



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Travis A. Voyles
Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director

SOLID WASTE FACILITY PERMIT PERMIT NUMBER 182

Facility Name: Caroline County Landfill

Facility Type: Sanitary Landfill

Latitude: N 38° 03' 05"

Site Location: Caroline County

Longitude: W 77° 19' 36"

Location Description: The facility is located on a 40-acre parcel adjoining Fort Walker and is approximately one-half mile west of the intersection of Lakewood Drive and U.S. Route 301, north of the Town of Bowling Green, Virginia. Access to the site is provided by Lakewood Drive.

Background: The facility encompasses 40 acres, of which 27.97 acres were permitted for waste disposal. The facility, operated by Caroline County Department of Public Works, handled an average of 10 to 13 tons per day of solid waste prior to closure. The facility served as a sanitary landfill for Caroline County since being permitted by the Virginia Department of Health on March 10, 1975. The total landfill capacity was estimated to be approximately 931,000 tons. The facility closed and began post-closure care in 2002.

Permit Modification: This major modification incorporates the Corrective Action Plan (CAP) and Corrective Action Monitoring Plan (CAMP) into the permit. All previous permit modifications are outlined in detail in Module I, Section I.G.

THIS IS TO CERTIFY THAT:

Caroline County
Department of Public Works
P.O. Box 424
Bowling Green, Virginia 22427

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, X, XI, XII, XIII and XIV and Permit Documents incorporated by reference. These Permit Modules and Permit Documents are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board. In accordance with Chapter 14, § 10.1 - 1408.1(D) of the Code of Virginia, prior to issuing this permit or major modification, any comments by the local government and general public have been investigated and evaluated and it has been determined that the facility poses no substantial present or potential danger to human health or the environment. The permit contains such conditions and requirements as are deemed necessary to comply with the requirements of the Virginia Code, the regulations of the Board, and to prevent substantial or present danger to human health or the environment.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended. Variances that have been approved for this facility are included in Permit Attachment I-1.

Issued: March 10, 1975
Modification 1: January 8, 1999
Modification 2: March 25, 1999
Modification 3: January 3, 2005
Modification 4: February 1, 2008

APPROVED: _____

Richard C. Doucette
Regional Director

DATE: _____

Modification 5

PERMIT MODULES REFERENCE LIST

PERMIT MODULE I – GENERAL PERMIT CONDITIONS

PERMIT ATTACHMENT I-1, PREVIOUS PERMIT APPROVAL LETTERS

PERMIT MODULE II – CONDITIONS OF OPERATION

PERMIT MODULE X – DETECTION MONITORING

PERMIT MODULE XI – ASSESSMENT MONITORING

PERMIT MODULE XIII – POST CLOSURE CARE

PERMIT MODULE XIV – CORRECTIVE ACTION

DRAFT

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.

1. Part B Application:
 - a. *Closure Plan and Post-Closure Care Plans*, prepared by Draper Aden Associates, Inc, dated March 15, 2001 (Attachment IV).
 - b. *Landfill Gas Control System Operations Plan*, prepared by Draper Aden Associates, last revised June 11, 1998 (Attachment IX).
 - c. *Groundwater Monitoring Plan*, prepared by Draper Aden Associates, last revised October 1998 (Attachment X).
 - d. *Groundwater Corrective Action Plan and Corrective Action Monitoring Plan*, prepared by TRC Engineers, Inc., dated March 13, 2024 (Attachment XI).

PERMIT MODULE I GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations (VSWMR, 9VAC20-81), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and 9VAC20-81. The effect of this permit is detailed in 9VAC20-81-490, and it shall be the duty of the permittee to ensure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in 9VAC20-81-530. In addition to these requirements, the following additional conditions are invoked per 9VAC20-81-430, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [9VAC20-81-490.D and 9VAC20-81-490.H]. Any other permit noncompliance constitutes a violation of Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [9VAC20-81-570 and 9VAC20-81-600].

I.B.2 The permittee shall comply with the requirements of this permit and any provisions of the Resource Conservation and Recovery Act (RCRA) Subtitle D (Title 40, Code of Federal Regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

- I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent substantial adverse impacts on human health or the environment.
- I.B.5. The permittee shall at all times properly maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper maintenance includes effective performance, adequate funding, adequate staffing, and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.
- I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information that the Director may request to determine compliance with this permit, regulations or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.
- I.B.7. The permittee shall allow the Director, or an authorized representative, at a reasonable time, upon the presentation of appropriate credentials, to:
- I.B.7.a. Enter the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;
 - I.B.7.b. Have access to and copy any records that must be kept under the conditions of this permit;
 - I.B.7.c. Inspect any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,
 - I.B.7.d. Sample or monitor, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.
- I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Environmental Protection Agency (EPA) Publication SW-846, if available.

Laboratory samples shall be analyzed in accordance with 1VAC30-45, Certification for Noncommercial Environmental Laboratories, or 1VAC30-46,

Accreditation for Commercial Environmental Laboratories.

- I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to 9VAC20-81-490.G. Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts III and V, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations, 9VAC20-70, and this permit.
- I.B.10. Specifications for all drainage media should specify that the material shall contain no greater than 15% calcium carbonate equivalent. Department literature regarding research on leachate collection media indicates that weight loss greater than 15% results in an unacceptable loss of performance. If a greater percentage is specified or allowed a demonstration that performance is not adversely affected must be provided to the Department for review and approval.
- I.B.11. The closure cost estimate must reflect the maximum cost of closure at all times. The owner has the responsibility to maintain the closure and post closure cost estimate and associated financial assurance funding as conditions change.
- I.B.12. Land-clearing, excavation, and construction activities that involve the disturbance of wetlands or streams shall not commence without authorization from the Virginia Water Protection (VWP) Program and/or Army Corps of Engineers.
- I.B.13. The facility shall maintain and follow an approved Erosion & Sediment Control Plan for all land-disturbing activities in accordance with the Erosion and Stormwater Management Regulations, 9VAC25-875.

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. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures.
- I.C.2. All other documents/records required and applicable from the following:
- I.C.2.a. Monitoring records from leachate, gas, and groundwater monitoring.
- I.C.2.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.

I.C.2.c. Personnel training records.

I.C.2.d. Construction quality assurance reports, record drawings and engineer's certifications for all new liner and/or final cover construction.

I.C.3. An approved copy of the complete Part A permit application.

I.C.4. Documentation of the authorization to discharge leachate into the publicly/private owned treatment works, leachate volumes sent to the POTW, and periodic leachate sampling analytical results.

I.C.5. Research, Development, and Demonstration Plan documentation and testing data, if applicable.

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or 9VAC20-81, the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. The as-built plans of all groundwater and gas monitoring wells shall be submitted as these wells are installed or modified. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent to:

Virginia Department of Environmental Quality
Division of Land Protection & Revitalization
Northern Regional Office
13901 Crown Court
Woodbridge, Virginia 22193

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. 182 have been evaluated for administrative and technical adequacy and have been approved as proposed. Therefore, any references to a design, construction, operation, monitoring, or closure criteria are considered to be approved as proposed.

I.F.2. Within 180 days of the approval of this permit modification, the facility shall submit a revised Groundwater Monitoring Plan.

I.G. PERMIT MODIFICATIONS

I.G.1. The permit was modified by a minor modification on January 8, 1999, incorporating changes to the Gas Management Plan to address the presence of methane gas above the lower explosive limit (LEL) in three onsite probes and the control of landfill odors.

I.G.2. The permit was modified on March 25, 1999, to incorporate alternate concentration limits (ACLs) for groundwater protection standards (GPS).

I.G.3. A permit modification was issued on January 3, 2005, to modify the groundwater monitoring network.

I.G.4. The permit was modified by a minor modification on February 1, 2008, to incorporate the Air Quality Monitoring Plan, which requested a reduction in sampling frequency and described the methods for obtaining and analyzing air samples.

PERMIT MODULE X

DETECTION GROUNDWATER MONITORING REQUIREMENTS

The purpose of Detection monitoring is to ensure the earliest possible recognition of a landfill impact to the uppermost aquifer at levels which exceed background.

X.A. GROUNDWATER COMPLIANCE POINT

X.A.1. Uppermost Aquifer

The groundwater monitoring compliance point is the uppermost aquifer [9VAC20-81-250.A.2.a] which encompasses the entire thickness between the first encounter with groundwater (not to include any perched water) and the first encounter with a confining unit forming the lower boundary of the uppermost aquifer [9VAC20-81-250.A.3.f.(1).(b/c)].

