Yes <input type="checkbox"/> No
20] Were samples analyzed using SW-846 (as updated) methods?			<input type="checkbox"/> Yes <input type="checkbox"/> No
21] Date signed/certified analytical report issued by lab:	E1: <a href="#">Click here to enter a date.</a>	E2: <a href="#">Click here to enter a date.</a>	E3: <a href="#">Click here to enter a date.</a>
22] Date signed/certified analytical reports received by consultant/facility:	E1: <a href="#">Click here to enter a date.</a>	E2: <a href="#">Click here to enter a date.</a>	E3: <a href="#">Click here to enter a date.</a>

<b>Interpretation and Response to Analytical Results</b>				
23] For groundwater sampled, do any constituents exceed background levels determined at the upgradient monitoring well(s) on site?				<input type="checkbox"/> Yes <input type="checkbox"/> No
24] For surface water sampled, do any constituents exceed background?				<input type="checkbox"/> Yes <input type="checkbox"/> No
25] For sampling lists that contain VOC, were any VOCs identified above their LOQ?				<input type="checkbox"/> Yes <input type="checkbox"/> No
(if yes) 25-a] Were any of the detections for new VOC constituents or sample points?				<input type="checkbox"/> Yes <input type="checkbox"/> No
26] Was verification sampling undertaken?				<input type="checkbox"/> Yes <input type="checkbox"/> No
(if yes) 26-a] Dates of the verification event?	E1: Click here to enter a date.	E2: Click here to enter a date.	E3: Click here to enter a date.	E4: Click here to enter a date.
(if yes) 26-b] Dates verification results were released by the analytical lab?	E1: Click here to enter a date.	E2: Click here to enter a date.	E3: Click here to enter a date.	E4: Click here to enter a date.
(if yes) 27] Did verification events confirm VOC detection?				<input type="checkbox"/> Yes <input type="checkbox"/> No
28] Dates DEQ was notified (if applicable) of the exceedance(s) on lines 23, 24 or 25?	E1: Click here to enter a date.	E2: Click here to enter a date.	E3: Click here to enter a date.	E4: Click here to enter a date.
29] Will the facility pursue an ASD for any of the exceedances?				<input type="checkbox"/> Yes <input type="checkbox"/> No
30] Do the sampling results, as presented in this certified submission, indicate landfill leachate has entered into the collection system being sampled?				<input type="checkbox"/> Yes <input type="checkbox"/> No
(if yes) 30-a] Has the discharge of collected media changed due to sampling results?				<input type="checkbox"/> Yes <input type="checkbox"/> No
(if yes) 30-b] What facility actions are planned to address the exceedances?				
<b>Attachments. The following attachments must be submitted in the order prescribed</b>				
Attachment I: Site Identified on a USGS 7 1/2-minute Topographic Map				
Attachment II: Site Plan, 11" x 17"				
Attachment III: Table of constituents exceeding background levels				
Attachment IV: Complete Laboratory Analytical Reports (including Verification events)				
Attachment V: Chain of Custody documentation (including Verification events)				
Attachment VI: Field book documentation (including Verification events)				
Attachment VII: Statistical Data Sheets				
<b>Responsible Official Signature:</b>				
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision by qualified personnel who properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the submitted information, to the best of my knowledge and belief, the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.				
Name:		Title:		
Signature:			Date:	

## **Instructions for Completing the ALUMS Report**

The Annual Landfill Underdrain Monitoring Summary (ALUMS) Report form was developed to provide a consistent annual report format that should enable an expeditious review of the submitted technical content by DEQ staff. To provide an annual report summarizing all sampling events during the calendar year, up to four date boxes are provided for questions 13, 16, 18, 21, 22, 26, and 28 to allow for reporting dates for up to four sampling events during the year, consistent with quarterly monitoring. If the underdrain system was only sampled once or twice during the calendar year, enter the appropriate dates in the E1 and E2 boxes and leave the remaining boxes (E3 and E4) blank.

The report should be filled out by the Owner/Operator, or their representative, and certified by a Responsible Official. Completed ALUMS Reports shall be addressed to the facility's Regional Office contact and received before December 31<sup>st</sup> of each calendar year. The descriptions below are listed in the order as they appear on the ALUMS Report.

### **General Facility Information**

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Line 1 DEQ Regional Office to which you submit monitoring reports. Select from drop-down: BRRO/L (Blue Ridge – Lynchburg), BRRO/R (Blue Ridge - Roanoke), NRO (Northern), PRO (Piedmont), SWRO (Southwest), TRO (Tidewater), and VRO (Valley).

