

Feasibility Report - Proposed Eastern
Expansion (WDNR License No. 3268)

Vernon County Landfill

Viroqua, Wisconsin

VERSW 167824 | September 11, 2023



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September 11, 2023

RE: Vernon County Landfill
Feasibility Report - Proposed Eastern
Expansion (WDNR License No. 3268)
Viroqua, Wisconsin
SEH No. VERSW 167824 4.00

Mr. Mark Peters, Hydrogeologist
Wisconsin Department of Natural Resources^[OBJ]
1027 W. St. Paul Ave.
Milwaukee, WI 53233

Dear Mr. Peters:

Short Elliott Hendrickson Inc. (SEH®), on behalf of the Vernon County Solid Waste Department, is submitting this Feasibility Report (FR) to obtain the Wisconsin Department of Natural Resources (WDNR) opinion regarding the suitability of the proposed landfill expansion. The Vernon County Landfill (WDNR License No. 3268) proposes an expansion of the existing landfill to continue to provide solid waste disposal services. The proposed expansion will be a contiguous horizontal and vertical expansion directly east of the existing landfill.

This FR was prepared in accordance with s. NR 512 Wisconsin Administrative Code. The enclosed report includes text, tables, and figures, along with appendices labeled A through U and Drawings numbered No. 1 through No. 35. The report information follows the general order and provides information required in the Feasibility Report Completeness Checklist Chapter NR 512, Wis. Adm. Code and addresses requirements presented in the Design and Construction Criteria Completeness Checklist Chapter NR 504, Wis. Adm. Code. Both checklists are included complete with location references.

Should you have any questions or would like to discuss the proposed expansion further, please contact me at 608.498.4844.

Sincerely,

Brian L. Kent, CHMM
Project Manager

dmk

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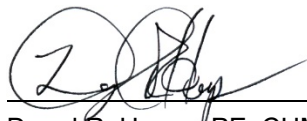
Feasibility Report - Proposed Eastern Expansion (WDNR License No. 3268)

Vernon County Landfill
Viroqua, Wisconsin

Prepared for:
Vernon County
Viroqua, Wisconsin

Prepared by:
Short Elliott Hendrickson Inc.
329 Jay Street, Suite 301
La Crosse, WI 54601-4034
608.782.3161

I, Darryl R. Heaps, hereby certify that I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.

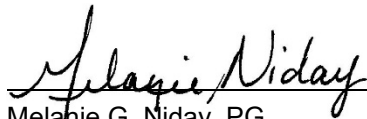


E-25799 September 11, 2023

Darryl R. Heaps, PE, CHMM PE Number Date
Professional Engineer



I, Melanie G. Niday, hereby certify that I am a licensed professional geologist in the State of Wisconsin in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code; that the preparation of this document has not involved any unprofessional conduct as detailed in ch. GHSS 5, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.



672-013 September 11, 2023

Melanie G. Niday, PG PG Number Date
Hydrogeologist



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Feasibility Report - Proposed Eastern Expansion (WDNR License No. 3268)

Vernon County Landfill

Prepared for Vernon County, Wisconsin

1 Introduction

1.1 Purpose and Scope

The Vernon County Solid Waste Department (Vernon County) proposes a vertical and horizontal expansion (referred to hereinafter as “Eastern Expansion” or “Expansion”) of the existing municipal solid waste (MSW) landfill (WDNR License No. 3268). Short Elliott Hendrickson Inc. (SEH®), on behalf of Vernon County, is issuing this Feasibility Report (FR) to provide the information required in NR 512 Wisconsin Administrative Code (Wis. Adm. Code) to demonstrate the feasibility of the proposed Expansion. Specifically, this report has been prepared in accordance with the requirements of NR 500.05, NR 504, and NR 512 Wis. Adm. Code to enable the Wisconsin Department of Natural Resources (WDNR) to provide an opinion on the potential for the Eastern Expansion. A copy of the WDNR’s NR 512 Feasibility Completeness Checklist and the NR 504 Design and Construction Criteria Completeness Checklist are provided in **Appendix A**.

The proposed Eastern Expansion includes a contiguous horizontal and vertical expansion of approximately 9-acres over and east of the existing MSW landfill (WDNR License No. 3268). The contiguous design promotes a minimized landfill footprint. The horizontal component consists of an approximate 4.0-acre horizontal expansion due east and contiguous to Phases IV through VI. The vertical component will extend the existing landfill vertically over an approximate 5.0-acre area of the existing footprint. The Expansion will overlay its waste onto existing Phases IV through VI.

The proposed Expansion results in an increase of 427,355 cubic yards (CY) of air space capacity. This FR presents locational, geologic, and hydrogeologic data collected during site investigations and existing available information. The site investigations also informed the design concepts, which are consistent with the currently permitted MSW Landfill. Supporting data included with this FR are presented as tables, maps, and illustrations within the report and attachments. A plan set including **Plan Sheets 1 through 35** are attached separately. Applicable correspondence, raw data, supporting calculations and miscellaneous information are presented in **Appendices A through U**.

1.2 History and Background

Vernon County owns and operates an integrated waste management system on approximately 250-acres located in the Town of Viroqua, Wisconsin. The current landfill, and proposed

Expansion, is located in portions of the Southwest and Southeast ¼ of Section 15, T13N, R4W, Town of Viroqua, Vernon County, Wisconsin. The integrated waste management system includes, but is not limited to:

- An approximate 10-acre MSW landfill, with an approximate design capacity of 590,000 CY (WDNR License No. 3268).
- A closed small sized (50,000 CY) C&D Landfill (WDNR License No. 3712).
- A recyclable material processing and baling facility.

The Vernon County Landfill was originally designed and permitted in early 1992 with three horizontal phases consisting of a design capacity of 315,000 CY. A vertical expansion was approved in 2005, which included three additional vertical sequences and added 275,000 CY of airspace. The landfill formerly operated as a balefill since it was initially opened in 1993 but was later modified to an area fill operation via a July 2016 Plan Modification.

Vernon County issued an Initial Site Inspection (ISI) request (SEH, November 2020) on November 4, 2020. The WDNR conducted an ISI for the proposed Expansion on November 18, 2020. A revised ISI request dated September 3, 2021 was submitted to the WDNR for consideration of additional area to the north and east of the existing landfill for potential landfill expansion. The WDNR conducted a site inspection of the additional areas on September 30, 2021. In letters dated December 15, 2020 and November 1, 2021, the WDNR indicated the site has potential to be suitable for an expansion. Vernon County submitted an Initial Site Report (ISR) dated November 17, 2021 to the WDNR for the proposed Expansion (SEH, November 2021). The WDNR ISR response, dated February 15, 2022 indicated the proposed expansion has potential for development of a solid waste disposal facility. WDNR comments provided in the ISR are addressed in Section 1.4 below. The WDNR ISI and ISR response letters are provided in **Appendix B**.

Additional historic correspondence and approvals pertinent to the MSW Landfill and this Expansion include:

- Vernon County Sanitary Landfill Feasibility Report (Central Wisconsin Engineers, Inc., October 1990)
- Initial Site Report (ISR) and Feasibility Report Completeness Letters (WDNR, February 6, 1991)
- Feasibility Determination for the Proposed Vernon County Sanitary Landfill (GW Monitoring ID No. 03268) (WDNR, February 26, 1992)
- Addendum to the Vernon County Sanitary Landfill Feasibility Report (Central Wisconsin Engineers, Inc., July 19, 1991)
- Vernon County Sanitary Landfill – Plan of Operation (Central Wisconsin Engineers, Inc., February 1992)
- Conditional Plan of Operation Approval – the Proposed Vernon County Balefill (July 20, 1992)
- Informal Plan Approval of Used Oil Collection Program, Vernon County (March 1, 1994)
- Plan of Operation Approval Modification for leachate Collection Pipe Layout – Module 2 of Phase 1, Vernon County Balefill (WDNR, October 11, 1995)
- Plan of Operation Approval Modification: Increase Phase Size & Eliminate Lysimeter – Modules 1 & 2 of Phase 2, Vernon County Balefill (WDNR March 20, 1997)

- Plan Modification Approval for Phasing Changes at Vernon County Balefill (WDNR, October 16, 2000)
- March 7, 2002 Expedited Plan Modification, Vernon County Sanitary Balefill, License #3268 (WDNR, March 12, 2002)
- Initial Site Inspection – Proposed Vertical Expansion of the Vernon County Landfill (WDNR, June 27, 2002)
- Initial Site Report (ISR) Completeness Determination for the Proposed Vertical Expansion at the Vernon County Landfill, (License No. 3268, Viroqua, WI (WDNR, August 23, 2002)
- Feasibility Report for the Proposed Vertical Expansion of the Vernon County Balefill (Central Wisconsin Engineers & Architects, Inc., August 2003)
- Conditional Plan of Operation for the Proposed Vertical Expansion of the Vernon County Balefill (Landfill) (WDNR, July 29, 2005)
- Conditional Plan Modification to the Plan of Operation Approval for the Expanded On Site Soil Borrow Source, Vernon County Balefill, License #3268, Vernon County, Wisconsin (WDNR, May 18, 2011)
- Conditional Plan Modification to the Plan of Operation Approval for Leachate Biotreatment, Vernon County Sanitary Balefill, License 3268, Town of Viroqua, Vernon County, Wisconsin (August 1, 2013)
- Conditional Plan Modification to the Plan of Operation Approval for the Vernon County Sanitary Balefill, License 3268, Town of Viroqua, Vernon County, Wisconsin. (WDNR, July 1, 2015)
- Conditional Plan Modification to the Plan of Operation Approval for the Vernon County Sanitary Balefill, License 3268, Town of Viroqua, Vernon County, Wisconsin (WDNR, October 10, 2016)
- Initial Site Inspection Request Vernon County Landfill, Viroqua Wisconsin, WDNR License No. 3268 (SEH, November 4, 2020)
- Initial Site Inspection Response - Proposed Expansion to Vernon County Landfill, License #3268 (WDNR, December 15, 2020)
- Conditional Plan of Operation Approval Modification for the Vernon County Sanitary Balefill Landfill, Town of Viroqua, Vernon County, License No. 3268 (WDNR, February 9, 2021)
- Revised Initial Site Inspection Request Vernon County Landfill, Viroqua Wisconsin, WDNR License No. 3268 (SEH, September 3, 2021)
- Supplemental Initial Site Inspection Opinion Letter – Proposed Expansion to Vernon County Landfill, License #3268 (WDNR, November 1, 2021)
- Initial Site Report Proposed Vertical and Horizontal Expansion Vernon County Landfill, Viroqua, Wisconsin, WDNR License No. 3268 (SEH, November 17, 2021)
- Initial Site Report for the Proposed Vertical and Horizontal Expansion Vernon County Landfill, Viroqua, Wisconsin – License #3268 (WDNR, December 17, 2021)
- Initial Site Report Opinion Letter for the Proposed Vertical and Horizontal Expansion Vernon County Landfill, Viroqua, Wisconsin – License #3268 (WDNR, February 15, 2022)

- Alternate Geotechnical Program Request – Proposed Landfill Expansion WDNR License No. 3268 (SEH, December 13, 2021)
- Conditional Plan of Operation Approval Modification for the Organic Stability Plan and Leachate Recirculation Plan for the Vernon County Landfill, Vernon County, Wisconsin, License #3268 (WDNR, October 11, 2022)
- Acceptance of Proposed Alternative Geotechnical Investigation Program for Feasibility Study, Vernon County Landfill, Vernon County, Wisconsin – License #3268 (WDNR, March 30, 2022)
- Response to AGIP Acceptance Letter – Proposed Landfill Expansion WDNR License No. 3268 (SEH, July 27, 2022)

1.3 Exemption Requests {NR 512.05}

The following exemptions to NR 500 and NR 140 Wis. Adm. Code are requested for the proposed Expansion. A listing and explanation of each exemption request is provided including references to the appropriate sections of this report and provides additional support and justification for each exemption request.