X.A.2. Monitoring Well Locations

All wells in the monitoring network, including those at the disposal unit boundary, or at an alternate compliance point [9VAC20-81-250.A.3.a.(3)], shall be installed within the permitted facility boundary and be screened within the uppermost aquifer unless a variance [9VAC20-81-250.A.3.a.(2)] meeting the requirements of 9VAC20-81-740.B has been granted.

X.A.3. Location Restrictions

No monitoring well serving the function defined under 9VAC20-81-250.A.3.a.(2) can be:

- X.A.3.a. located at a distance more than 500 feet away from the disposal unit boundary or
- X.A.3.b. outside of the facility boundary [9VAC20-81-740.A].

X.B. MONITORING NETWORK REQUIREMENTS

X.B.1. The following Performance Standards shall be met:

X.B.1.a. Network requirements of 9VAC20-81-250.A.2.a and A.3.a/b/f.

X.B.1.b. Wells requiring replacement due to non-performance shall be reported to the Department within 30 days of recognizing the non-performance. The notification shall include a site plan depicting the proposed location for the replacement well(s) for Department review [9VAC20-81-530.C.1].

X.B.1.c. Wells that require replacement must be replaced prior to the next regularly scheduled groundwater sampling event unless the Director has granted an extension to meeting the monitoring system compliance requirements under 9VAC20-81-250.A.3.a.

X.B.1.d. Any wells that require abandonment shall be sealed and abandoned in accordance with existing Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) guidance as well as any applicable state or local requirements.

X.B.2. Installation, Operations and Maintenance

All wells shall be installed, operated and maintained during the life of the monitoring program in accordance with requirements of 9VAC20-81-250.A.3.c-e.

X.B.3. Well Designations

The following wells shall be included in the groundwater monitoring network:

Upgradient Wells	Downgradient Wells	Piezometers
MW-01S	MW-02R	MW-07
	MW-03S	MW-10D
	MW-04	MW-11D
	MW-05	CC-01*
	MW-06	CC-02*
	MW-12	CC-05*
	MW-13	CC-06*
	MW-14	CC-07 (upgradient)*
	MW-15	CC-08*
		CC-10*

*The ability to sample wells on Fort Walker property is contingent upon written authorization from the Fort.

X.C. AQUIFER INFORMATION

X.C.1. Aquifer Data Acquisition - Requirements

X.C.1.a. Static groundwater elevations [9VAC20-81-250.A.4.c] shall be:

X.C.1.a.(1). measured in all monitoring wells.

X.C.1.a.(2). measured to an accuracy of 0.01 foot.

X.C.1.a.(3). measured each time groundwater is sampled on site.

X.C.1.a.(4) obtained from all wells in the network within a single 24 hour period to avoid temporal variations/fluctuations in the groundwater table.

X.C.1.b Groundwater flow rate and direction [9VAC20-81-250.A.4.c] shall be:

X.C.1.b.(1). determined each time groundwater is sampled on site,

X.C.1.b.(2). calculated using technical methods accepted for use in EPA RCRA groundwater programs.

X.C.2. Aquifer Data Acquisition - Response

X.C.2.a. The Permittee shall evaluate the function of each monitoring network well each time groundwater is sampled. If the evaluation shows that one or more of the well(s) no longer functions in a manner that meets the requirements of 9VAC20-81-250.A.3.e, the Permittee shall:

X.C.2.a.(1). Within 30 days of recognizing the non-performance, notify the Department of the need to modify the number, location, or depth of the monitoring wells, and provide for Department review, proposed locations for new (replacement) monitoring wells keyed to a site plan.

X.C.2.a.(2). Complete additions or modifications to the network, prior to the next regularly scheduled groundwater sampling event, unless an extension has been granted by the Director for meeting the monitoring system compliance requirements under 9VAC20-81-250.A.3.a.

X.D. SAMPLING ACTIONS

The Permittee shall:

X.D.1. Meet the field sampling and laboratory procedures of 9VAC20-81-250.A.4.a.

X.D.2. Use the analytical methods of EPA SW-846 as amended [9VAC20-81-250.A.4.b].

X.D.3. Not filter groundwater samples prior to analysis [9VAC20-81-250.A.4.b].

X.D.4. Sample all Detection constituents referenced under Table 3.1 Column A [9VAC20-81-250.B.2.a].

X.E. SAMPLING FREQUENCY

X.E.1. The Permittee shall, during the active life and post-closure care periods, sample groundwater and analyze for the required Table 3.1 constituents in all monitoring wells on at least a semi-annual basis [9VAC20-81-250.B.2.a.(2)] unless the quarterly wetlands provisions apply to an active sanitary landfill [9VAC20-81-250.B.1.e.].

X.E.2. The length of the semi-annual sampling period shall not conflict with the requirements of 9VAC20-81-10.

X.F. DETERMINATION OF BACKGROUND

X.F.1. The Permittee shall establish site background values [9VAC20-81-250.A.4.d –f] for all Detection monitoring constituents within the timeframes of 9VAC20-81-250.B.2.a.(1).

X.G. STATISTICAL PROCEDURES

When evaluating the groundwater sampling event results, the Permittee shall:

X.G.1 within 30 days of completion of the laboratory analysis for each sampling event [9VAC20-81-250.A.4.h.(2)], determine whether or not there is a statistically significant increase over site background for each monitoring constituent using a method meeting the requirements of 9VAC20-81-250.A.4.h.(1) and A.4.g and D.

X.G.2. For the purpose of this Permit, laboratory analysis is considered complete upon issuance of the final analytical report under laboratory signature.

X.H. BACKGROUND EXCEEDANCE ACTIONS

If the statistical comparisons required under the monitoring program show no exceedances, the Permittee shall continue monitoring groundwater within the current program.

When a Permittee has determined there has been a Statistically Significant Increase (SSI) exceedance over site background for one or more of the Detection monitoring constituents, the Permittee shall upon the end of the 30-day SSI determination period allowed by 9VAC20-81-250.A.4.h.(2), notify the Director within the timeframes of 9VAC20-81-250.B.2.b.(1)(a). The notification must indicate which groundwater monitoring constituents have shown statistically significant increases over background and describe whether the Permittee shall:

X.H.1. initiate Assessment monitoring described under 9VAC20-81-250.B.3 within the timeframes of 250.B.3.a., or

X.H.2. submit an Alternate Source Demonstration meeting the content requirements and

timeframes of 9VAC20-81-250.A.5.a., b. Unless Director approval of the demonstration is obtained, the Permittee shall follow the sampling requirements and timeframes required of Assessment monitoring.

X.I. RECORD-KEEPING REQUIREMENTS

The Permittee shall retain all records identified under 9VAC20-81-250.E.1 as well as 9VAC20-81-530.B.1 and B.2 throughout the facility active life (including closure) and post-closure care period. The records shall be retained at the facility or another location approved by the Director.

X.J. REPORTING REQUIREMENTS

X.J.1. Annual groundwater reports containing, at a minimum, content under 9VAC20-81-250.E.2.a.(2), shall be submitted to the Director within the timeframes of 9VAC20-81-250.E.2.a.(1).

X.J.2. Semi-annual groundwater reports containing at a minimum, groundwater flow rate and direction determinations [9VAC20-81-250.A.4.c], statistical comparison results [9VAC20-81-250.B.2] and content defined under 9VAC20-81-250.E.2.b.(1), shall be submitted to the Department within the timeframes of 9VAC20-81-250.E.2.b.(1) unless qualifying facilities have received a variance from this requirement.

X.J.3. Within 44 days of well completion, the Permittee shall supply the Director a Well Installation Report containing the well number, surveyed elevation, boring log [9VAC20-81-250.A.3.d], casing length, total depth, and a completion diagram [9VAC20-81-250.E.1.c] for each monitoring well, along with a certification [9VAC20-81-250.A.3.g] from a qualified groundwater scientist that the monitoring wells have been installed in accordance with the submitted plans.

X.J.4. Within 44 days of well abandonment, the Permittee shall supply the Director a Well Abandonment Report containing information including field methods utilized, and a certification from a qualified groundwater scientist verifying the well abandonment activities met all applicable requirements [9VAC20-81-250.E.1.c].

X.K. NOTIFICATION REQUIREMENTS

X.K.1. Background SSI Notifications shall be submitted to the Director within the timeframes noted under 9VAC20-81-250.B.2.b.(1)(a).

X.K.2. Well Non-Performance Notifications shall be submitted to the Director within 30 days of recognizing the non-performance issue in order to meet 9VAC20-81-530.C.1 - 3.