Line 2 List the name of your DEQ Regional Office contact.

Line 3 Select date of the submittal.

Line 4 Permit number, SWP###.

Line 5 Identify the landfill name.

Line 6 Select the groundwater sampling program status, (i.e., Detection, Assessment, Modified Assessment, First Determination, or Phase II). This is a general indicator of whether there has been a landfill impact on the aquifer identified to date.

Line 7 Select the landfill operational status: active, closing, or post-closure.

Line 8a Identify the system being sampled (e.g., drain system, dewatering or gradient control system, witness zone, piped stream, seep/spring collection system, or other).

Line 8b Identify the type of media being sampled (i.e., perched water, groundwater, stormwater, surface water, mix of groundwater and surface water, or witness zone).

Line 8c Describe the underdrain discharge, indicating how and where (e.g., storm water basin, stormwater ditch, receiving stream, etc) the collected discharge is managed.

Line 9 Identify the underdrain sampling frequency.

Line 10 Yes or No.

Line 11 List total number of system monitoring points sampled.

Line 12 For piped stream collection systems, list total number of any upgradient monitoring points sampled. For groundwater collection systems, if applicable, list the number of upgradient monitoring wells sampled. Use 'NA' if not applicable.

### **Sampling Specifics**

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Line 13 List the date(s) the system was sampled. Boxes are provided for up to four sampling events for the calendar year. If the underdrain was only sampled semi-annually or annually, enter sampling dates within the calendar quarter the sample was taken.

Line 14 Yes or no. If the answer is yes, please fill out lines 'a' through 'c' with a yes or no as appropriate and check the initial occurrence box if applicable.

Line 15 Were any parameters measured directly in the field? Yes or No.

### **Analytical Lab Information**

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Line 16 Provide the dates the samples were sent to the analytical lab.

Line 17 Yes or no.

Line 18 Provide the dates the samples were received at the lab.

Line 19 Yes or no.

Line 20 Yes or no. Please note, SW-846 methods are only required for constituents that are listed on Table 3.1 of 9 VAC 20-81-250.E.

Line 21 Provide the dates the analytical reports were issued by the lab under the signature of the lab manager/director.

Line 22 Provide the dates the analytical report was received by the consultant/facility.

### **Interpretation and Response to Analytical Results**

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Line 23 Yes or no. Please note that for some system designs, it may be more appropriate for a facility to compare the point of sampling data against its own background level (similar in concept to intrawell analysis) if data from the upgradient groundwater monitoring well(s) is not considered truly representative of the media being collected in the underdrain system.

Line 24 Yes or no. Please note that for surface water, an entity which can be highly variable, background level, shall consist of upgradient samples (at least four independent samples) obtained the same day as the downgradient samples are obtained. Background level shall not consist of historical upstream sampling data.

Line 25 Yes or no.

Line 26 Yes or no.

Line 27 Yes or no.

Line 28 Provide dates of notification (if applicable).

Line 29 Yes or no.

Line 30 Yes or no. If yes complete Line 30a and Line 30b

Line 30a Indicate (yes or no) whether the discharge method as identified in 8c has changed due to sampling results indicating landfill leachate has entered the underdrain collection system.

Line 30b Identify planned facility actions to address the exceedance(s).

### **Attachments**

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Att-I Provide a USGS topographic map showing site location.  
It is not appropriate to identify the site solely on a 3rd party electronic mapping database unless the software uses seamless digitized versions of USGS 7.5 minute topographic quadrangle maps.

- Att-II Provide a site plan showing sampling location(s), scaled to fit a page no larger than 11" x 17".
- Att-III Provide a simple table which lists each sampling point by 'ID' and its corresponding list of groundwater constituents found to exceed facility background (or VOC above LOQ).
- Any constituents found to exceed for the initial time should be presented in **bold italics**.
- Att-IV Attach a copy of the laboratory report, including the cover and signature pages, as well information concerning VELAP lab accreditation/certification.
- Att-V Attach a copy of the Chain of Custody documentation related to the sampling event.
- Att-VI Attach a copy of the field book documentation concerning sampling actions.
- Att-VII Attach statistical analysis (if applicable).