1.3.1 New Exemption Requests

Alternate Geotechnical Investigation Program (AGIP)

The following are exemptions requested as part of the Alternate Geotechnical Investigation Program (AGIP) for the proposed Eastern Expansion that was submitted to the WDNR on December 13, 2021 (**Appendix I**) and accepted by the WDNR on March 30, 2022 (**Appendix B**). A Response to AGIP Acceptance Letter was also submitted to the WDNR on July 27, 2022 (**Appendix I**):

NR 507.05(2) - Attempts to core bedrock have been unsuccessful due to weathering, existing fractures, and layered heterogeneity of dolomite, dolomitic sandstone, and siltstone, Vernon County is requesting an exemption to NR 507.05(2) Wis. Adm. Code and propose that coring of bedrock be attempted at only one drilling location (MW-14WT). In lieu of bedrock coring, downhole geophysical logging will be used to evaluate bedrock.

NR 512.09 - Vernon County Landfill is requesting an exemption to use previously collected data to meet requirements of s. NR 512.09, Wis. Adm. Code. Use of this data would include, but not be limited to, the following: Field hydraulic conductivity tests completed on the existing wells, including those wells which have been abandoned; Grain size analysis, Atterberg limits, soil classification, and laboratory hydraulic conductivity from past investigations; Soil boring logs from past investigations which are not totally compliant with the present NR 507.05 Wis. Adm. Code, but provide useful and accurate data; Existing groundwater quality data as background data.

NR 512.11(2) – NR 512.11(2) Wis. Adm. Code requires that geological cross-sections be constructed through all borings. Since we have a considerable amount of boring and monitoring well data for the facility, we request an exemption to the requirement and propose to construct cross-sections only through the borings and wells that assist in defining the lateral and vertical extent of the major lithostratigraphic units, this will include all borings that characterize the subsurface within 300 feet of the expansion.

NR 507.14 and NR 140.23 - Sections NR 507.14 and NR 140.23, Wis. Adm. Code, require that soil boring information be presented on department forms and include the information listed in s.

NR 507.14(2), (3) and (4), Wis. Adm. Code. Some historic data from the files for the year 1987 are not available; however, some historical soil boring descriptions are presented on geological figures in historical files. Although sufficient information is provided from available and proposed soil boring logs, Vernon County is requesting an exemption for the use of all historical logs during final presentation in the feasibility report, if appropriate, to assist in the overall site interpretation.

NR 507.05(1)(e) - An exemption to NR 507.05(1)(e) Wis. Adm. Code is being requested for the requirement to retain soil samples until the department approves the report that included documentation of the soil samples. The soil samples from the existing historic borings utilized for the AGIP have not been retained. The borings were completed during previous permitting processes or investigations and approved by WDNR.

Baseline Sampling of New Groundwater Monitoring Wells

NR 140.10, NR 140.12, and NR 140.28 - An exemption is requested from NR 140 Wis Adm. Code groundwater quality standards based on the results of the first six rounds of baseline groundwater sampling at five recently installed monitoring wells. Details of the baseline groundwater sampling results are included in Section 5.4.3.2, and a summary of the exemption requests are provided on **Table 5-8**. Specifically, exemptions are requested for the following wells and parameters.

- An exemption in accordance with NR 140.28(3)(a) is requested for arsenic at MW-14WT.
- An exemption in accordance with NR 140.28(4)(a) is requested for manganese at MW-14WT.

Existing Groundwater Monitoring Wells within 300-feet of Proposed Expansion

NR 140.10, NR 140.12, and NR 140.28 - An exemption is requested from NR 140 Wis Adm. Code groundwater quality standards based on the results of semi-annual detection groundwater sampling an existing monitoring well installed during past investigations and utilized for the detection groundwater monitoring program. Details of the detection groundwater sampling results are included in Section 5.4.3.2, and a summary of the exemption requests are provided on **Table 5-8**. Specifically, exemptions are requested for the following well and parameter.

- An exemption in accordance with NR 140.28(3)(a) is requested for nitrate plus nitrite, as nitrogen (N+N) at MW-6.

5% Overfill

NR 504.09(2)(h) - An exemption is being requested to temporarily allow final outboard fill slopes to exceed 4 horizontal to 1 vertical slopes. The proposed modification is to allow maximum intermediate waste filling grades that are slightly higher than the approved final waste grades in areas of the landfill that have not received final cover. We are requesting approval for the maximum intermediate waste grades to be 5 percent higher than the final waste grades when compared to the total depth of waste at a given location. At no time during the operating life of the landfill will the waste volume exceed the permitted capacity. This modification does not change the final waste grades, the permitted capacity, or the closure sequencing for the landfill. Geotechnical slope stability analysis will account for 5% overfill grades and will be completed in the Plan of Operation.

NR 504.06(3)(h) – An exemption is being requested decrease the length of clay liner tie in between the proposed Expansion and existing clay liner. NR 504.06(3)(h) Wis. Admin. Code requires that the clay component of a liner in adjacent phases shall be keyed together using a

minimum of 4 steps, with the total width of the spliced area measuring a minimum of 15 feet. We are requesting that the clay tie in be performed with 4 steps over a 5-foot distance to minimize disruption to in place waste and composite clay and geomembrane base liner as shown on **Detail 7** on **Plan Sheet 30**.

1.3.2 Previous Granted Exemptions

In the Feasibility Determination for the previous vertical expansion dated June 28, 2004, the WDNR granted the following exemptions for the MSW landfill. These exemptions were addressed and incorporated in the Plan of Operation for MSW landfill and are requested to be continued for the proposed expansion, unless otherwise noted.

Exemptions for Proximity to Private Water Supply Well NR 504.04

NR 504.04 (3)(f) - An exemption to NR 504.04 (3)(f) was granted within the Feasibility Determination for the previous vertical expansion dated June 28, 2004, to allow the expansion to occur within 1,200 feet of the existing private water-supply well that serves the balefill facility.

Exemptions to Water Quality Standards NR 140.10, NR 140.12

NR 140.10, NR 140.12, and NR 140.28 - Exemptions to the water quality standards specified in s. NR 140.10 and s. NR 140.12 Wis. Adm. Code were approved for the currently permitted landfill in the feasibility determination letter dated June 28, 2004. Additionally, alternative concentration limits (ACL) for several inorganic parameters were approved in WDNR Plan of Operation approval dated July 29, 2005. The following NR 140 groundwater standard exemptions are requested to be continued for the proposed Expansion. It is also requested that the ACLs outlined in the July 29, 2006, Plan of Operation approval be continued for the proposed Expansion. Refer to **Table 5-7** for a summary of the existing groundwater quality exemptions.

- Request continuation of NR 140.28(3)(a) exemption for iron at MW-1R.
- Request continuation of NR140.28(4)(a) exemption for iron at MW-1PR, MW-3, MW-5A, MW-7, MW-9, MW-12, and P-1.
- Request continuation of NR 140.28(3)(a) exemption for fluoride at MW-2, MW-2P, MW-3, MW-4P, MW-5A, MW-6, MW-8R, MW-11, and MW-12.
- Request continuation of NR 140.28(3)(a) exemption for manganese at MW-14.
- Request continuation of NR 140.28(3)(a) exemption for nitrate plus nitrite, as nitrogen (N+N) at MW-1RZ, MW-13P, and MW-14.
- Request continuation of NR 140.28(4)(a) exemption for nitrate plus nitrite, as nitrogen (N+N) at MW-14Z.

1.4 WDNR ISR Comments {NR 512.05}

In accordance with NR 512.05, the following addresses all review comments in the WDNR's ISR response letter. To assist in the WDNR's review, each comment identified in the letter has been listed in *italics*, and subsequently addressed in non-italicized text.

WDNR Comment: *The uppermost bedrock unit at the site is fractured dolomite. Flow patterns through fractured bedrock generally are difficult to monitor and do not retard or facilitate attenuation of contaminants in groundwater. Fractured bedrock flow can act as a conduit to deeper aquifers that may be sources for water supply wells, in the event of groundwater impacts. The ISR states that it is anticipated that bedrock excavation may be necessary to achieve a 10-*

foot separation between the bottom of the liner and the top of bedrock. The feasibility report should discuss what type of soil backfill and method of placement that would be used to achieve the 10-foot minimum separation. The geotechnical analysis should also discuss the suitability of this geological setting with respect to demonstrating compliance to the groundwater protection standard of s. NR 504.04 (4)(d), Wis. Adm. Code. This may include an evaluation of the bedrock fractures including their size, frequency, distribution, connectivity, hydraulic conductivity, observations from boring and well drilling, existing facility design and performance, and other aspects. Alternative designs and additional measures to protect groundwater should be considered and discussed. Examples of additional measure may include an additional layer to the liner, additional leachate extraction, larger diameter leachate collection pipes or other designs to provide additional protection to groundwater. The feasibility report should include a discussion of the proposal and any alternatives considered, using the information from the site-specific geotechnical investigation.

In addition, the ISR states the Cambrian sandstone aquifer would be the only aquifer available for use within the proposed landfill expansion area. However, cross-sections and logs from previous investigation conducted at the site indicate the existence of perched groundwater and water table aquifer conditions within the Ordovician dolomites of the Prairie du Chien Group beneath the site. The feasibility report should provide a more complete description of the groundwater conditions, aquifers, and hydrogeology at site, using existing and new information from the site-specific geotechnical investigation.

Response: After further site investigation, it has been determined that bedrock will not have to be excavated in order to achieve a 10-foot separation between the bottom of the liner and the top of bedrock. Further discussion regarding bedrock separation is presented in Section 8.5.1. Further evaluation of the suitability of the geological setting with respect to demonstrating compliance to the groundwater protection standard of s. NR 504.04 (4)(d), Wis. Adm. Code is presented in Section 5.4. The aquifer encountered on-site is the St. Peter-Prairie du Chien-Jordan aquifer. All monitoring wells and piezometers on-site are completed within bedrock of the Prairie du Chien Group. A comprehensive discussion of the groundwater conditions on-site is presented in Section 5.4.2.