X.L. MISCELLANEOUS ALLOWANCES

- X.L.1. Use of Alternate Site Background. The Permittee may request the Director allow site background to be developed using wells that are not hydrologically upgradient of the disposal unit as long as the request addresses the technical criteria contained under 9VAC20-81-250.A.4.e and is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, background shall be determined by sampling wells which are upgradient of the disposal unit and meet the requirements of 9VAC20-81-250.A.3.f.(2).
- X.L.2. Use of Alternate Statistical Method. The Permittee may request the Director allow the use of an Alternate Statistical Method as long as the Permittee can demonstrate the alternate method can meet the technical criteria defined under 9VAC20-81-250.D.2. Until such time as Director approval is obtained, the statistical test(s) applied to site groundwater data shall be from 9VAC20-81-250.D.1. Whichever method is approved for use at the site, the method should be listed in the facility Groundwater Monitoring Plan as required under 9VAC20-81-250.A.4.g.
- X.L.3. Verification Sampling. The Permittee, at any time within the 30 day statistical determination period defined under 9VAC20-81-250.A.4.h.(2), may obtain verification samples. Undertaking verification sampling shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9VAC20-81-250.A.4.i.
- X.L.4. Data Validation. The owner or operator may at any time within the 30 day statistical determination period defined under 9VAC20-81-250.A.4.h.(2) undertake third-party data validation of the analytical data received from the laboratory. Undertaking such validation efforts shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9VAC20-81-250.A.4.j.
- X.L.5. When the Permittee recognizes a failure to submit any relevant facts or has submitted incorrect information in any groundwater monitoring report to the Director, he shall, within 7 days, submit such omitted facts or the correct information with a full explanation [9VAC20-81-530.E].

X.M. MISCELLANEOUS DEMONSTRATIONS

- X.M.1. To address an exceedance which is the result of something other than a release of solid waste constituents, the Permittee may submit a report entitled Alternate Source Demonstration, certified by a qualified groundwater scientist, for review by the Director within 90 days of providing the SSI notification unless the submission and approval timeframe has been extended by the Director for good cause [9VAC20-81-250.A.5.b].

- X.M.1.a. If a successful demonstration of an alternate source for the noted increase is made by the Permittee and approved by the Director within the 90 day timeframe, the Permittee may continue in the applicable monitoring program as defined in this Permit Module.
- X.M.1.b. If a successful demonstration of an alternate source for the noted increase is not made by the Permittee within the 90 day timeframe, the Permittee shall take actions required under 9VAC20-81-250.A.5.c.(3) within Regulatory timeframes unless an extension has been granted by the Director.
- X.M.2. The Permittee may submit to the Director a Multi-unit Groundwater Monitoring System Demonstration containing the content defined under 9VAC20-81-250.A.3.b and certified by a qualified groundwater scientist, when he feels that the implementation of such a monitoring system will be as protective of human health and the environment as individual systems would be.
- X.M.2.a. If a successful demonstration is made and approved by the Director, the Permittee may discontinue use of individual monitoring systems and institute the monitoring of a multi-unit system.
- X.M.2.b. If a successful demonstration is not made, the Permittee shall initiate (or continue) to monitor individual networks under the applicable monitoring program.
- X.M.3. The Permittee may request the Director suspend groundwater monitoring requirements by submitting a No-Potential-Migration Demonstration, certified by a qualified groundwater scientist, meeting the technical requirements of 9VAC20-81-250.A.1.c.
- X.M.3.a. If a successful demonstration is made and approved by the Director, the Permittee may suspend groundwater monitoring actions.
- X.M.3.b. If a successful demonstration is not made, the Permittee shall continue monitoring as required under B.2.
- X.N. PERMIT DOCUMENTS

As required under 9VAC20-81-470.A.1, the Permittee must have Design Plans that include detailed instructions concerning groundwater monitoring [9VAC20-81-470.A.1.g]. These detailed groundwater monitoring instructions must at a minimum cover the items listed under 9VAC20-81-250.A.4.a and applicable information under 250 and 260. The document containing these instructions, called the Groundwater Monitoring Plan, shall be placed in the file record.

It shall be the responsibility of the Permittee to update this monitoring plan as needed [9VAC20-81-250.B.3.e], which may include actions otherwise defined under 600.A – F, if changes to the monitoring program have taken place since original Plan development.

X.O. LIMITATIONS/AUTHORITIES

- X.O.1. Solid waste shall not be deposited in or permitted to enter any surface waters or groundwater [9VAC20-81-240.C.10].
- X.O.2. Should information contained in any Permittee authored document referenced in this Module conflict with any requirement or condition of this Module, or requirements found within 9VAC20-81-10 et seq., as amended, the Module condition and/or Regulatory requirement shall prevail over the language in the Permittee supplied document [9VAC20-81-35.D and 490.E] unless it can be demonstrated that a variance from that regulatory requirement has been granted by the Director following the procedures under 700 et seq.
- X.O.3. The groundwater monitoring and reporting requirements set forth here are minimum requirements. The Director may require, by amending the Permit, any owner or operator to install, operate, and maintain a groundwater monitoring system and program that contains requirements more stringent than those of the Regulations whenever it is determined that such requirements are necessary to prevent significant adverse effects on public health or the environment [9VAC20-81-250.A.2.c].

PERMIT MODULE XI

ASSESSMENT GROUNDWATER MONITORING REQUIREMENTS

The purpose of Assessment monitoring is to ensure the earliest possible recognition of a landfill impact to the uppermost aquifer at levels which exceed groundwater protection standards and therefore may trigger potential groundwater remediation.

XI.A. GROUNDWATER COMPLIANCE POINT

XI.A.1. Uppermost Aquifer

The groundwater monitoring compliance point is the uppermost aquifer [9VAC20-81-250.A.2.a] which encompasses the entire thickness between the first encounter with groundwater (not to include any perched water) and the first encounter with a confining unit forming the lower boundary of the uppermost aquifer [9VAC20-81-250.A.3.f.(1).(b/c)].

XI.A.2. Monitoring Well Locations

All wells in the monitoring network, including those at the disposal unit boundary, or at an alternate compliance point [9VAC20-81-250.A.3.a.(3)], shall be installed within the permitted facility boundary and be screened within the uppermost aquifer unless a variance [9VAC20-81-250.A.3.a.(2)] meeting the requirements of 9VAC20-81-740.B has been granted.

XI.A.3. Location Restrictions

No monitoring well serving the function defined under 9VAC20-81-250.A.3.a.(2) can be:

XI.A.3.a. located at a distance more than 500 feet away from the disposal unit boundary or

XI.A.3.b. outside of the facility boundary [9VAC20-81-740.A].

XI.B. MONITORING NETWORK REQUIREMENTS

XI.B.1. The following Performance Standards shall be met:

XI.B.1.a. Network requirements of 9VAC20-81-250.A.2.a and A.3.a, b, f.

XI.B.1.b. Wells requiring replacement due to non-performance shall be reported to the Department within 30 days of recognizing the non-performance. The notification shall include a site plan depicting the proposed location for the replacement well(s) for Department review [9VAC20-81-530.C.1].

XI.B.1.c. Wells that require replacement must be replaced prior to the next regularly scheduled groundwater sampling event unless the Director has granted an extension to meeting the monitoring system compliance requirements under 9VAC20-81-250.A.3.a.

XI.B.1.d. Any wells that require abandonment shall be sealed and abandoned in accordance with existing Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) guidance as well as any applicable state or local requirements.

XI.B.2. Installation, Operations and Maintenance

All wells shall be installed, operated and maintained during the life of the monitoring program in accordance with requirements of 9VAC20-81-250.A.3.c-e.

XI.B.3. Well Designations

The following wells shall be included in the groundwater monitoring network:

Upgradient Wells	Downgradient Wells	Piezometers
MW-01S	MW-02R	MW-07
	MW-03S	MW-10D
	MW-04	MW-11D
	MW-05	CC-01*
	MW-06	CC-02*
	MW-12	CC-05*
	MW-13	CC-06*
	MW-14	CC-07 (upgradient)*
	MW-15	CC-08*
		CC-10*

*The ability to sample wells on Fort Walker property is contingent upon written authorization from the Fort.

XI.C. AQUIFER INFORMATION

XI.C.1. Aquifer Data Acquisition - Requirements

XI.C.1.a. Static groundwater elevations [9VAC20-81-250.A.4.c] shall be:

XI.C.1.a.(1). measured in all monitoring wells.

XI.C.1.a.(2). measured to an accuracy of 0.01 foot.

XI.C.1.a.(3). measured each time groundwater is sampled on site.

XI.C.1.a.(4) obtained from all wells in the network within a single 24 hour period to avoid temporal variations/fluctuations in the groundwater table.