### **Responsible Official Signature**

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The form must be signed by a responsible official. A responsible official is defined in the Virginia Solid Waste Management Regulations (9 VAC 20-81-10 *et seq.*) as:

- “1. For a business entity, such as a corporation, association, limited liability company, or cooperative: a duly authorized representative of such business entity if the representative is responsible for the overall operation of one or more operating facilities applying for or subject to a permit. The authority to sign documents must be assigned or delegated to such representative in accordance with procedures of the business entity;
2. For a partnership or sole proprietorship: a general partner or the proprietor, respectively; or
3. For a municipality, state, federal, or other public agency: a duly authorized representative of the locality if the representative is responsible for the overall operation of one or more operating facilities applying for or subject to a permit. The authority to sign documents must be assigned or delegated to such representative in accordance with procedures of the locality.”

## Attachment 2. Underdrain System Applicable Permit Conditions

### PERMIT DOCUMENTS

The documents listed below are hereby incorporated into this permit and the permittee is subject to all conditions contained therein. It is the responsibility of the permittee to properly maintain and update these documents. Any version with a revision date other than as listed below is not considered to be the official approved version and is subject to Department review and approval prior to being recognized as the “permitted” version.

*{List application documents submitted in support of the underdrain design. The design of the underdrain system should be reflected in the Design Report and Design Plans, and system components shall be addressed in the Construction Quality Assurance Plan and Technical Specifications. The Underdrain Monitoring Plan shall also be listed.}*

*Plan Title*, prepared by *Consultant*, dated/last revised *DATE*.

### PERMIT MODULE I GENERAL PERMIT CONDITIONS

#### I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain a complete copy of the Solid Waste Permit and incorporated Permit Documents at the facility, or another location approved by the director, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents. In addition, the facility shall maintain the following additional documents:

I.C.1. Operations Manual with annual certification by Responsible Official

I.C.2. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures

I.C.3. All other documents/records required and applicable from the following:

I.C.3.a. Monitoring records from leachate, gas, groundwater, and underdrain monitoring.

#### I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. The final permit is based on permit application submittals (drawings and reports) that may contain the word “proposed” and similarly tentative language. The documents that are incorporated into Permit No. **XXX** have been evaluated for administrative and technical adequacy and have been approved as proposed.

## Attachment 2. Underdrain System Applicable Permit Conditions

Therefore, any references to a design, construction, operation, monitoring or closure criteria are considered to be approved as proposed.

- I.F.2. The facility is subject to the conditions listed in the Part A approval letter dated **DATE**.
- I.F.3. *List other site-specific conditions. These should be conditions that don't fit in other Modules (II, III/IV/V, X, XI, XII, XIII, or XIV), and should focus more on requested additional submittals.*

*{Add conditions II.J. and III/IV/V.E. provided below to this section of the permit for old format/non-streamlined permits}*

### PERMIT MODULE II CONDITIONS OF OPERATION

*{Add for Underdrain}*

#### II.J. UNDERDRAIN MONITORING AND MAINTENANCE

The facility's underdrain system shall be monitored and maintained in accordance with Module **III/IV/V**, and the facility's Underdrain Monitoring Plan incorporated into the this permit. The underdrain system shall be inspected at a rate consistent with the system's monitoring frequency. Repairs should be made to any damage that prevents the underdrain system from functioning as designed.

### PERMIT MODULE III/IV/V SANITARY/CDD/INDUSTRIAL LANDFILL DESIGN

*{Add for Underdrain. For landfills in post-closure care with operational underdrain systems, the applicable permit conditions from this section should be included in Module XIII for Post-Closure Care.}*

#### III/IV/V.E UNDERDRAIN SYSTEM

##### E.1. Underdrain System Description

This landfill is constructed with an underdrain system which carries flow from *[stormwater, a groundwater seep or spring, stream, or witness zone]* and discharges to *[discuss where flow discharges too if surface water, leachate collection system, or sediment pond, etc.]* The underdrain system consists of *[describe underdrain system construction, size of piping, bedding material and describe layers soil/stone/geosynthetic between underdrain and liner system]*

- E.2. The landfill, including any discharge of water collected in an underdrain system, may not cause a discharge of pollutants into waters of the United States,

## Attachment 2. Underdrain System Applicable Permit Conditions

including wetlands, that violates any requirements of the Clean Water Act (33 USC § 1251 et seq.), including, but not limited to, VPDES requirements and Virginia Water Quality Standards (9VAC25-260).