Vernon County has historically implemented additional measures to protect groundwater through its composite liner design. The composite liner design of the existing landfill contains a 5-foot thick clay layer which exceeds the minimum 4-foot thick requirement of NR 504.06(2)(e). Vernon County intends to continue implementation of a 5-foot thick clay layer for the proposed Expansion. Further discussion of the liner design is provided in Section 8.7. Additionally, regulatory changes to liner design criteria in NR 504 will improve effectiveness of the liner system through requirements for higher permeability drainage blanket material (1 centimeter per second) coupled with a geotextile cushion to protect the underlying geomembrane. Electrical resistivity testing will continue to be performed to verify the geomembrane is not damaged during placement of the leachate collection blanket, or if damaged is appropriately prepared prior to waste placement. Vernon County also implements operational practices for added protection of the composite liner system through placement of a 10-foot "fluff" lift of initial waste in a newly constructed cell. The fluff lift consists of MSW that does not contain large items that could potentially pierce the liner. Waste compaction equipment is not allowed to operate until this initial fluff lift has been established.

WDNR Comment: *The ISR indicates that the proposed expansion footprint is within 1,200 feet of one private water supply well – the well serving the landfill office and recycling center. Section*

NR 504.04(3)(f), Wis. Adm. Code, requires a minimum distance of 1,200 feet to be maintained between the limits of filling and public or private water supply wells. If the well remains in service, the feasibility report will need to request an exemption from s. NR 504.04(3)(f), Wis. Adm. Code, for this water supply well. An exemption request needs to explain why the exemption is warranted, including supporting information showing how the well would be adequately protected from potential groundwater contamination. The supporting information should consider the factors that affect the ability to meet the groundwater protection standard which include the groundwater flow properties displayed in this site-specific bedrock, the distance to bedrock and groundwater, soil backfill characteristics and the proposed landfill design. Additional factors to consider include the groundwater flow directions, the construction of the water supply well and the ability to effectively monitor groundwater around the facility.

In addition, a variance from the locational setback requirement of s. NR 812.08 (4) (g) (1), Wis. Adm. Code, for each water supply well located within 1,200 feet of the proposed limits of waste, under the provisions of s. NR 812.43, Wis. Adm. Code would be needed; or may need to be updated if a variance was previously issued. The feasibility report should include a copy of any previously issued NR 812 well variances. If a previous variance exists, the department will determine if an updated variance is necessary and provide that information to Vernon County. A variance may need to be updated depending on circumstances such as changes in proximity of waste to the well, changes in waste location with respect to groundwater flow, changes to the well or other reasons.

Because the review times established in ch. NR 812, Wis. Adm. Code, are different than the review times established for the feasibility report, please coordinate submittal of any variance application needed with the department so that the department's decision on the variance is synchronized with the decision on landfill's feasibility determination. The department will inform Vernon County when to submit the NR 812 variance application. Typically, this is just before the public comment period.

Any NR 812 well variance applications should be submitted to Marty Nessman with the department's Drinking Water and Groundwater (DG) program. The NR 812 variance application form can be accessed at:

<https://dnr.wi.gov/files/pdf/forms/3300/3300-209.pdf> The department must receive both the well construction information for each well and a completed NR 812 well variance application before the department may issue an NR 504 exemption.

Response: The existing private well-supply well (P-1) that serves the balefill facility is located greater than 1,200 feet from the proposed Expansion area; therefore, an exemption is not needed.

WDNR Comment: As a reminder, in accordance with ss. 289.22 and 289.23, Wis. Stats., the applicant must notify all affected municipalities and apply for all specified local approvals at least 120 days before a feasibility report can be submitted to the department (the exact time period depends upon the municipal response). The Waste Facility Siting Board has specific requirements which apply to the municipal notification. For additional information on these requirements, please contact the Wisconsin Waste Facility Siting Board at (608) 267-7854. The feasibility report must contain documentation showing that all proper notifications and applications for all specified local approvals have been made, in accordance with s. NR 512.06, Wis. Adm. Code.

Response: Local notifications with certified mail confirmations can be found in **Appendix C**. Notifications are dated June 1, 2022, postmarked June 15, 2022, and were delivered June 17, 2022 or June 27, 2022.

2 Procedural Requirements {NR 512.06, NR 512.19 and Wis Stats. 289.24(1)(d)}

2.1 Local Approvals {NR 512.06(1)}

Affected municipalities, as defined under s. 289.01 (1) of Wisconsin Statutes, surrounding the proposed Expansion include the Town of Viroqua and Vernon County (the applicant). The Vernon County Solid Waste and Recycling Department notified the affected municipalities regarding the proposed landfill Expansion by letter dated June 1, 2022. Copies of each notification letter sent to the affected municipalities along with the signed return receipts for certified mail are provided in **Appendix C**. The Waste Facility Siting Board (WFSB) was formally notified on June 1, 2022. Due to issues with the WFSB not receiving certified mail receipts until March 17, 2023, an extension was given to the affected municipalities.

The Town of Viroqua passed a siting resolution on March 16, 2023 indicating their intent to participate in negotiations with Vernon County regarding the proposed Expansion. Vernon County is the applicant, therefore, is not considered an “affected municipality” for the purposes of negotiation. A siting agreement is currently being negotiated between the affected parties.

2.2 Submission of Reports {NR 512.06(2)}

As part of the landfill siting process, Vernon County is required to submit a FR in accordance with NR 512.05. As required by NR 512.06(2) and applicable requirements of Wis State Statutes, the appropriate number of copies and plans as well as the ISR were sent to WDNR and affected municipalities. Certified mail receipts and documentation of the transmittal to the local affected municipalities and local library will be sent to WDNR when they become available.

2.3 County Solid Waste Management Plans {Wis Stats. 289.24(1)(c)}

According to state statute 289.10, “each county board in Wisconsin individually or jointly with another county board may prepare and adopt a county solid waste management plan.” The Vernon County Landfill accepts wastes primarily from within Vernon County.

Based on information presented in the 2003 FR, Vernon County’s original solid waste management plan was completed in 1986 but was revised in March of 2002. These documents were reviewed in the process of conducting this feasibility study to ensure that the proposed landfill Expansion is consistent with existing solid waste management plans.

Vernon County’s 1986 Solid Waste Management Plan recommended the construction and operation of a countywide sanitary landfill in conjunction with source reduction efforts. Acting on this recommendation, Vernon County opened its sanitary landfill in 1993, with the waste collection and transportation services contracted to a private firm. Source reduction efforts focused on recycling plastics, metals, glass, motor oil, and some paper products. Vernon County later opened a construction and demolition landfill (in 1995) at the same site to provide a lower cost option for the disposal of inert building materials.

The revised (2002) Vernon County Solid Waste Management Plan addressed future waste disposal alternatives in anticipation of the time when the existing disposal facilities are full. This revised plan recommended that construction/demolition waste be placed in the landfill once the construction/demolition waste landfill closed and that a vertical expansion be added to the landfill to extend its life.

Vernon County's Solid Waste Management Plan has not been updated since 2002. Although no update has been made, the proposed Expansion does not conflict with the County's approach and philosophy to managing waste. Vernon County believes in managing waste locally to provide cost effective waste disposal to its residents and in continuing to expand upon disposal alternatives, waste reduction, reuse, and recycling where opportunities arise. In 2018, Vernon County modified its policy to allow acceptance of out of county waste. However, out of county waste is not a significant source of incoming waste nor does Vernon County currently pursue out of county waste for purposes of adding additional revenue and/or becoming a regional facility.

2.4 Advisory and Public Opinion Process {Wis Stats. 289.24(1)(d)}

In accordance with s. 289.24(1)(d), the FR is required to contain a description of the advisory process undertaken by the applicant to provide information to the public and affected municipalities and to solicit public opinion on the proposed facility.

Throughout the existence of the Vernon County Landfill, the County has strived to strengthen community relations and outreach through various methods. Community outreach has included a mixture of delivery and communication approaches including direct mailings, local press releases and interviews, public tours, and engagement with local schools and at public events, special interest groups, and clubs. Following is a summary of examples of advisory and solicitation of public opinion efforts:

- Provide informative brochures via direct mailing to guide residents on recycling and waste disposal practices and pricing.
- Maintain solid waste and recycling information on the County website for residents to readily access for information on waste disposal, recycling, household hazardous materials (HHM) recycling, agricultural plastic film recycling, asbestos disposal, etc.
- Use of social media to inform residents of collection events, photographs of the facilities, and links to more information.
- Offer and host informative tours of the recycling center and landfill.
- Conduct monthly solid waste committee meetings that are open to the public.

Each of the above outreach efforts has focused on demonstrating the value of the services it provides to the community. The proposed Expansion will continue to provide a local option to support waste disposal services.

2.5 Ownership and Compliance with Plans and Orders {NR512.19}

According to NR 512.19, the FR shall identify all persons owning a 10% or greater legal or equitable interest in the applicant or in the assets of the applicant, including shareholders of a corporation, which is an applicant, and partners of a partnership, which is an applicant. The FR shall also identify all other Wisconsin solid or hazardous waste facilities for which the applicant or any identified person is named in, or subject to an order or plan approval issued by WDNR. In addition, the FR shall identify all other Wisconsin solid or hazardous waste facilities that are

owned by persons, including corporations and partnerships, in which the applicant or any identified person owns or previously owned a 10 percent or greater legal or equitable interest or a 10 percent or greater interest in the assets and include a statement indicating whether all plan approvals and orders relating to all identified facilities are being complied with.

The Vernon County Landfill, and associated facilities, are wholly owned by the County. The County does not own a 10% or greater interest in any other solid or hazardous waste facilities. Please refer to **Appendix D** for a copy of WDNR Inspection Reports (2019-2022) and compliance records. Two non-compliance letters were issued during 2021 and 2022 but Vernon County Landfill worked diligently to resolve these issues and a Return to Compliance Letter was issued by the WDNR on October 11, 2022. Vernon County Landfill was recently issued a notice of non-compliance in a letter dated August 23, 2023 by the WDNR for a minor infraction regarding daily cover. At the time, Vernon County was awaiting imported daily cover materials for placement over the active working face. Vernon County is currently addressing the issue and is anticipated to be resolved well before the WDNR's specified September 30, 2023 timeline.

3 General Facility Information {NR512.07 and Wis Stats. 289.24(1)(c)}

The following provides general facility information regarding the existing landfill and proposed Expansion as required by NR 512.07.