XI.C.1.b Groundwater flow rate and direction [9VAC20-81-250.A.4.c] shall be:

XI.C.1.b.(1). determined each time groundwater is sampled on site,

XI.C.1.b.(2). calculated using technical methods accepted for use in EPA RCRA groundwater programs.

XI.C.2. Aquifer Data Acquisition - Response

XI.C.2.a. The Permittee shall evaluate the function of each monitoring network well each time groundwater is sampled. If the evaluation shows that one or more of the well(s) no longer functions in a manner that meets the requirements of 9VAC20-81-250.A.3.e, the Permittee shall:

XI.C.2.a.(1). Within 30 days of recognizing the non-performance, notify the Department of the need to modify the number, location, or depth of the monitoring wells, and provide for Department review, proposed locations for new (replacement) monitoring wells keyed to a site plan.

XI.C.2.a.(2). Complete additions or modifications to the network, prior to the next regularly scheduled groundwater sampling event, unless an extension has been granted by the Director for meeting the monitoring system compliance requirements under 9VAC20-81-250.A.3.a.

XI.D. SAMPLING ACTIONS

The Permittee shall:

XI.D.1. Meet the field sampling and laboratory procedures of 9VAC20-81-250.A.4.a.

XI.D.2. Use the analytical methods of EPA SW-846 as amended [9VAC20-81-250.A.4.b].

XI.D.3. Not filter groundwater samples prior to analysis [9VAC20-81-250.A.4.b].

XI.D.4. Sample all Assessment constituents referenced under Table 3.1 Column B [9VAC20-81-250.B.3.a] during annual sampling events and all Detection constituents referenced under Table 3.1 Column A as well as those constituents

in Column B that were previously detected [9VAC20-81-250.B.3.c.(2)] during semiannual sampling events.

XI.E. SAMPLING FREQUENCY

- XI.E.1. The Permittee shall, during the active life and post-closure care periods, sample groundwater and analyze for the required Table 3.1 constituents in all monitoring wells on at least a semi-annual basis [9VAC20-81-250.B.3.c.(2)] unless the quarterly wetlands provisions apply to an active sanitary landfill.
- XI.E.2. The length of the semi-annual sampling period shall not conflict with the requirements of 9VAC20-81-10.
- XI.E.3. Upon triggering the need for Assessment monitoring, the initial Assessment sampling event shall be completed in a timeframe meeting the requirements of 9VAC20-81-250.B.3.a.

XI.F. DETERMINATION OF BACKGROUND & GPS

- XI.F.1. The Permittee shall establish site-specific Assessment background values [250.A.4.d.–f.] for all detected constituents within the timeframes of 9VAC20-81-250.B.3.c.(3)
- XI.F.2. Groundwater Protection Standards (GPS) established using the process defined under 250.A.6.b, for each detected Assessment monitoring constituent shall be:
 - X.F.1.a. proposed within timelines of 9VAC20-81-250.B.3.d., and
- XI.F.3. Groundwater Protection Standards shall be updated as follows:
 - XI.F.3.a. Federal Maximum Contaminant Level-based GPS or department approved background by following the process under 9VAC20-81-250.A.6.d.
 - XI.F.3.b. Alternate Concentration Limit-based GPS by following the process under 9VAC20-81-250.A.6.e.

XI.G. STATISTICAL PROCEDURES

When evaluating the groundwater sampling event results, the Permittee shall:

- XI.G.1 within 30 days of completion of the laboratory analysis for each sampling event [9VAC20-81-250.A.4.h.(2)], determine whether or not there is a statistically significant increase over site background and GPS for each monitoring constituent using a method meeting the requirements of 9VAC20-81-250.A.4.h.(1) and A.4.g and D.

XI.G.1.a. For GPS based on Federal Maximum Contaminant Level or ACLs, the comparison of analytical results from the downgradient wells shall be based on either a point to point comparison to the GPS, or a statistical comparison using 95% Lower Confidence Limit derived from at a minimum four independent sampling events completed during the compliance period.

XI.G.1.b. For GPS based on statistically calculated site background, the comparison of analytical results from the downgradient wells shall be based on a point to point comparison to the GPS.

XI.G.2. For the purpose of this Permit, laboratory analysis is considered complete upon issuance of the final analytical report under laboratory signature.

XI.H. GPS EXCEEDANCE ACTIONS

If the statistical comparisons required under the monitoring program show no exceedances, the Permittee shall continue monitoring groundwater within the current program.

When a Permittee has determined there has been a Statistically Significant Increase (SSI) exceedance over Groundwater Protection Standards (GPS) for one or more of the Assessment monitoring constituents, the Permittee shall notify the Director within the timeframe of 9VAC20-81-250.B.3.f.(3)(a). The notification must indicate which groundwater monitoring constituents have shown statistically significant increases over GPS and describe whether the Permittee shall:

XI.H.1. initiate Corrective Actions described under 9VAC20-81-260.C within the timeframes of 9VAC20-81-260.C.1 including defining the horizontal and lateral extent of the GPS exceeding release [9VAC20-81-260.C.1.a], as well as the actions described under 9VAC20-81-260.C.1.b-e. or

XI.H.2. submit an Alternate Source Demonstration meeting the content requirements and timeframes of 9VAC20-81-250.A.5.a., b. Unless Director approval for the demonstration is obtained, the Permittee shall follow the sampling requirements and timeframes required of Corrective Action Program [9VAC20-81-260.C.] in response to a GPS exceedance.

XI.I. RECORD-KEEPING REQUIREMENTS

The Permittee shall retain all records identified under 9VAC20-81-250.E.1 as well as 9VAC20-81-530.B.1 and B.2 throughout the facility active life (including closure) and post-closure care period. The records shall be retained at the facility or another location approved by the Director.

XI.J. REPORTING REQUIREMENTS

- XI.J.1. Annual groundwater reports containing, at a minimum, content under 9VAC20-81-250.E.2.a.(2), shall be submitted to the Director within the timeframes of 9VAC20-81-250.E.2.a.(1).
- XI.J.2. Semi-annual groundwater reports containing at a minimum, groundwater flow rate and direction determinations [9VAC20-81-250.A.4.c], statistical comparison results [9VAC20-81-250.B.3] and content defined under 9VAC20-81-250.E.2.b.(1), shall be submitted to the Department within the timeframes of 9VAC20-81-250.E.2.b.(1) unless qualifying facilities have received a variance from this requirement.
- XI.J.3. Within 30 days of establishing facility background, or re-establishing background due to the installation of new monitoring wells, or a change in sampling technique, the Permittee shall report the background values and statistical computations forming the basis for those values in a report entitled Facility Background Determination Report.
- XI.J.4. Within 44 days of well completion, the Permittee shall supply the Director a Well Installation Report containing the well number, surveyed elevation, boring log [9VAC20-81-250.A.3.d], casing length, total depth, and a completion diagram [9VAC20-81-250.E.1.c] for each monitoring well, along with a certification [9VAC20-81-250.A.3.g] from a qualified groundwater scientist that the monitoring wells have been installed in accordance with the submitted plans.
- XI.J.5. Within 44 days of well abandonment, the Permittee shall supply the Director a Well Abandonment Report containing information including field methods utilized, and a certification from a qualified groundwater scientist verifying the well abandonment activities met all applicable requirements [9VAC20-81-250.E.1.c].
- XI.J.6. Upon issuance of GPS, the Permittee shall place the GPS listing in the operating record [9VAC20-81-250.A.6.c] and update that record as needed upon any changes in GPS.

XI.K. NOTIFICATION REQUIREMENTS

- XI.K.1. GPS SSI Notifications shall be submitted to the Director within the timeframes noted under 9VAC20-81-250.B.3.f.(3)(a).
- XI.K.2. Well Non-Performance Notifications shall be submitted to the Director within 30 days of recognizing the non-performance issue in order to meet 9VAC20-81-530.C.1 - 3.
- XI.K.3. Off-site Plume Notifications shall be submitted to the affected landowner

[9VAC20-81-260.C.1.b] and copied to the Director within 15 days of identifying the impacts.

XI.K.4. Table 3.1 Column B Detect Notifications shall be submitted to the Director within the timeframes noted under 9VAC20-81-B.3.c.(1).

XI.K.5. Return to Detection Monitoring Notification shall be submitted to the Director [9VAC20-81-B.3.f.(1)] no less than 30-days prior to re-instating Detection monitoring.

XI.L. MISCELLANEOUS ALLOWANCES

XI.L.1. Use of Alternate Site Background. The Permittee may request the Director allow site background to be developed using wells that are not hydrologically upgradient of the disposal unit as long as the request addresses the technical criteria contained under 9VAC20-81-250.A.4.e and is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, background shall be determined by sampling wells which are upgradient of the disposal unit and meet the requirements of 9VAC20-81-250.A.3.f.(2).