### E.3 Underdrain Performance Sampling

To ensure the underdrain system is operating as designed, and to detect whether or not landfill constituents have gained entry into the system, the collected water shall be sampled as follows:

Underdrain System (if multiple)	Upgradient Sampling Location*	Downgradient Sampling Location*	Sampling Frequency

\*Samples shall be collected prior to pipe discharge and not in the receiving channel.

Upgradient and downgradient sampling should take place within the same day. Because the flow (volume) of surface water entering the system can be significant and variable, at a minimum, four independent upstream samples should be obtained during each end-of-pipe sampling event. The time separating each upstream sample collection (e.g., 15 mins) should be appropriate for the surface water flow rate on the day of the sampling to ensure sample independence.

Sampling of inflow and outflow volumes shall also take place at the time of sampling to look for unaccounted additional flow which might be recognized at the end-of-pipe.

III.E.3.a The samples shall be collected, handled, and transported in a manner consistent with applicable USEPA RCRA guidance including use of a Chain-of-Custody. The collected water shall be analyzed for the constituent list provided below using SW-846 methods, unless an alternate method was been approved by the Director.

E.3.b Both the method used and the laboratory completing the work must be VELAP certified/accredited (1 VAC 30-45 & 36). Laboratory LOQ's must be equivalent to those achieved during the groundwater monitoring well compliance sampling undertaken for 9 VAC 20-81-250.B or C and Permit Modules X and XI.

E.3.c *{Underdrain at Sanitary Landfill}* The collected water shall be analyzed for volatile organic compounds (VOCs) listed in Table 3.1 Column A under 9 VAC 20-81-250.B. *which can be analyzed under method 8260 and/or leachate indicator parameters {specify}*.

## Attachment 2. Underdrain System Applicable Permit Conditions

*{Underdrain at CDD or Industrial Landfill}* The collected water shall be analyzed for leachate indicator parameters including Chloride, Alkalinity, TSS, TKN, BOD, COD, Boron, and waste-specific metals {specify}. Additional indicator parameters such as TOC, TDS, sodium, iron II and sulfate may be utilized as needed based on the type of waste accepted on site.

Background for these parameters may be determined from sampling the facility upgradient monitoring well(s) eight times during a 12-month background establishing period, on a frequency that best ensures the events represent independent samples of groundwater. Background for these parameters shall be periodically updated such that the background values are based on the most recent 16 sampling event results.

*{Underdrain at CCR Landfill}* The collected water shall be analyzed for the list of metals and water quality parameters specified in the sampling list (condition F) of Permit Module XI. *[In the case of piped streams, end of pipe (outfall) results should be compared to upstream (pre-inlet) results.]*

- E.3.d The results of underdrain sampling and analysis completed during the calendar year shall be reported to the DEQ Regional Office by December 31<sup>st</sup> of each year on the Annual Landfill Underdrain Monitoring Summary (ALUMS) Report form. Underdrain sampling and analysis results must also be maintained on site in the facility Operating Record during the active life and post-closure care period.

### E.4 Underdrain Sample Evaluation

- E.4.a If the analytical results from the underdrain sampling event show *{pick appropriate: any VOC equal to or above its respective LOQ // a statistically significant increase (SSI) for any of the indicator parameters or waste-specific metals compared to results from the site's upgradient groundwater sampling point(s) // boron equal to or above its LOQ}*, the owner/operator must notify the Director in writing within 14 days of receipt of laboratory analyses.
- E.4.b The written notification must include either:
- a plan to obtain a single verification sample within 15-days of the notification;
  - a plan to submit an Alternate Source Demonstration within 30-days of the notification if the identified constituent(s) is (are) proven to be either laboratory or cross contaminants sourced from something other than the solid waste; or

## Attachment 2. Underdrain System Applicable Permit Conditions

- a statement that the underdrain discharge containing landfill constituents will be handled in a manner consistent with the requirements of 9 VAC 20-81-210.D within a minimum of 60 days. The notification shall also outline any interim steps the facility is taking to minimize risk to human health or the environment.
- E.4.c. If the Permittee undertakes verification sampling to refute a suspect SSI, verification sampling results shall be submitted to the Director within 14 days of receipt of laboratory analyses.
- E.5 The Director may require the owner/operator undertake an assessment of **potential** options to remediate the condition(s) causing the release of solid waste constituents into the underdrain system.
- E.6 If the proposed remediation or **actions related to the** collection/disposal of the discharge from the underdrain require modification of the Permit or associated Permit Document, the proposed modification(s) shall be submitted to the Department within 30 days of the notification.