Name of Site:	Vernon County Landfill
License No.:	WDNR License No. 3268
Site Location:	Southwest and Southeast ¼ of Section 15, T13N, R4W, Town of Viroqua, Vernon County, Wisconsin
Total Acreage	Existing: Total Facility: 250 acres Current MSW Landfill (Phases I-VI): 10.02 acres Proposed: Horizontal Expansion (Phases VII-XI): 4.57 acres Vertical (Overlay) Expansion: 9.58 acres
Owner/Permittee/Operator:	Vernon County Stacie Sanborn, Director of Solid Waste S3705 County Road LF Viroqua, WI 54665 Phone: 608.634.2900 Email: stacie.sanborn@vernoncounty.org
Landfill Address:	S3705 County Road LF Viroqua, WI 54665
Areas Serviced:	Vernon County
Expected Waste Type:	MSW, C&D, Special Waste
Estimated Waste Quantities:	MSW: 25,000 cubic yards per year 19,000 tons per year
Site Life and Calculated Closure Date:	Existing MSW: approximately 1 year, capacity expected to be reached during the Fall 2024 Proposed MSW Expansion: maximum 15-years (2024-2039)
Design Capacity:	Existing MSW: 590,000 cubic yards Proposed MSW Expansion: 427,355 cubic yards
Submittal Prepared by:	Short Elliott Hendrickson Inc. (SEH) 3535 Vadnais Center Drive St. Paul, MN 55110 Project Manager: Brian Kent, CHMM Project Engineer: Darryl Heaps, P.E. Project Geologist: Melanie Niday, P.G.

3.1 Project Title

Vernon County Landfill
Proposed Eastern Expansion
WDNR License No. 3268
Viroqua, Wisconsin

3.2 Primary Contacts

Owner, Operator, and Applicant:

Vernon County
Contact: Stacie Sanborn, Director of Solid Waste
S3705 County Road LF
Viroqua, WI 54665
608.634.2900
stacie.sanborn@vernoncounty.org

Engineering Consultant:

Short Elliott Hendrickson Inc.
Contact: Brian Kent
329 Jay Street Suite 301
La Crosse, WI 54601
608.498.4844
bkent@sehinc.com

3.3 Present and Proposed Property Owner

Vernon County
S3705 County Road LF
Viroqua, WI 54665

3.4 Proposed Landfill Location by ¼ - ¼ Section

The existing landfill and proposed Expansion are located in the SE ¼ of the SW ¼ and the SW ¼ of the SE ¼ of Section 15, T13N, R4W.

3.5 Total Acreage of Property and Proposed Fill Area

The existing landfill and proposed Expansion will be located on approximately 250 acres of contiguous property owned by Vernon County. The proposed fill area of the horizontal component of the Expansion is approximately 4-acres and the vertical component resides over an approximate 5-acre area of the existing footprint. The existing landfill plus the proposed Expansion will result in an approximate total landfill footprint of 15-acres.

3.6 Proposed Landfill Life and Design Capacity

The proposed Expansion will have a design capacity of approximately 427,355 CY. The design capacity is based on a maximum 15-year site life. Refer to Section 11 for more detailed discussion on proposed site life and anticipated closure date.

3.7 System Description and Municipalities Serviced

The Vernon County Landfill serves all municipalities, commercial businesses, and industry located within Vernon County which includes 21 townships, 9 villages, and three cities. Based on population estimates from the Wisconsin Department of Administration (WIDOA), the estimated population of Vernon County at the start of 2023 was 30,914.

The system accepts residential, commercial, industrial, and institutional wastes. Vernon County also serves as the recycling responsible unit for the municipalities within the County. The services offered by the system are consistent with Wisconsin's waste management policies. The system keeps transportation distances and costs low, as well as ensuring strong private sector competition by maintaining accessible, fairly priced services.

3.7.1 MSW Landfill

The MSW landfill was originally designed and permitted in early 1992 with three horizontal phases, a design capacity of 315,000 CY, and comprising of an approximately 10-acre footprint. A vertical expansion was approved in 2005, which included three additional vertical sequences and added 275,000 CY of air space.

The liner system for Phases I through III consists of a 5-foot-thick clay liner overlain with a 60-mil HDPE geomembrane liner. Phases I and III are underlain with a partial basin clay lined lysimeter. To date, all the permitted landfill cells have been constructed. Approximately 7-acres of the landfill has interim cover, and no final cover has been completed.

Waste currently placed in the MSW landfill includes MSW from County residences and commercial establishments, C&D waste, and industrial/special wastes. Per the WDNR tonnage report for 2022, approximately 33,769 CY of permitted airspace remains as of January 2023 in the MSW landfill. Based on recent filling rates, the existing permitted MSW landfill will be full in approximately the Fall of 2024. Copies of WDNR tonnage reports are provided in **Appendix E**.

3.7.2 Recycling Program

Beginning in 1991, the Vernon County Solid Waste and Recycling program has served as the Responsible Unit (RU) for the municipalities located within Vernon County except for the Town of Liberty. The recycling program provides roll-off containers and curbside delivery and pick up to each participating municipality. The source separated recycled materials are delivered to the recycling building, located at the landfill property, where they are further processed, sorted, and bailed for subsequent sale. The Vernon County recycling program was recognized with the WDNR Wisconsin Recycling Excellence Overall System Award during 2020.

3.7.3 C&D Debris

C&D debris that is not diverted prior to delivery to the landfill is placed in the MSW landfill.

3.7.4 Citizens Drop-off Area

Use of the landfill's public drop-off site is available to homeowners, renters, and businesses located within Vernon County. In 2019, the citizen's drop-off area was expanded to include bins for source separated recyclables and provides a valued convenience to the system users and is

much safer than allowing the general public access to the active landfill face and recyclable material processing areas with equipment operators and haulers. Drop off items include:

- Source separated recyclables (plastic, glass, tin, paper, metal)
- Tires
- Large items: Furniture and furnishings including upholstered items
- General household waste, toys, bikes, grills, lawnmowers (without gas and oil), mattresses, stoves, hot water heaters, washers, dryers, small appliances, and other items
- Demolition/Construction Debris: Wood, drywall, doors, windows, sinks, toilets, tubs, roofing, bricks, carpets, tile, and flooring
- Garbage: Normal household waste like bagged waste, paper, and food waste
- Other: Yard waste/grass clippings, shingles, brush, and animal carcasses
- Refrigerators, dehumidifiers, air conditioners

3.8 Anticipated Waste Types, Characteristics, and Volumes

It is anticipated that the future waste types and characteristics will remain very similar to the waste currently being received, and landfilled, at the facility. Slight changes may occur as the result of improvement to national, regional, and local recycling initiatives, such as food wastes or other high organic waste streams being diverted. Per the 2022 WDNR tonnage report, approximately 17,327 tons of waste was placed in the MSW landfill. Of this tonnage, approximately 94% was MSW, 5% was C&D material, and less than 1% was alternate daily cover (ADC) materials.

While not a significant source of tonnage, special waste is accepted at the landfill. Prior to accepting special wastes at the facility, each waste type and generator are thoroughly reviewed in accordance with the approved Special Waste Management Plan to ensure they are appropriate for disposal and will not negatively impact landfill operations. Special waste sources that are not appropriate are rejected as part of the application process and are not received at the facility.

Waste volumes can vary based on density, but typically Vernon County Landfill consumes approximately 25,000 CY of airspace annually. Waste intake can vary seasonally with less tonnage received in the winter months and higher tonnage over the summer months. Seasonal fluctuations are primarily driven by construction and recreation in the area. These tonnages and volumes already consider the effect of waste reduction and recycling initiatives as materials diverted from landfill, such as household recyclables, are not included in the tonnage or airspace consumption totals.

3.9 Anticipated Cover Frequency

Cover frequency will be daily, as is currently applied. Most of the daily cover utilized by the facility consists of sand imported to the site. When available, ADC, which are beneficially used waste products received at the facility, are utilized for daily cover. Currently the facility is approved to utilize the following waste streams for ADC:

Foundry Sand	Wood Chips	Petroleum Impacted Soil
Street Sweepings	Foundry Slag	Coal Bottom Ash

At least 6-inches of daily cover and/or ADC is placed on the active working face at the end of each day. To the extent feasible, the daily cover and ADC is removed at the beginning of each day and reused.

3.10 Mode of Operation

The Vernon County Landfill will continue to operate as an area fill with the following considerations:

- Segregate C&D material from MSW to the extent operationally feasible.
- Utilize a 10-foot “fluff” lift when placing waste on a newly constructed cell. The fluff lift consists of MSW that does not contain large items that could potentially pierce the liner.
- Separate disposal areas for asbestos containing materials, which are tracked and mapped.

3.11 Hours of Operation

Hours of operation are Monday through Friday from 7:30 am to 3:30 pm, and every second Saturday of each month between 8:00 am and 12:00 pm (noon).

4 Land Use Information {NR512.08}

4.1 Site Present Land Use

No changes to the present land use within the Expansion footprint or overall landfill property have occurred since submittal of the November 2021 ISR. The approximate 4.0-acres for the proposed horizontal expansion are currently vegetated grassland, wooded, and undeveloped, except for the current sedimentation basin along the east side of the existing landfill. The land immediately to the east and north of the landfill and proposed Expansion area is owned by Vernon County. It consists of a wooded ridge sloping rapidly to separate valleys, which converge approximately 5,000-feet to the northeast in the area of Seas Branch Pond. Beyond the wooded valley to the east are agriculture fields with a farm located approximately 1-mile east and a farm approximately 4,000-feet southeast. The Vernon County owned parcel east of the landfill entrance road and south of the landfill is the existing clay borrow source which is also used as cultivated agricultural croplands. Figure 5 in **Appendix F** depicts existing land use for the landfill property and surrounding land use within 1-mile of the proposed Expansion.

4.2 Surrounding Area Land Use

No changes to the surrounding land use have occurred since submittal of the ISR. Adjacent property to the north is wooded and decreases in elevation to the Seas Branch Stream, located approximately 1,500-feet from the landfill, which meanders along County Highway Y. Intermittent residential properties are located along County Highway Y, with the closest being approximately 1,900-feet from the landfill. Land use for property to the west of the landfill is a mixture of agriculture fields and wooded parcels. The closest residence to the west is located on County Road Y and is approximately 2,700-feet from the landfill. Land use for the property to the south of the landfill is also a mixture of agriculture fields and wooded parcels. The closest residence to the south is located on County Road LF and is approximately 1,500-feet from the landfill.

4.3 Land Use Zoning

No land use zoning changes have occurred since submittal of the ISR. The Vernon County Landfill property is located within the Town of Viroqua jurisdictional boundary. According to the Town of Viroqua Clerk, the township has adopted a zoning ordinance which is available on their website. Based on review of the draft ordinance and zoning map (Town of Viroqua 2017), the Vernon County Landfill property is located in a “Special Purpose District”. Permitted uses in the special purpose district include the following uses, so long as such sites are secured in a sufficient manner to insure public and environmental safety, including meeting all applicable State or Federal standards and laws: Landfills and former Landfills; Junk Yards; and, chemical, biological, and/or hazardous material production or handling.

Based on review of the Town of Viroqua’s zoning ordinance, current zoning will not require special applications or variances to facilitate the Expansion. Since the entire proposed Expansion footprint is located on Vernon County property, and does not require a purchase of agricultural property, an Agricultural Impact Statement will not be required.

As indicated in the WDNR’s opinion to the ISI, the proposed Expansion is not located in a floodplain, conservancy, or shore land. In such, zoning ordinances relating to these instances are not applicable.