XI.L.2. Use of Alternate Statistical Method. The Permittee may request the Director allow the use of an Alternate Statistical Method as long as the Permittee can demonstrate the alternate method can meet the technical criteria defined under 9VAC20-81-250.D.2. Until such time as Director approval is obtained, the statistical test(s) applied to site groundwater data shall be from 9VAC20-81-250.D.1. Whichever method is approved for use at the site, the method should be listed in the facility Groundwater Monitoring Plan as required under 9VAC20-81-250.A.4.g.

XI.L.3. Verification Sampling. The Permittee, at any time within the 30 day statistical determination period defined under 9VAC20-81-250.A.4.h.(2), may obtain verification samples. Undertaking verification sampling shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9VAC20-81-250.A.4.i.

XI.L.4. Data Validation. The owner or operator may at any time within the 30 day statistical determination period defined under 9VAC20-81-250.A.4.h.(2) undertake third-party data validation of the analytical data received from the laboratory. Undertaking such validation efforts shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9VAC20-81-250.A.4.j.

XI.L.5. When the Permittee recognizes a failure to submit any relevant facts or has submitted incorrect information in any groundwater monitoring report to the Director, he shall, within 7 days, submit such omitted facts or the correct information with a full explanation [9VAC20-81-530.E].

XI.L.6. The Permittee may request the Director allow an alternate frequency for the repeated sampling of the full Table 3.1 Column B constituent list as long as the request addresses the technical items contained under 9VAC20-81-250.B.3.b.(3), and is certified by a qualified groundwater scientist. Until such time as Director Approval is obtained, sampling for the full Table 3.1 Column B shall continue on an annual basis consistent with 9VAC20-81-250.B.3.a.

XI.L.7. In an effort to reduce sampling costs, the Permittee may request the Director:

XI.L.7.a. approve an appropriate subset of monitoring wells that may remain in detection monitoring defined under 9VAC20-81-250.B.2., based on the results of initial or subsequent annual Table 3.1 Column B sampling events. Monitoring wells may be considered for the subset if: (1) they show no detections of Table 3.1 Column B constituents other than those already previously detected in detection monitoring; and (2) they display no SSI over background for any constituents on the Table 3.1 Column A list. All requests for a subset of wells to remain in detection monitoring shall be certified by a qualified groundwater scientist. Until such time as Director Approval is obtained, all site wells shall be sampled annually for the Table 3.1 Column B constituent list consistent with 9VAC20-81-250.B.3.a. If an SSI is subsequently recognized in a well approved for the subset, the well shall no longer be considered part of the detection monitoring subset.

XI.L.7.b. allow for the deletion of certain Table 3.1 Column B constituents from the sampling list [9VAC20-81-250.B.3.b(2)] as long as the request contains information showing that the constituents are not reasonably expected to be in or derived from the waste mass, and the request is certified by a qualified groundwater scientist. Until such time as Director Approval is obtained, all site wells shall be sampled annually for the full Table 3.1 Column B constituent list consistent with 9VAC20-81-250.B.3.a.

XI.M. MISCELLANEOUS DEMONSTRATIONS

XI.M.1. To address an exceedance which is the result of something other than a release of solid waste constituents, the Permittee may submit a report entitled *Alternate Source Demonstration* (ASD), certified by a qualified groundwater scientist, for review by the Director within 90 days of providing the SSI notification unless the submission and approval timeframe has been extended by the Director for good cause [9VAC20-81-250.A.5.b].

XI.M.1.a. If a successful demonstration of an alternate source for the noted increase is made by the Permittee and approved by the Director within the 90 day timeframe, the Permittee may continue in the applicable

monitoring program as defined in this Permit Module.

XI.M.1.b. If a successful demonstration of an alternate source for the noted increase is not made by the Permittee within the 90 day timeframe, the Permittee shall take actions required under 9VAC20-81-250.A.5.c.(3) within Regulatory timeframes unless an extension has been granted by the Director.

XI.M.2. The Permittee may submit to the Director a Multi-unit Groundwater Monitoring System Demonstration containing the content defined under 9VAC20-81-250.A.3.b and certified by a qualified groundwater scientist, when he feels that the implementation of such a monitoring system will be as protective of human health and the environment as individual systems would be.

XI.M.2.a. If a successful demonstration is made and approved by the Director, the Permittee may discontinue use of individual monitoring systems and institute the monitoring of a multi-unit system.

XI.M.2.b. If a successful demonstration is not made, the Permittee shall initiate (or continue) to monitor individual networks under the applicable monitoring program.

XI.M.3. The Permittee may request the Director suspend groundwater monitoring requirements by submitting a No-Potential-Migration Demonstration, certified by a qualified groundwater scientist, meeting the technical requirements of 9VAC20-81-250.A.1.c.

XI.M.3.a. If a successful demonstration is made and approved by the Director, the Permittee may suspend groundwater monitoring actions.

XI.M.3.b. If a successful demonstration is not made, the Permittee shall continue monitoring as required under B.3.

XI.N. PERMIT DOCUMENTS

As required under 9VAC20-81-470.A.1, the Permittee must have Design Plans that include detailed instructions concerning groundwater monitoring [9VAC20-81-470.A.1.g]. These detailed groundwater monitoring instructions must at a minimum cover the items listed under 9VAC20-81-250.A.4.a and applicable information under 250 and 260. The document containing these instructions, called the Groundwater Monitoring Plan, shall be placed in the file record.

It shall be the responsibility of the Permittee to update this monitoring plan as needed [9VAC20-81-250.B.3.e], which may include actions otherwise defined under 9VAC20-81-600.A–F, if changes to the monitoring program have taken place since original Plan development.

XI.O. LIMITATIONS/AUTHORITIES

- XI.O.1. Solid waste shall not be deposited in or permitted to enter any surface waters or groundwater [9VAC20-81-240.C.10].
- XI.O.2. Should information contained in any Permittee authored document referenced in this Module conflict with any requirement or condition of this Module, or requirements found within 9VAC20-81-10 et seq., as amended, the Module condition and/or Regulatory requirement shall prevail over the language in the Permittee supplied document [9VAC20-81-35.D and 490.E] unless it can be demonstrated that a variance from that regulatory requirement has been granted by the Director following the procedures under 9VAC20-81-700 et seq.
- XI.O.3. The groundwater monitoring and reporting requirements set forth here are minimum requirements. The Director may require, by amending the Permit, any owner or operator to install, operate, and maintain a groundwater monitoring system and program that contains requirements more stringent than those of the Regulations whenever it is determined that such requirements are necessary to prevent significant adverse effects on public health or the environment [9VAC20-81-250.A.2.c].

PERMIT MODULE XIII POST-CLOSURE CARE

XIII.A. POST-CLOSURE CARE REQUIREMENTS

XIII.A.1. The facility shall conduct post-closure care of the landfill in accordance with its approved Post-closure Care Plan.

XIII.A.1.a. Leachate shall be managed in accordance with 9VAC20-81-210 and the facility's Leachate Management Plan. If a leachate seep(s) occurs, the owner or operator shall repair the seep(s) and follow the procedures outlined in 9VAC20-81-210.F.

XIII.A.1.b. Landfill gas shall be monitored in accordance with 9VAC20-81-200 and the facility's Landfill Gas Management Plan. The gas management system shall be inspected at a rate consistent with the system's monitoring frequency.

XIII.A.1.c. Groundwater shall be monitored in accordance with 9VAC20-81-250, Module X, and Module XI and the respective groundwater permit documents as applicable. The groundwater monitoring system shall be inspected at a rate consistent with the system's monitoring frequency.

XIII.A.2. Amended Post-closure Care Plans shall be submitted to the department for review and approval by the director.

XIII.B. POST-CLOSURE PERIOD

XIII.B.1. Post-closure care shall be conducted for 30 years.

XIII.B.2. The length of the post-closure care period may be decreased by the director if the owner or operator demonstrates that the reduced period is equally protective of human health and the environment and the demonstration is approved by the director. This demonstration shall contain:

XIII.B.2.a. Certification, signed by the owner or operator and a professional engineer licensed in the Commonwealth, verifying that decreasing the post-closure care period will be equally protective of human health and the environment; and

XIII.B.2.b. An evaluation prepared by a professional engineer or professional geologist licensed in the Commonwealth, which assesses and evaluates the landfill's potential for harm to human health and the environment in the event that post-closure monitoring and maintenance are discontinued.

XIII.B.3. The facility shall continue post-closure care and monitoring until such time that the department approves termination or the post-closure care and/or monitoring activity.