4.4 Adjacent Landowners

Review of Vernon County online land records in July 2023 indicated there have been six landowner changes to parcels adjacent to the Vernon County property since submittal of the ISR. Landowners whose property is contiguous to the landfill property boundaries and all residences located within 1,200 feet of the anticipated limits of filling are provided in **Appendix F**, Figure 2. Landowner changes since submittal of the ISR are indicated on this figure. Names and contact information for the landowners are summarized on Table 1 located in **Appendix F**. The proposed landfill Expansion footprint is located on property currently owned by Vernon County and the footprint is greater than 100-feet from any existing property boundary. In addition, there are no existing residences or private wells located within 1,200 feet of the proposed landfill Expansion footprint. The private well servicing the County’s office and recycling center is located less than 1,200 feet from the existing landfill footprint but greater than 1,200 feet from the proposed Expansion area. On November 5, 1991, the WDNR issued the County a variance to install a potable well within 1,200-ft of the proposed landfill as discussed in Section 1.5. An exemption to NR 504.04 (3)(f) was granted within the Feasibility Determination for the previous vertical expansion dated June 28, 2004, to allow the expansion to occur within 1,200 feet of the existing private water-supply well that serves the balefill facility.

Properties contiguous to the County landfill property consist primarily of large vacant parcels of property owned by local residents. Following is a summary of the properties contiguous to the landfill property and a cross reference number showing their location on Figure 2 and Table 1 in **Appendix F**. Landowner changes of these parcels since submittal of the ISR are underlined.

- Randy and Karen Crume own two parcels to the north and east of the County property. One parcel (#1) is approximately 20-acres and is wooded and undeveloped. The second contiguous parcel (#2) is approximately 38-acres is being utilized for pasture, agricultural fields and agriculture buildings. The Seas Branch Stream also meanders through the parcel.

- Randy Crume owns an approximate 5-acre parcel (#3) to the east of parcel #1 and north of the County property. The parcel is wooded and undeveloped. A portion of this parcel (approximately 2 acres) was formerly owned by Vernon County and appears to have been sold to Mr. Crume since submittal of the ISR.
- Gerald S Hanoski Trust owns an approximate 30-acre parcel (#4) of wooded undeveloped land east and north of the County property.
- K&M Herlitzke Farms LLC owns five parcels (#5, #6, #7, #12, and #13) to the east, southeast and south of the County property. The parcels comprise approximately 140-acres and are utilized for agriculture fields.
- Steven and Debra Clark own an approximate 20-acre parcel (#8) east of the County property. The property is wooded, and a small house or cabin is located in the south-central portion of the property.
- Wisconsin RSA #8 owns an approximate 9-acre parcel (#9) east of the County property. The parcel contains a telecommunication tower and a small building within a fenced and secured area. The building likely contains equipment associated with the telecommunications tower.
- The Zion Church owns an approximate 1-acre parcel (#10) to the southeast of the County property. The one-acre parcel is vacant except for a small rural cemetery.
- Jerome Butera Trust owns an approximate 5-acre parcel (#11) to the southeast. This property does not appear to directly adjoin Vernon County property. The property is developed and contains a residence.
- The John & Linda Kieler Revocable Trust owns three parcels (#14, #16, #18) south of the County property across County Road LF. The parcels comprise approximately 90-acres wooded and are utilized for agriculture fields.
- Robert & Tammy Menne own an approximate 4-acre parcel (#15) south of the landfill property across County Road LF. The property is utilized as a residence and for agriculture related activities.
- Chad Williams owns an approximate 4-acre parcel (#17) south of the landfill property. The property is utilized as a residence. The William's private well is routinely sampled as part of the existing WDNR plan of operation approval.
- Wayne Kruizenga owns an approximate 28-acre parcel (#19) west of the landfill property. The property is vacant is utilized as an agriculture field.
- Rodney Wiebe owns two contiguous parcels (#20 & #21) west and northwest of the landfill property. The parcels comprise approximately 80-acres and are a mixture of wooded areas, agriculture fields and pasture. County Road Y and the Seas Branch Stream meander through the northernmost parcel (#21).
- Grace Acres LLC own two contiguous properties (#22 & #23) north and northwest of the landfill property. The parcels comprise approximately 28-acres and contain a mixture of wooded areas, agriculture fields and pasture. The Seas Branch Stream meanders through the parcel #22 and a residence and outbuildings are located on the north side of the Seas Branch Stream.

4.5 Recreational, Historical, Archaeological and Critical Habitats

4.5.1 Recreational Areas

There are no recreational areas on and in the vicinity of the landfill property.

4.5.2 Historical and Archeological Sites

As required by Wis. Stat. §44.40, the WDNR performed a review of the area to determine if any known historic, scientific, or archeological areas exists at or near the proposed facility. On October 2, 2020, Laura Spears, WDNR Wastewater Specialist, issued a letter summarizing the findings of an endangered resources (ER) and cultural/historic review for the proposed Expansion as part of the ISI request. The ER and cultural/historic review were updated in an August 31, 2021, letter issued from Laura Spears, which included the additional area provided in the revised ISI request. Copies of the above letters were included with the ISI request which is included in **Appendix B** to this FR. The ER review was updated on August 18, 2023 which continued to indicate there are no cultural or historic concerns for this parcel. The updated ER review is also included in **Appendix B**.

4.5.3 Critical Habitats and Endangered Resources

The WDNR has conducted a review of the area for occurrences of Endangered, Threatened, or Special Concern Species, natural communities, or State Natural Areas in accordance with Wis. Stat. §26.604(4). Per WDNR review and subsequent August 18, 2023 renewed ER review, there are no record of the above occurrences that would be impacted by the proposed project. A copy of the August 18, 2023 ER review from the WDNR is included in **Appendix B**.

4.6 Federal Aviation Administration

The proposed landfill Expansion is located approximately 2.7 miles (>15,840 feet) northeast of the closest runway at the Viroqua Airport and is not located in the approach or departure path for the airport. Since the Expansion is located less than 5 miles from the airport, the County has issued a letter dated October 23, 2020 to the Federal Aviation Administration (FAA) notifying them of their intent to expand. A copy of the notification letter is attached in **Appendix F**, “FAA Correspondence.”

Review of applicable regulations regarding landfill siting and expansions near airports indicate that the requirements of 49 USC Section 44718(d) apply only to new municipal solid waste landfills (MSWLF's), which are defined as a municipal waste landfill that was established or constructed after April 5, 2000. Furthermore, FAA Advisory Circular AC No. 150/5200-34A states that 49 USC Section 44718(d) does not apply to the expansion or modification of an existing MSWLF. The current active Vernon County Landfill was first constructed in 1993, therefore exempt from the limitations of 49 USC Section 44718(d).

As part of the last expansion process, Vernon County issued a letter to the FAA on May 29, 2002 notifying interested parties of their intention to expand. In a letter dated June 16, 2002 the FAA responded with a letter concurring with the proposal relative to compatibility standards contained in FAA Advisory Circular AC No. 150/5200-33, with the following conditions:

1. The landfill facility must be properly supervised to assure that the bird populations are not increasing and that appropriate control procedures are being followed.
2. Any increases in bird activity that might be hazardous to safe aircraft operations will result in prompt mitigation actions and/or closure of the landfill.
3. The above conditions must be clearly defined via State/Local licensing procedures associated with establishment of the landfill.

4. The landfill owner/operator should develop and implement a Wildlife Hazard Management Plan for operation of the landfill.

A Wildlife Hazard Management Plan (Plan) was included in their Plan of Operation, which has been approved by the WDNR and part of the facility operating record. The Plan utilizes the following strategies:

- Minimization of standing water areas
- Minimization of uncovered waste areas
- Prompt revegetation of disturbed areas outside of the waste footprint
- Utilization of bird harassment techniques, perch deterrents, and avoidance structures, as needed

The FAA does not approve or disapprove of solid waste landfill locations but is primarily concerned about location relative to safety. With issuance of the attached notification letter, it is anticipated that the FAA may reply with additional conditional actions to address safety concerns.

In an electronic mail dated March 19, 2021 Bobb Beauchamp, Environmental Protection Specialist with the FAA, confirmed that the landfill expansion is exempt from the requirements of 49 USC Section 44718(d) and encouraged the continued use and implementation of the Plan. The FAA also indicated that the Viroqua Airport does not have regularly scheduled service in addition to general aviation operations, so the provisions of FAA AC 150/5200-34A, Construction or Establishment of Landfills Near Public Airports also does not apply.

A copy of the October 23, 2020, notification and March 19, 2021 FAA response was provided with the ISR which is included in **Appendix B** to this FR.

4.7 Transportation and Access

No changes are proposed to the existing landfill access. The main roads leading to Viroqua and the landfill include US14/State Highway (STH) 27 to the north, STH56 from the West, STH56/82 from the east, US14 from the south, and STH27/82 from the southwest. Once in Viroqua, or Westby to the north, access to the landfill is gained by turning east on County Road (CR) Y from US14/STH27. Travelling east on CR Y, then turn south on CR LF to the landfill property entrance located on the north side of CR LF. There are no weight restrictions on US14 and STH56, STH82 or STH 27. The county roads have weight restrictions during a brief period in the spring which 6 tons for single axle vehicles and 10 tons for double axle vehicles. Weight restrictions are not enforced on local town roads.

4.8 Existing Land Uses Which May Have an Impact on Suitability

There are no existing land uses within one mile of the landfill that will have a negative impact on the suitability of the proposed Expansion. The closest residence to the existing landfill is located approximately 1,500-feet to the south and is shielded from the operations view due to topography and wooded parcels. Agricultural activities in the area have not historically impacted site operations, or vice versa. Very little residential development has occurred near the landfill since the landfill was initially permitted.

4.9 Cause and Significance of Groundwater Standard Exceedances

The parameters of iron, fluoride, manganese, and nitrate+nitrite exceed the NR 140 Wis. Adm. Code regulatory limits within several wells at Vernon County Landfill. In accordance with NR 140.28 Wis Adm. Code, exemptions to select groundwater quality standards have been requested, and approved by the WDNR as part of the 2003 feasibility determination for the last expansion. Although these exceedances of several inorganic parameters exist on-site, they are thought to be due to background conditions and there is currently no evidence that the active MSW Landfill (WDNR License No. 3268) has caused groundwater contamination at the facility.

4.10 Impacts of Expansion on Groundwater Quality

No groundwater quality impacts associated with the historic solid waste disposal operations have been identified at the site. Due to the design requirements for the existing and proposed landfill Expansion, including an engineered liner/cover and leachate collection, the proposed Expansion should not adversely impact groundwater quality.

4.11 Areas Where Land Uses Would Be Affected by Proposed Landfill Expansions

There are not areas where land uses would be affected by the proposed landfill Expansion. The proposed Expansion is located entirely on existing property owned by Vernon County. The land use on properties adjacent to the landfill property are not anticipated to change.

5 Geology and Hydrogeology {NR512.085, NR512.09, NR512.10, and NR512.11}

The intent of a geotechnical program completed as part of a feasibility study is to characterize the soils, bedrock geology, and groundwater flow system associated with a proposed landfill site through field investigation, laboratory testing, and data analysis. The information collected is then used to evaluate the suitability of the proposed site for landfill development in reference to the physical and chemical site conditions and the geotechnical engineering properties of the site.

Regional and site-specific geotechnical information has been collected historically at the Vernon County Landfill and provided to WDNR at various investigative phases since approximately 1987. WDNR landfill licenses attained to-date include an approximate 10-acre municipal solid waste landfill (WDNR License No. 3268) and a closed small sized (50,000 cubic yard) C&D Landfill (WDNR License No. 3712). Other facilities include: a recyclable material processing and baling facility. The previously permitted areas, site facilities, and the proposed landfill expansion area are depicted on **Plan Sheet 3**.

5.1 Alternative Geotechnical Investigation Program (AGIP)

On December 13, 2021, an Alternate Geotechnical Investigation Program (AGIP) request was sent to Ms. Carolyn Cooper, WDNR district hydrogeologist, requesting approval for an alternative geotechnical program as allowed under NR512.09 Wis. Adm. Code. The WDNR accepted the AGIP in a letter submitted to Vernon County Landfill on March 30, 2022, with several comments. On June 9, 2022, representatives of Vernon County and SEH held a conference call with Ms. Cooper to discuss the details of the alternative geotechnical program approval. Following the

conference call, a Response to the AGIP Acceptance Letter (SEH, July 25, 2022) was sent to Ms. Cooper summarizing the items discussed and agreed upon on the conference call.

A copy of the AGIP Request and the Response to the AGIP Acceptance Letter are provided in **Appendix I**. The AGIP approval was granted in a letter from the WDNR dated March 30, 2022 (**Appendix B**). The letter gave approvals and exemptions for the following:

- NR507.05(2) Wis. Adm. Code for bedrock coring – attempt bedrock coring at one location and complete geophysics in order to provided sufficient data on bedrock.
- NR507.06(1) Wis. Adm. Code for use of drilling fluids - drilling fluids can be used when conditions warrant it and an exemption from the code isn't required.
- NR512.06(4)(a) Wis. Adm. Code for grain size analysis of bedrock - grain size analysis is required as appropriate for the particular type of material and an exemption from the code isn't required.
- NR512.09(4)(b) Wis. Adm. Code for hydraulic conductivity of fine-grained units – samples should be attempted from weathered and competent bedrock. Hydraulic conductivity analysis data previously collected will be allowed to be used towards meeting Code requirements.
- NR512.09(4) Wis. Adm. Code for use of soil laboratory data collected during past investigations – the use of previously collected data is allowed.
- NR512.09(1) and (2) Wis. Adm. Code for use of existing borings and wells primarily in the existing landfill footprint and the previous Closed Landfill area - use of existing borings and wells is approved.
- NR512.09(4)(g) Wis. Adm. Code for use of existing groundwater quality data - the use of previously collected data is allowed.
- NR512.11(2) Wis. Adm. Code for use of all borings in the geological cross-sections - all borings, wells, and piezometers within 300 feet of the limits of the vertical and horizontal expansion much be included within the geological cross-sections.
- NR507.14 and NR 140.23 Wis. Adm. Code for use of soil boring and well information not on WDNR forms - the department understands some historic soil borings logs may be recorded on non-department forms. All available boring logs within 300 feet of the proposed limits of the vertical and horizontal expansion that were used for previous feasibility reports should be provided.

Based on a proposed horizontal landfill expansion area of 4 acres, a geotechnical investigation including 10 soil borings, five water table monitoring wells, and four piezometers is required. The accepted AGIP includes utilization of data from 18 existing soil borings, three existing perched water table monitoring wells (MW-4P, MW-5A, and MW-12), two existing regional water table monitoring wells (MW-5 and MW-14), and five existing nested piezometers (MW-3, MW-6, MW-10, MW-11, and MW-14Z). In order to meet the regulatory requirements and further investigate the subsurface in the area of the proposed expansion, eight new borings (B-18, B-19, B-20, B-21, MW-14WT, MW-15WT, MW-16, and MW-17WT) were performed to provide bedrock data and additional soil data. Four new perched water table monitoring wells (MW-14WT, MW-15WT, MW-16WT, and MW-17WT), and one new regional water table monitoring well (MW-16) were also completed during the investigation of the proposed expansion area to meet regulatory requirements and provide groundwater data in accordance with the approved AGIP.

5.2 Field Investigation

The field investigation was completed in accordance with the AGIP Request, WDNR AGIP Approval Letter, the Response to the AGIP Acceptance Letter, and NR512.09 Wis. Adm. Code.

Drilling and monitoring well/piezometer installation for the AGIP was conducted during August and September 2022. Drilling to identify the bedrock surface elevations and to install new monitoring wells and piezometers was performed by Braun Intertec (Braun) under the direction and supervision of a Wisconsin certified SEH Professional Geologist. Monitoring well development, geophysics, groundwater sample collection, and in-situ hydraulic conductivity testing were also conducted by SEH geologists and scientists under the direction and supervision of a Wisconsin certified SEH Professional Geologist. Groundwater sample analysis was performed by Eurofins Environment Testing (Eurofins). The new soil boring, monitoring well, and piezometer locations are shown on **Plan Sheet 3**, along with existing borings, wells, and piezometers in the proximity of the proposed expansion area which were utilized during the investigation and groundwater monitoring program.

A summary of all field investigation methods and procedures is provided within the AGIP Field Investigation Procedures Memo included within **Appendix J**.

5.3 Physiographical and Geological Setting

The following subsections include information on regional geologic, hydrogeologic, and topographic conditions at the site and in the vicinity.

5.3.1 Regional Setting

The proposed landfill Expansion lies within the west central portion of the West Fork Kickapoo River Watershed which is part of the Lower Wisconsin River Basin. This area of sedimentary rocks is unglaciated, as it is part of the “Driftless Area”, and has narrow, steep-sided bedrock ridges, narrow stream valleys, and few natural lakes. The upper reaches of the streams have V-shaped valley cross-sections and fairly steep gradients. Downstream reaches generally have thick alluvial fill in which the present stream channel is incised. The sedimentary rocks that underlie the basin dip gently and thicken to the south and southwest, conforming to the surface of the underlying Precambrian bedrock. Surface-water drainage is controlled generally by the topography of the bedrock surface. The northern portion of the site drains to the north to Seas Branch Creek which then flows east towards the west fork of the Kickapoo River. The southern portion of the site drains to the south to an unnamed tributary which then flows northeast to Seas Branch Creek and then east to the west fork of the Kickapoo River. More regionally surface water drainage is to the southeast towards the Kickapoo River. In the vicinity of the site, depth to the regional groundwater system ranges from 80 to 180 ft bgs and generally flows to the north towards the Seas Branch Creek.

5.3.2 Regional Topography

The area in the vicinity of the proposed landfill Expansion consists of dolostone bluffs and coulees. The maximum elevation in the surrounding area is approximately 1,260 ft (United States Geological Survey (USGS) datum) while the minimum elevation is approximately 980 ft (USGS datum). The site is located on a dolostone bluff that is oriented in the northeast to southwest direction. To the north of the site is the Seas Branch Creek, to the east and south surface

drainage to the Seas Branch Creek, and to the west a continuation of the dolostone bluff. Refer to the topographic map provided in **Appendix F** for further details.

5.3.3 Regional Hydrology

The site is located within the West Fork Kickapoo River Watershed with regional surface water draining to the Kickapoo River Watershed. Surface water from the northern portion of the site drains to the north to Seas Branch Creek which then flows east towards the west fork of the Kickapoo River. Surface water from the southern portion of the site drains to the to an unnamed tributary which then flows northeast to Seas Branch Creek and then east to the west fork of the Kickapoo River. More regionally surface water drainage is to the southeast towards the Kickapoo River. The West Fork Kickapoo River Watershed is bound to the north by the Coon Creek Watershed and the Middle La Crosse River Watershed, the east by the Bear Creek-Kickapoo River Watershed, the south by the Tainter Creek-Kickapoo River Watershed, and the west by the Bad Axe River Watershed.

The annual average precipitation in the region as measured over a 30-year period (1992-2022) is approximately 34.86 inches with a range of 23 inches (2003) to 44 inches (2016) (National Weather Service, 2023). Average annual snowfall in the region within the same 30-year period (1992-2022) is approximately 46 inches with a range of 21.5 inches (2012) to 69.2 inches (1997) (National Weather Service, 2023).

Significant surface water bodies or drainage in the vicinity of the site include Seas Branch Creek (approximately 1,500 feet north of the proposed expansion), an unnamed intermittent creek (approximately 750 feet south and southeast of the proposed expansion), and Seas Branch Pond (approximately 0.90 miles to the northeast) that is formed due to a wet flood control structure or dam.

Locally, minor wetlands exist north and south of the proposed landfill Expansion area within surface water drainage features and Seas Branch Creek. A more extensive wetland is present northeast of the Site as part of Seas Branch Pond.

5.3.4 Regional Geology

5.3.4.1 Near Surface Soils

Based on review of the Web Soil Survey for Vernon County (USDA, accessed July 2023), a large portion of the existing landfill is designated “2050” for “landfill”, indicative of disturbed or developed areas. A soil survey for the landfill property is provided in **Appendix F**. The remaining soil cover within the landfill expansion area including the following soil types:

- Seaton Silt Loam (115D2), driftless ridge, 12 to 20 percent slopes, moderately eroded.
- Basco Silt Loam (234D2), 12 to 20 percent slopes, moderately eroded.
- Pepin Silt Loam (125D2), 12 to 20 percent slopes, moderately eroded.
- Valton Silt Loam (133C2), 6 to 12 percent slopes, moderately eroded.
- Mt. Carroll Silt Loam (114B2), 2 to 6 percent slopes, moderately eroded.

5.3.4.2 Unconsolidated Deposits

Unconsolidated deposits in the vicinity of the site generally consist of alluvium in the river and stream channels and terraces deposited during Holocene time. These soils are typically fine grained and range from clays to medium sands (Young, 1973). The project area is situated in the

unglaciated driftless zone of southwestern Wisconsin. As a result, unconsolidated materials away from stream channels are generally associated with windblown deposition or mass wasting that occurred during the Late Pleistocene.

Evans (2003) also describes rolling topography along the lower slopes of the Paleozoic bedrock ridges as evidence of the downslope movement of the primarily sandstone and dolostone bedrock due to mass-wasting processes. Colluvium deposits are generated from the weathering and subsequent re-deposition of materials comprising the sandstone and dolostone bluffs in the region. A thin layer of loess (silt) is often found on the surface or buried below colluvium across the region. Residuum deposits are generated from in-place weathering of the sandstone and dolostone bedrock. Thickness of unconsolidated deposits in the vicinity of the site ranges from 0 to 50 feet in upland areas, to over 200 feet in stream valleys (Young, 1973).

5.3.4.3 Bedrock Geology

The bedrock geology generally consists of Paleozoic sedimentary beds overlying pre-Cambrian basement rock. The Paleozoic rock units generally have a regional dip to the southwest at a rate of approximately 10 feet per mile, which largely parallels the Precambrian surface (Evans, 2003).