XIII.C. CERTIFICATION OF COMPLETION OF POST-CLOSURE CARE

Not less than 180 days prior to the completion of the post-closure monitoring and maintenance period as prescribed by the Board's regulations or by the Director, the owner or operator shall submit to the Director:

XIII.C.1. Certification, signed by the owner or operator and a professional engineer licensed in the Commonwealth, verifying that post-closure monitoring and maintenance have been completed in accordance with the facility's Post-closure Care Plan; and

XIII.C.2. An evaluation prepared by a professional engineer or professional geologist licensed in the Commonwealth, which assesses and evaluates the landfill's potential for harm to human health and the environment in the event that post-closure monitoring and maintenance are discontinued.

If the Director determines that continued post-closure monitoring or maintenance is necessary to prevent harm to human health or the environment, he shall extend the post-closure period for such additional time as the Director deems necessary to protect human health and the environment and shall direct the owner or operator to submit a revised post-closure plan and to continue post-closure monitoring and maintenance in accordance therewith. Requirements for financial assurance shall apply throughout such extended post-closure period.

PERMIT MODULE XIV MNA-BASED AND ACTIVE REMEDY BASED CORRECTIVE ACTION 9VAC20-81-260

XIV.A. PURPOSE

This Module describes the requirements applicable to the remedial technology implemented on site as a result of an exceedance of groundwater protection standards (GPS).

The following permit documents outline the proposed remediation:

- Corrective Action Plan (CAP)
- Corrective Action Groundwater Monitoring Plan (CAMP)

XIV.B. INTERIM MEASURES

At any time during the Corrective Action process, the Permittee or Director may determine that interim measures are required. Nothing in this Permit shall preclude the Permittee from performing interim measures at any time if required to reduce or eliminate the risk to human health and the environment, as long as the interim measures are consistent with the goal(s) of the Corrective Action Plan. If interim measures are required by the Director, the Permittee will respond with a plan for interim measures within 60 days of the Director's notification of the need for the requirement.

XIV.C. REMEDY REQUIREMENTS

The remedy applied to the impacted aquifer shall be able to meet each of the criteria defined under 9VAC20-81-260.C.3.c.(1).

XIV.D. REMEDY DESCRIPTION

Direct Oxidation/In-Situ Chemical Oxidation (DO/ISCO) Organic contaminants of concern may be destroyed by direct injection of an oxidant into the groundwater. For this case, the facility will be using one or more of the following oxidants in the aquifer: potassium permanganate, sodium permanganate, hydrogen peroxide, Fenton's reagent, or another oxidant approved by DEQ. Chlorine or sodium hypochlorite is not approved.

Monitored Natural Attenuation (MNA) may be appropriate for implementation in those instances where source control is in place, current trends in groundwater quality are acceptable and display evidence of biologic attenuation of the contaminant mass, the plume remains within the permitted facility boundary or off-site impacted landowners agree with its use, there is no risk to receptors on off-site property(ies) and no evidence of any current or expected cross-media transfer of groundwater contaminants to surface waters.

Enhanced Bioremediation (EBR) may be appropriate for implementation in those instances where the plume of contaminated groundwater remains within the permitted facility boundary or off-site impacted landowners agree with its use, source control is in place, current trends in groundwater quality are acceptable, the implemented remedy has a history of successful application to the constituents of concern and, there is no risk to receptors on off-site property(ies) nor any current or expected cross-media transfer of groundwater contaminants to surface waters.

Geochemical Manipulation (GCM): In those cases where GPS exceeding constituents are solely metals, it may be possible to implement a groundwater remedy based on the long-term monitoring of geochemical parameters in the aquifer. Metal transport is often contingent upon whether or not the metal is in an 'oxidized' or 'reduced' state. This condition will be governed by the presence or absence (anoxic or reducing conditions) of free oxygen within the groundwater – as well as other reactants such as nitrate, ferric iron, and ferrous iron. In such cases, the mobility of a metal may be controlled either by natural means, or the use of a chemical catalyst/oxidant, and such controls may be successful in achieving GPS. For this case, the facility will be using the following catalyst in the aquifer: potassium permanganate, sodium permanganate, hydrogen peroxide, Fenton's reagent, or another oxidant approved by DEQ, coupled with Long Term Performance (LTP) monitoring.

The site-wide remedy chosen for the landfill consists of the following components:

- DO/ISCO of organic compounds
- MNA for organic compounds
- EBR for organic compounds
- GCM and LTP of metals

XIV.E. REMEDY IMPLEMENTATION

XIV.E.1. Implementation of the CAP and its related monitoring program begins on the date the Permit is amended to incorporate this Permit Module.

XIV.E.2. If any remedy components are not in place at the time this permit is issued:

XIV.E.2.a. the CAP shall contain a schedule which details each phase of the remedy implementation [9VAC20-81-260.D.1.b],

XIV.E.2.b. during the schedule period, the Permittee shall provide to the Director, updates every 30 days during the site preparation and installation phase of any remedy component installed after permit issuance [9VAC20-81-260.D.1.b.(8).a],

XIV.E.2.c. design plans for any remedy component should be submitted for Department review no less than 180-days prior to component installation.

- XIV.E.3. If any condition causes a delay in the completion of the implementation schedule as outlined in the CAP, the Permittee must notify the Director of the problem within 7-days of recognizing the delay and amend the schedule accordingly.
- XIV.E.4. Any changes in the implementation of the remedy design or groundwater monitoring program will require a modification to the facility's Permit.
- XIV.E.5. The Director has the authority to modify the Permit for any changes to Corrective Action if any conditions of 9VAC20-81-600.E.5 or E.8, and 9VAC20-81-260.G.2 are found to be applicable.
- XIV.E.6. The proposed design specifications of the EBR and catalyst injection systems can be found in the CAP.

XIV.F. ALTERNATE REMEDY PROVISIONS

A combination of DO/ISCO, MNA, EBR, geochemical manipulation and LTP has been selected as the remedy of choice on site.

The Permittee or Director may determine, based on information obtained after Corrective Action has been implemented, that compliance with the requirements of 9VAC20-81-260.C.3.c.(1) are not being achieved by the remedy selected. In such cases, the Permittee shall, within 90-days of the determination:

- XIV.F.1. submit an Assessment of Corrective Measures [9VAC20-81-260.C.3],
- XIV.F.2. upon Director approval of the Assessment of Corrective Measures, submit a revised Corrective Action Plan consistent with the timeframes of 9VAC20-81-260.C.1.f,
- XIV.F.3. unless the alternate remedy is already described in the Corrective Action Plan, submit a revised Corrective Action Plan describing the alternate remedy for Department review,
- XIV.F.4. if the alternate remedy is already described in the existing Corrective Action Plan, submit any detailed design plans or monitoring component changes to the Department for review,
- XIV.F.5. modify the facility's Permit to implement an alternate remedy, unless the Permittee submits and receives Director approval for the demonstration allowed under 9VAC20-81-260.G.3.

XIV.G. REMEDY PERFORMANCE MONITORING

The permittee shall operate and maintain the groundwater monitoring wells on site as specified below, in a manner which at a minimum meets the requirements of 9VAC20-81-250.A.3.e and 9VAC20-81-260.D.1.c. Unless otherwise specified, the upgradient well as listed in Permit Module XI shall act as the upgradient well for groundwater remediation sampling purposes as well.

GPS Exceeding Compliance Well(s)	The Associated Performance Well(s)	The Associated Sentinel Well(s)
MW-03S	MW-03S	CC-05 (off-site)
MW-04	MW-04	MW-09
MW-05	MW-05	MW-08
	MW-16	MW-17
	MW-18	MW-19

Any additional wells which the Department requires for the Corrective Action network shall be installed prior to the implementation of the site remedy, or in the timeframe identified in the Monitoring Well Installation Schedule.

The groundwater remediation effort shall be coupled with a monitoring system designed, capable, and operated to demonstrate:

XIV.G.1. the areal extent (both vertical and horizontal) of the plume at concentrations which exceed background [9VAC20-81-260.D.1.c.(2)]. Because both the horizontal and vertical aspects of the plume must be monitored, the well network must include wells installed to a depth appropriate to intersect all groundwater flow paths in the aquifer.

XIV.G.2. the effectiveness of the implemented Corrective Action Program [9VAC20-81-260.D.1.c.(3)].

XIV.G.3. compliance with groundwater protection standards [9VAC20-81-260.D.1.c.(4)].

XIV.G.4. whether the plume has expanded (and remains onsite) since remedy implementation.

XIV.G.5. in the case of MNA use, successful biologic destruction of the waste mass.

XIV.G.6. in the case of metals, successful geochemical changes in the aquifer which retard metals transport in groundwater.