The uppermost sedimentary bedrock units in Vernon County within the vicinity of the site consist of Ordovician aged dolostone, sandy dolostone, and dolomitic sandstone of the Oneota and Shakopee Formations (Prairie du Chien Group). The Prairie du Chien Group is underlain by the Cambrian aged sandstone and dolomitic siltstone of the Jordan Formation and St. Lawrence Formation (of the Trempealeau Group), the glauconitic sandstone of the Lone Rock Formation (of the Tunnel City Group), and the quartz sandstone of the Wonewoc Formation (of the Elk Mound Group) (Ostrom, 1981).

Based on regional publications by Young (1992), Hindall and Borman (1974), Young and Borman (1973), the bedrock encountered at Vernon County Landfill is the Prairie du Chien Group. It appears that all on-site borings terminate within the lower part of the Prairie du Chien Group. Based on boring logs from the City of Viroqua municipal wells, the Jordan Sandstone should occur approximately 250 feet below ground surface on-site.

The Prairie du Chien Group consists of the upper Shakopee Formation and the lower Oneota Formation. The Shakopee Formation is further divided into the Willow River and New Richmond members. The Oneota Formation is further divided into the Hager City and Stockton Hill members. The Stockton Hill Member is the basal member of the Prairie du Chien Group and is characterized by silty to sandy dolostone and dolomitic sandstone. The Hager City Member is characterized by thin to medium beds of laminated and stromatolitic dolostone with little to no silt or sand. The New Richmond Member is characterized by fine-grained, feldspathic quartz sandstone. The Willow River Member is the upper-most member of the Prairie du Chien Group and is characterized by stromatolitic and wavy laminated sandy dolostone.

The Jordan Formation has not been encountered during on-site drilling but underlays the Prairie du Chien Group. The Jordan Formation is characterized by a quartz-rich sandstone with medium to large-scale sets of cross-stratification. The St. Lawrence Formation underlies the Jordan Formation and is characterized by thin-bedded sandy dolomite, dolomitic sandstone, and dolomitic siltstone. The Lone Rock Formation underlays the St. Lawrence Formation and is characterized by thin to medium-bedded, cross-stratified, very fine to fine grained sandstone that is brown to greenish brown in color due to the presence of the green-black mineral, glauconite. The Wonewoc Formation underlies the Lone Rock Formation and is generally comprised of buff

to white, fine to medium grained sandstones. The very fine to fine grained quartz sandstones, sandy siltstones, and shales of the Eau Claire Formation underlie the Wonewoc Formation in Vernon County. The Mount Simon Formation is the bottom most Cambrian unit in Vernon County. The formation is largely comprised of medium to coarse grained sandstone containing abundant well-rounded quartz grains (Evans, 2003).

Precambrian igneous and metamorphic basement rock is present below the Paleozoic deposits in Vernon County. These rocks consist of Archean Gneiss and early Proterozoic granite and rhyolite. These rocks originated from Precambrian intrusions and volcanic events, or subsequent metamorphosis of these rocks.

5.3.5 Regional Hydrogeology

Regional hydrogeologic reports recognize six hydrogeologic units in Vernon County within the vicinity of the site: 1) St. Peter-Prairie du Chien-Jordan aquifer, 2) St. Lawrence-Lone Rock confining unit, 3) Wonewoc aquifer, 4) Eau Claire confining unit, 5) Mt. Simon aquifer, and 6) Precambrian confining unit (Young, 1992; Mandle and Kontis, 1992; Olcott, 1992).

As stated above, the deepest on-site borings terminate within the basal member of the Prairie du Chien Group, meaning that the St. Peter-Prairie du Chien-Jordan aquifer is the only hydrogeologic unit being monitored on-site.

Within Vernon County, the St. Peter-Prairie du Chien-Jordan aquifer is typically the uppermost aquifer but has a limited potential. According to Hindall and Borman (1974), well yields from this formation average less than 15 gallons per minute (gpm). Therefore, this aquifer typically provides sufficient yield for individual domestic wells but not public supply wells. Domestic well logs within the vicinity of the site confirm this with maximum construction depths of 300 feet, which places them within the St. Peter-Prairie du Chien-Jordan aquifer.

The deeper aquifers of the Wonewoc Formation and the Mt. Simon Formation can yield more than 500 gpm and therefore these aquifers are typically used for public supply wells. The closest municipal well (Viroqua's Well No. 5) is located approximately 2.7 miles southwest of the site and draws its water from both the Wonewoc and Mt. Simon aquifers.

In the vicinity of the site, the St. Peter-Prairie du Chien-Jordan aquifer system is typically hydraulically connected to streams because of steep topography within the region. The degree of this connection, however, is affected by the permeability of the deposits comprising the aquifer. The most permeable deposits have the greatest connection to streams, but the connection decreases with decreasing permeability.

Groundwater in the aquifer system moves from recharge areas at or near the outcrop of the aquifer to discharge areas, which is regionally the Kickapoo River and its tributaries. In the vicinity of the Vernon County Landfill and the proposed expansion, the main discharge area is north of the site at Seas Branch Creek. Regional groundwater in the vicinity of the site flows primarily to the north to northeast, towards Seas Branch Creek.

The majority of the regional groundwater flow within the Cambrian aquifer system occurs within the Mt. Simon aquifer which is generally under a leaky artesian (confined) system and moves toward the Mississippi River, the regional discharge area. Although individual aquifers in the system are separated by confining units that may be much less permeable than the aquifers, some water moves vertically through these confining units. Hydraulic heads in the individual

aquifers of the Cambrian aquifer system generally are at successively lower altitudes, which indicated that water moves vertically downward into the aquifer system in most areas (Olcott, 992).

Depth to the water table in the vicinity of the site depends largely on topography and ranges from 0 to almost 200 ft bgs. The extreme depths occur in regions where the water table is near the surface in valleys and is deep below ridges (Young and Borman, 1973).

5.3.6 Regional Water Quality

5.3.6.1 Regional Groundwater Quality

Groundwater in the Lower Wisconsin River Basin is generally of good quality and is usable for most purposes. The quality, though, is variable depending on the concentrations of dissolved solids and chemical constituents. The main chemical constituents in the water in the basin are calcium, magnesium, and bicarbonate ions. Hardness as calcium carbonate is estimated to be between 100 to 400 milligrams per liter (mg/L) (Hindall and Borman, 1974).

Regional differences in the quality of groundwater are due to the composition, solubility, and surface area of the particles of soil and rock through which the water travels, and due to the length of time the water is in contact with these materials. Water from the sandstone aquifer system is not greatly mineralized in areas where the aquifer crops out or is buried only to shallow depths, but mineralization increases downgradient where the aquifer is deeply buried.

Since the region is predominately agricultural, often the contaminants found in the groundwater are the result of agricultural land use practices. Some of the documented groundwater quality issues in this region include nitrate, bacteriological, nutrients, pesticides, and herbicides. The potential for groundwater contamination within the West Fork Kickapoo River Watershed is considered high due to over 50% of the land is used for agriculture (WDNR, 2002).

5.3.6.2 Regional Surface Water Quality

The chemical quality of surface water in the Lower Wisconsin River Basin is generally good. The water is generally calcium magnesium bicarbonate type, similar to groundwater described in Section 5.3.6.1.

The primary water quality concerns are caused from nonpoint sources of pollution, particularly from agricultural operations, excessive populations of rough fish, and hydrologic modifications of the streams such as damming, straightening, and the ditching, draining, or other alternation of wetlands. The potential for surface water contamination within the West Fork Kickapoo River Watershed is considered high due to over 50% of the land is used for agriculture (WDNR, 2002).

5.4 Subsurface Data Analysis {NR512.10 and NR512.11}

The following subsections discuss data collected and analyzed from the newly installed wells and includes information from previous investigations at the Vernon County Landfill. Subsurface data analysis was completed in accordance with the AGIP Request (SEH, December 13, 2021), the WDNR AGIP Approval Letter (WDNR, March 30, 2022), the Response to the AGIP Acceptance Letter (July 27, 2022), and NR 512.10 Wis. Adm. Code. The locations of the wells and boreholes are shown on **Plan Sheet 3. Appendix J** through **Appendix Q** provide supplemental data and information to support the following subsections.

5.4.1 Site Geology

Information regarding site geology was obtained from recent and previous site investigations. A summary of new and previously completed soil borings located within 300 feet of the proposed expansion is provided on **Table 5-1**. A summary of geotechnical data from the landfill property is provided on **Table 5-2**. Soil boring logs used to meet the investigation requirements are included in **Appendix K**. Laboratory soil geotechnical test results are provided in **Appendix L**. Geologic cross-sections of the site are shown on **Plan Sheet 11** through **Plan Sheet 22**.

The uppermost site geologic units have been defined in reference to three primary depositional environments as follows: Unconsolidated deposits including loess and residuum; saprolite; and dolostone bedrock. For purposes of site characterization, saprolite refers to weathered bedrock retaining details or structural features of the bedrock and, residuum, while also formed from bedrock, no longer retains the structural features or details of its bedrock and represents a true unconsolidated deposit. The following sections describe the physical characteristics of the unconsolidated deposits and the dolostone bedrock as determined from soil borings and geotechnical analysis.

5.4.1.1 Unconsolidated Deposits

The Vernon County Landfill is in the unglaciated “driftless” zone of southwestern Wisconsin. As a result, the unconsolidated deposits at the Vernon County Landfill consist of loess and residuum deposits overlying dolostone bedrock. In some areas, saprolite separates the unconsolidated deposits from the dolostone bedrock below. Generally, the more competent saprolite and dolostone bedrock are distinguished by refusal during standard penetration testing.

The total thickness of unconsolidated sediments identified within borings completed within 300--feet of the proposed landfill expansion ranges from approximately 14.0 feet (MW--3/MW--4P/MW--6) to 79.5 feet (MW-10/MW-11/MW-12). The variability in unconsolidated soil thickness is a result of the land surface topography and the topography of the upper bedrock surface. In general, the residuum is thicker within valleys due to greater weathering occurring as water moves downslope away from more resistant bedrock that forms ridges in the area. The distribution of loess and residuum deposits is presented on the site cross-sections (**Plan Sheet 11** through **Plan Sheet 22**).

5.4.1.1.1 Loess Deposits

Loess soils at the Vernon County Landfill vicinity consists of windblown fine-grained sediment deposited during the Late Pleistocene. These deposits are discontinuous at the site, particularly because most loess has been removed as part of site development. Where present, loess deposits can generally be described as light brown to brown to gray, clayey silt to silty clay to clay with silt (ML to CL). Thickness of loess soils in the vicinity of the proposed landfill expansion area range from 0 to 10 feet with the greatest thickness found along ridges in undeveloped portions of the landfill property.

A total of 24 loess geotechnical samples have been analyzed for grain-size across the landfill property as shown on **Table 5-2**. The average grain-size distribution for loess deposits is 0 percent gravel, 1.6 percent sand, and 98.8 percent fines (silt and clay). The additional tests conducted on the fines indicate an average of 73.9 percent silt and 25.0 percent clay. Atterberg limits were determined for 21 samples resulting in an average liquid limit of 37.7 percent and a plasticity index of 15.6.