XIV.H. WELL NETWORK

XIV.H.1. Because both the horizontal and vertical aspects of the plume must be monitored, the well network must include wells installed to a depth which will intersect all groundwater flow paths.

- XIV.H.2. The permittee shall operate and maintain the Corrective Action groundwater monitoring wells on site in a manner which is at a minimum, meets 9VAC20-81-250.A.3.e and allows the network to be operated as designed for the length of the Corrective Action Program.
- XIV.H.3. Any new wells installed on site shall be constructed meeting the requirements of the Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document (TEGD).
- XIV.H.4. The Director must be notified prior to the abandonment of any site wells utilized during Corrective Action. Wells shall be abandoned following the general requirements of EPA's RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD) and a well abandonment report shall be transmitted under signature of a qualified groundwater professional to the Department within 30-days of completion of field activities.
- XIV.H.5. *Upgradient wells* are those which provide site-specific background data as required under 9VAC20-81-250.A.3.a.(1).
- XIV.H.6. *Compliance wells* are those which determine whether the landfill has impacted groundwater quality at the waste management unit boundary as required by 9VAC20-81-250.A.3.a.(2).
- XIV.H.7. *Sentinel wells* are those which ensure there is no expansion of the plume or impact to sensitive receptors as a result of changes in plume migration post remedy implementation. These wells should intercept groundwater which shows no impact over background such that the data obtained from them can assist in delineating the full extent of the landfill-impacted groundwater. For organics, no impact means concentrations less than the limit of detection (LOD).
- XIV.H.8. *Performance wells* are those which measure or quantify the success of the remedy implemented. These wells, installed downgradient of each GPS exceeding well, should intercept groundwater which displays GPS exceedances. Data obtained from these wells is used to draw a line around that portion of the aquifer which continues to exceed GPS and thus require remediation.
- XIV.H.9. Sentinel and Performance wells must be located along the same groundwater flow path as the corresponding impacted compliance well. EPA (1999) has previously stated that any inferences about attenuation based on apparent decreases in contaminant concentrations in the downgradient direction will likely be incorrect unless wells are located

along the downgradient groundwater flow path and monitored at the appropriate frequency.

XIV.H.10. When MNA is being applied to the organic contaminant plume, the Sentinel and Performance wells shall be positioned in a manner which allows providing the data defined by EPA (1999) as being required to measure the progress or effectiveness of MNA-based remediation (EPA, 2004). The data required by EPA includes that which: (1) demonstrates MNA is occurring as expected, (2) can detect any changes in the geochemistry of the aquifer which may hinder MNA effectiveness, (3) identify any MNA breakdown products, (4) verifies the plume is not expanding either vertically or horizontally, (5) verifies no unacceptable impact to on site or off site receptors, (6) can detect any new releases to the environment, (7) can demonstrate the effectiveness of any institutional controls put in place to protect potential receptors, and (8) verifies clean-up goals have been met.

XIV.H.11. When geochemical manipulation is being applied to the cobalt plume, the Sentinel and Performance wells shall be positioned in a manner consistent with providing data required to measure the progress or effectiveness of the aquifer geochemistry in reducing the metals concentrations to GPS levels. The aquifer data required to demonstrate speciation includes that which: (1) demonstrates the oxidation state of the aquifer within the plume of contamination and at the 'precipitation/oxidation' boundary, (2) can measure the relationship of other aquifer parameters in assisting or hindering chemical speciation (i.e. ferrous iron, pH, etc.), (3) verifies the plume is not expanding either vertically or horizontally, (4) verifies no unacceptable impact to on site or off site receptors, (5) can detect any new releases to the environment, and (6) verifies clean-up goals have been met.

XIV.I. MONITORING CONSTITUENTS

XIV.I.1. The permittee shall monitor all wells utilized during the Corrective Action Program for the constituents and frequencies defined in the tables below. Other wells on site shall be monitored as required under Permit Modules X and XI.

GPS COC are defined as any constituent on the Table 3.1 Column B sampling list which has been identified at concentrations which exceed its respective GPS. Daughter Products are defined as any constituent resulting from the biodegradation of a COC.

Monitoring Well Type	Monitoring Frequency	Constituent List	Compare Results To
Performance Wells	Quarterly for the 1 st year, semi-annually after that	As required under the Assessment Program and remedy-specific	GPS

		parameters as specified below	
Sentinel Wells	Same as Compliance Wells, unless as specified in a Director approved Variance	GPS COC's, Daughter Products	GPS

DO/ISCO Performance Parameters, and the purpose they serve, are listed in the table below. To make comparisons appropriate for the understanding of the oxidation process, these parameters will be added to the sampling list at the site background and downgradient compliance well and injection target well.

Interference Compounds	Constituents of Oxidant	Geochemical Parameters
Total Organic Carbon (TOC)	Potassium permanganate or sodium permanganate injectant: potassium, sodium	Oxidation Reduction Potential (ORP)
Ferric (II) iron	Hydrogen peroxide injectant: none	pH
	Fenton's reagent injectant: sulfate	Conductivity

MNA/EBR Performance Parameters, and the purpose they serve, are listed in the table below. To make comparisons appropriate for the understanding of the MNA process, these parameters will be added to the sampling list at the site background and downgradient compliance well and injection target well (when using EBR).

Depleted Electron Acceptors	Metabolic By-Products	Miscellaneous	EBR Parameters for Specified Target Wells
Dissolved Oxygen (DO)	Ferric (II) Iron	Oxidation Reduction Potential (ORP)	Lactic acid (if using hydrogen-releasing compounds)
Nitrate	Methane	Total Organic Carbon (TOC)	Other compounds relevant to selected remedial product
Sulfate		pH	
Ferrous (III) iron	Alkalinity	Conductivity	
		Temp	

GCM and LTP Parameters, and the purpose they serve, are listed in the table below. To make comparisons appropriate for the understanding of the attenuation process, these parameters will be added to the sampling list at the site background and downgradient compliance well and injection target well (when using GCM).

GCM Interference Compounds	Geochemical Parameters	GCM Constituents of Oxidant
Total Organic Carbon (TOC)	Oxidation Reduction Potential (ORP)	Potassium permanganate: Potassium (K)
Ferric (II) Iron	Conductivity	Sodium Permanganate: sodium (Na)
	pH	Hydrogen Peroxide: none
	Temp	Fenton's Reagent: sulfate

XIV.I.2. For the purposes of corrective action groundwater sampling:

XIV.I.2.a. the semi-annual sampling period shall be 180 days plus or minus 30 days between sampling events unless authorized by the Director,

XIV.I.2.b. the annual sampling period shall not exceed 360 days between sampling events unless authorized by the Director, and

XIV.I.2.c. the quarterly sampling period shall not exceed 90 days between sampling events unless authorized by the Director.

XIV.I.3. Constituent Detects - Refers to any constituent found above the laboratory limit of detection (LOD) during any sampling event.

XIV.I.4. If a Permittee employs verification sampling, the alpha value shall be modified as outlined in the Department's most recent technical memorandum for Data Analysis Guidelines for Solid Waste Facilities. Such samples shall be obtained within the timeframe defined under 9VAC20-81-250.A.4.h.(2). Verification sampling events conducted outside this timeframe, but within the compliance period, may be submitted in the form of an Alternate Source Demonstration meeting the requirements of 9VAC20-81-250.A.5.

XIV.J. REMEDY PERFORMANCE DEMONSTRATIONS

XIV.J.1. *Engineered System Evaluation Reports (SER)*

Sites which implement a remedy based on Presumptive Remedy or MNA do not normally require submission of monthly SER's, unless the component of

the Presumptive Remedy is being constructed as part of CAP implementation. The frequency of the SER submittal (if described below) may be reduced by the Director after the initial CASE evaluation period has been completed.

XIV.J.2. *Corrective Action Site Evaluations (CASE)*

A report titled Corrective Action Site Evaluation (CASE) shall be submitted to the Director, with a copy provided under separate cover to the Public Data Repository, five years after the date the Permit was amended to implement the chosen remedy. Subsequent reports will be submitted once every three years, due on the calendar date the Permit was amended to implement the chosen remedy. The Permittee shall utilize the Department's Submission Instructions for CASE reports (2009 as amended) when putting together the CASE report for submission.

The CASE reports, signed by a qualified groundwater professional, will include the material requested for within the Submission Instructions, including but not limited to:

XIV.J.2.a. The remedy type in place [9VAC20-81-260.D.1.b.(8).(d)].

XIV.J.2.b. The concentrations of all sampled constituents identified above their respective detection limits since remedy implementation [9VAC20-81-260.D.1.b.(8).(b)].

XIV.J.2.c. Plume maps showing the lateral and vertical extent of each constituent of concern found at levels above GPS and background [9VAC20-81-260.D.1.c.(2)].

XIV.J.2.d. Calculated rate of contaminant migration during the CASE period [9VAC20-81-260.D.1.c.(1)].

XIV.J.2.e. A groundwater potentiometric surface map based on the most recent groundwater elevation data.

XIV.J.2.f. A discussion of the progress during the CASE period toward reaching GPS including any revisions needed to the timelines initially provided in the Corrective Action Plan [9VAC20-81-260.D.1.b.(8).(c, e, and f)].

XIV.J.2.g. Copies of the field sampling records laboratory reports for all sampling events conducted during the CASE period [9VAC20-81-260.D.1.b.(8).(g)].

XIV.J.2.h. Information concerning whether the plume remains contained within the facility property boundary [260.C.2.c.(2)].

XIV.J.2.i. An evaluation of the groundwater sampling data [260.C.2.f.(b)] and data trends derived from the post remedy-implementation sampling events [260.C.2.f.(3)].

XIV.J.2.j. Discussion of the progress toward meeting the schedule of remedy completion [260.C.2.f.(4)].

XIV.K. REMEDY COMPLETION DEMONSTRATION

XIV.K.1. *Certificate Submission*

Within 14-days of completing the groundwater remedy, the Permittee shall submit a Certification, signed and certified by the Permittee and a qualified groundwater scientist stating all requirements of 9VAC20-81-260.H.1 have been met, (a copy of the Certification shall also be placed at the Public Data repository).

XIV.K.2. *CACR Submission*

With submission of the Certification, the Permittee shall submit for approval by the Director, a Corrective Action Completion Report (CACR), signed and certified by a qualified groundwater scientist, demonstrating that the remedial actions have been successful in meeting the requirements of Permit Module XIV and 9VAC20-81-260.C.3.(c).(1):

XIV.K.2.a. Documentation that groundwater protection standards have been achieved at all Performance and Sentinel monitoring points within the plume of contamination beyond the compliance well network established under Permit Module XI during the last three years of groundwater monitoring [9VAC20-81-260.H.1.a].

XIV.K.2.b. Documentation that groundwater protection standards have been achieved at all Compliance monitoring points at the waste unit boundary during the last three years of groundwater monitoring [9VAC20-81-260.H.1.a].

XIV.K.2.c. All actions required as part of the remedy have been satisfied or completed [9VAC20-81-260.H.1.b].

XIV.K.2.d. Documentation that all technical actions and certifications required to complete the remedy have been satisfied [9VAC20-81-260.H.2-3].

XIV.K.3. If, after review of the Certification and the CACR, the Director agrees that Corrective Action requirements have been met, the Permittee shall be released from the remedial requirements of 9VAC20-81-260 and the financial assurance requirements of 9VAC20-70-10 et seq. If the Director

finds that the presented materials do not substantiate that Corrective Action goals have been achieved, the Permittee shall remain under the Corrective Action requirements until such time as these requirements have been met [9VAC20-81-260.H.4.b].

XIV.L. REMEDY ABANDONMENT

The Permittee may submit to the Director a Technical Infeasibility Report (TIR) describing the technical reasons why the clean-up objectives cannot be practically met on site using the chosen remedy. The TIR shall be submitted within the timeframe specified in 9VAC20-81-260.G.3 and include:

- XIV.L.1. The certification of a qualified groundwater scientist [9VAC20-81-260.G.3.a].
- XIV.L.2. A discussion of the reasons why the chosen remedy, and any applicable back-up remedy were not successful in meeting the Corrective Action requirements.

If the Director approves of the TIR demonstration:

- XIV.L.3. Within 180 days of the Director approval, but no later than 14 days prior to implementing any alternative measures [9VAC20-81-260.G.3.b], the Permittee shall submit to the Director an Alternate Measures Report (AMR), signed by a qualified groundwater scientist, describing the Alternate Measures to meet the requirements of 9VAC20-81-260.G.3.d. A copy of the AMR shall also be placed at the Public Data Repository.
- XIV.L.4. If, after review of the AMR, the Director agrees that the measures applied to the site meet the requirements of 9VAC20-81-260.G.3.b, the Permittee shall be released from the Corrective Action requirements and financial assurance requirements of 9VAC20-70-10 et seq. If the Director finds that the presented measures do not meet the regulatory requirements, upon the Director's notification, the Permittee shall revise the AMR submission until such time as regulatory conformance is demonstrated.

If the Director disapproves of the TIR demonstration:

- XIV.L.5. Within 180 days of the Director's decision, the Permittee shall submit to the Director a revised CAP, signed and certified by a qualified groundwater scientist, describing a new remedy to be applied on site to meet the requirements of 9VAC20-81-260.C.3.(c).(1) and shall remain in Corrective Action until those requirements are met.

XIV.M. REMEDY RECORD-KEEPING REQUIREMENTS

- XIV.M.1. The Permittee shall record in the facility operating record all actions related to the remedy installed on site, including but not limited to any manifests related to investigatively derived wastes, as well as any design plans, construction reports, as-built documentation, and waste manifests, where applicable.
- XIV.M.2. Throughout the life of the Corrective Action Monitoring Program, the Permittee must place on file, in a location accessible to the public, copies of any Corrective Action program materials submitted to the Department including copies of the final Nature and Extent, Presumptive Remedy and/or Assessment of Corrective Measures reports. Consistent with the US EPA's RCRA Public Participation Policy, the location chosen by the Permittee shall serve as the public data repository for all monitoring reports generated during the Corrective Action process and shall in part satisfy the requirements for public participation established under RCRA. The location of the public data repository is listed below.

<p>Location Name: Caroline County Public Library Bowling Green Branch Location Address: 17202 Richmond Turnpike Location City: Milford, Virginia 22514</p>
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XIV.N. CORRECTIVE ACTION NOTIFICATION REQUIREMENTS

- XIV.N.1. *System Preparation Update Notification*
During any site preparation phase concerning implementation of a surface water mitigation system, or monitoring well installation phase, the Permittee shall provide written or electronic status updates to the Director every 30 days until such time as the construction of the components is considered complete [9VAC20-81-260.D.1.b.(8).(a)].
- XIV.N.2. *System Component Failure*
Emergency Modification Notification
Within 7 days of noting any Corrective Action remedy component failure, the Permittee shall submit to the Director, a notification describing the cause of the failure [9VAC20-81-260.D.1.b.(8).(e)].
- XIV.N.3. *System Modification*
If modifications other than those described in the CAP are required to correct deficiencies or enhance monitoring system performance after implementation of the remedy, the Permittee shall submit a written request to the Director for approval of the proposed changes no later than 60 days

prior to the date of the proposed modification. The notification must include a description and drawings of the proposed modification; justification for the modification; and evaluation of the performance improvements.

XIV.N.4. *System Design “As-builts”*

Well installation diagrams, boring logs, and the certification required from the groundwater professional shall be submitted as required under 9VAC20-81-250.A.3.g. As-builts for any other remedy component which will be installed after remedy implementation should be submitted within 30-days of construction completion.

XIV.N.5. *Miscellaneous Groundwater Notifications*

Notifications regarding new background determinations, GPS exceedances, background exceedances, off-site impacts, dry wells, well abandonment, well installation, etc., must be reported in a manner consistent with requirements of 9VAC20-81-10 et seq., unless otherwise defined in this Module.

XIV.O. INVESTIGATIVELY DERIVED WASTES

If applicable, based on the remedy implemented onsite, all investigatively derived waste shall be managed in a manner that is protective of human health and the environment, compliant with all applicable state and federal requirements, and is consistent with the methods outlined in the CAP [9VAC20-81-260.C.3.(c).(1).(d)].

XIV.P. SURFACE WATER INVESTIGATION

XIV.P.1. Surface water monitoring is not a component of the site remediation.

XIV.Q. PERMIT DOCUMENTS

It shall be the responsibility of the Permittee to update any permit documents as needed. This may trigger Permit modifications.

XIV.R. LIMITATIONS

Should information contained in any Permittee-authored Permit Document conflict with any requirement or condition contained herein, or language found within 9VAC20-81-10 et seq., as amended; the Module condition and/or Regulatory requirement shall prevail over the language in the Permittee supplied document unless it can be demonstrated that a variance from that regulatory requirement has been granted by the Director.

When the Permittee becomes aware that she/he failed to submit any relevant facts or submitted incorrect information in any groundwater monitoring report to the Director,

she/he shall promptly submit such omitted facts or the correct information with an explanation [9VAC20-81-530.E].

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