5.4.1.1.2 Residuum Deposits

Residuum deposits on the landfill site were generated from the weathering of the underlying dolostone bedrock. Although residuum originates from bedrock, the extent of weathering has removed all bedrock structure and it is therefore considered an unconsolidated deposit. The residuum can be generally described as brown to red brown to red, clay (CL) with to trace sand and gravel to clayey sand (SC) with to trace gravel. The thickness of the residuum deposits identified in historic borings performed in the vicinity of the proposed landfill expansion area ranges from approximately 14.0 to 79.5 feet. As described above, the residuum is generally thicker within valleys due to greater weathering occurring as water moves downslope away from more resistant bedrock that forms ridges in the area.

A total of 49 fine-grained residuum and 24 coarse-grained residuum geotechnical samples have been analyzed for grain-size across the landfill property as shown on **Table 5-2**. The fine-grained and coarse-grained units are present due to layering within the original bedrock prior to weathering. The fine-grained residuum samples taken from the landfill property indicate an average grain-size distribution of 1.9 percent gravel, 18.3 percent sand, and 76.2 percent fines (silt and clay). The coarse-grained residuum samples taken from the landfill property indicate an average grain-size distribution of 9.1 percent gravel, 59.7 percent sand, and 24.6 percent fines (silt and clay). Atterberg limits were determined for 45 fine-grained residuum and 7 coarse-grained residuum samples. For the fine-grained residuum the samples resulted in an average liquid limit of 55.4 percent and an average plasticity index of 31.6. For seven (7) of the 24 coarse-grained residuum samples, the clay content was high enough to establish Atterberg limits that resulted in an average liquid limit of 19.9 percent and an average plasticity index of 18.0.

5.4.1.2 Saprolite

Saprolite on the landfill site was generated from the weathering of the underlying dolostone bedrock. Unlike residuum, the saprolite unit still holds the original bedrock structure and is therefore more similar to bedrock than an unconsolidated deposit. The saprolite can be generally described as weathered dolostone to weathered dolostone with silty sand to weathered dolostone with clay. As with the residuum, the physical variability of the saprolites is due to layering within the original bedrock prior to weathering.

During the 2022 drilling investigation, water or drilling mud loss was noted at MW-16 beginning at 70 feet below the ground surface. This water loss was noted above the water table within saprolite described as highly weathered with sand layers throughout. Weathered shale was also noted above and below this interval. As a result, this loss of water was concluded to not be due to fractures within the formation but was most likely due to the highly weathered sandy dolostone between two layers of lower permeability shale. The high head exerted within the borehole from the mud rotary drilling method is able to force the mud or water into the unsaturated, more permeable layers of the formation.

Since the saprolite unit still holds the original bedrock structure, the top of the saprolite surface, where it is present, will be used for bedrock separation for the proposed subbase elevations. See Section 5.4.1.3 for further discussion on the bedrock surface elevations encountered within the footprint of the proposed landfill Expansion. A bedrock surface map, including saprolite, for the entire landfill property is provided on **Plan Sheet 10**; areas where saprolite is included in the bedrock surface illustrated are shaded. Saprolite surface elevations, depths to saprolite, and saprolite elevations for the proposed expansion area are provided in **Table 5-1**.

5.4.1.3 Dolostone Bedrock

The uppermost bedrock formation in the proximity of the proposed landfill expansion area has been established as the Ordovician-aged Hager City Member of the Prairie du Chien Group. The Hager City Member is characterized by thin to medium beds of laminated and stromatolitic dolostone with little to no silt or sand (Evans, 2003). The Stockton Hill Member, which is the basal member of the Prairie du Chien Group and is characterized by silty to sandy dolostone and dolomitic sandstone and appears to be encountered on-site as well. As stated previously, all on-site borings terminate within the lower part of the Prairie du Chien Group; based on boring logs from the City of Viroqua municipal wells, the Jordan Sandstone would occur on-site at an elevation of around 1000 feet NAVD.

Coring of bedrock on-site has had variable success and during the 2022 drilling investigation, bedrock coring was attempted at the MW-14WT location. Coring was attempted at several depths once bedrock was encountered but coring proved difficult and produced poor RQD results. All coring occurred above the water table to a depth of 60.5 feet bgs (groundwater was encountered at 94 feet bgs). Eventually, coring rods became stuck, and coring was deemed infeasible to continue at the MW-14WT location. As indicated on the coring log in **Appendix K**, observations of the rock core described the bedrock as highly fractured and the presence of small voids. Historical rock core logs also observed fractures and small voids within the uppermost bedrock, particularly above the water table. However, logs from sonic borings could not distinguish the presence of voids and fractures due to the disturbance produced from the sonic drilling methods. Therefore, bedrock coring at the site has resulted in the following observations and conclusions:

- Dissolution cavities and bedrock fractures associated with dolomitic rock are primarily present above groundwater in bedrock on-site.
- Dissolution cavities occur primarily as small voids and do not appear to be interconnected.
- Bedrock, in general, is often highly fractured and the fractures are likely interconnected.
- Under hydraulic conditions, fractured bedrock above the water table would likely function as a porous media with only localized shale and clay layers providing limitations to the vertical percolation of water.

The saprolite and dolostone bedrock surface elevation encountered within the footprint of the proposed landfill Expansion area had elevations ranging from approximately 1221.0 (B-18) to 1195.0 (B-20) feet NAVD. The top of the saprolite and dolostone bedrock is currently approximately 17 feet below (B-18) to 23 feet below (B-20) the proposed subbase elevations. A bedrock surface map, including saprolite, for the entire landfill property is provided on **Plan Sheet 10**. Bedrock surface elevations, depths to bedrock, and bedrock elevations for the proposed Expansion area are provided in **Table 5-1**.

5.4.1.4 Geophysical Horizons

As described within **Appendix J**, natural gamma radiation was completed at three new well locations (MW-14WT, MW-15WT, and MW-17WT) and at seven existing well locations (MW-1, MW-1R, MW-2, MW-5, MW-6, MW-7, and MW-12). Note that geophysics could not be completed at MW-16 due to access issues. Gamma logging was processed and formatted to other software such as gINT and AutoCAD for presentation and data interpretation.

On the gamma logs included in Attachment E of **Appendix J**, the relatively high or low gamma counts produce high or low spikes, which can typically be traced from one log to another by

identifying similar gamma spikes with the context of similar vertical sequences. These laterally traceable spikes are called marker horizons, and in some cases, they may be traced (or correlated) over great distances before they become obscure. Carefully traced marker horizons are believed to closely approximate synchronous lanes within the stratigraphic sequence. Identifying marker horizons across a site can aid in aligning geologic units when boring logs are lacking in detail due to inability to core bedrock or other drilling limitations.

Potentially, a large number of gamma log marker horizons could be selected and correlated. For the purposes of this study, five marker horizons, designated in ascending order as H1 through H5, were identified and illustrated on geologic cross-sections. Given the depth to the regional water table on site and the limited wells available to greater depth, each of the marker horizons were established above an elevation of 1100 feet NAVD. In general, these markers identify spikes or relatively low gamma values (likely coinciding closely to quartz sand or sandstone) or strong shifts in gamma character (which generally coincide with the lithologic changes from sand to shaley or clayey units). However, the magnitudes of the gamma spikes and positions of bulk lithologic changes relative to the gamma markers shift laterally. Therefore, the markers give an indication of the different types of sediments which were deposited during the same interval of time across the site but may have weathered to a saprolite or residuum. In most cases, the marker horizons were able to be correlated to specific rock types or weathered bedrock material.

As stated above, five marker horizons (H1 to H5) were identified across the site. These geophysical horizons are provided on the boring logs within Attachment E of **Appendix J** and on geological cross-sections (**Plan Sheet 12** through **Plan Sheet 22**). Identification of the five marker horizons across the site confirms that the bedrock geology across the site is consistent and predictable and provides correlation between historic boring logs and current boring logs as well as correlation from weathered to unweathered bedrock. Based on the gamma logs, the following observations and conclusions have been made:

- Although regionally the bedrock generally dips to the southwest at 10 feet per mile, the marker horizons indicate a relatively horizontal bedrock structure for the limited extent of the site.
- Marker horizon H1 occurs below the perched water table in sandy dolostone with a lower gamma value above a gamma spike.
- Marker horizon H2 occurs below the perched water table near a contact between sandy dolostone and an overlying dolostone with a lower gamma value above a gamma spike.
- Marker horizon H3 generally occurs just above the perched water table in dolostone with a spike below a lower gamma value.
- Marker horizon H4 occurs above H3 and the perched water table in dolostone, but its lower gamma value between two spikes correlates into saprolite within valleys.
- Marker horizon H5 occurs above H4 and the perched water table in in dolostone, but its low gamma value above a spike correlates into both saprolite and residuum within valleys.

5.4.1.5 Geologic Cross-sections

Eleven geologic cross-sections (Sections A through K) have been created across the landfill property to evaluate the subsurface conditions across the site and within the proposed expansion area. The cross-section location map is included in **Plan Sheet 11**, with geologic cross-sections provided on **Plan Sheet 12** through **Plan Sheet 22**.

5.4.1.5.1 Geologic Cross-section A-A' (Plan Sheet 12)

Geologic Cross-section A-A' (Section A) is drawn north of the existing landfill area and the proposed Expansion area and trends from west to east. Section A shows a bedrock high within the west near boring TB-3, with the bedrock surface decreasing to the east between borings TB-3 and B-17. Another bedrock high is present within the east in the area of TB-4 and well nest MW-3/MW-4P/MW-6. Minor and discontinuous loess deposits and saprolite are present in the areas of borings TB-3 and TB-4.

5.4.1.5.2 Geologic Cross-section B-B' (Plan Sheet 13)

Geologic Cross-section B-B' (Section B) is drawn on the very northern extent of the existing landfill and proposed landfill Expansion area and trends from west to east. Section B shows a bedrock high within the west near boring B-11, with the bedrock surface decreasing to the east between borings B-11 and B-15. Another bedrock high is present within the east near well nest MW-14/MW-14Z. Minor and discontinuous loess deposits are present in the areas of well nests MW-7/MW-8R/MW-9 and MW-14/MW-14Z. Minor and discontinuous saprolite is present in the areas of well nest MW-7/MW-8R/MW-9 and well MW-14WT.

5.4.1.5.3 Geologic Cross-section C-C' (Plan Sheet 14)

Geologic Cross-section C-C' (Section CC) is drawn on the northern portion of the existing landfill and proposed landfill Expansion area and trends from west to east. Section C shows a bedrock high within the west between borings B-9 and B-12. The bedrock surface then decreases slightly to the east between borings B-12 and B-19. Section C shows a bedrock low east of the proposed landfill expansion area near well MW-15WT. Section C shows continuous saprolite from the western edge of the existing landfill through the eastern extent of the cross-section, with significant thickening in the area of well MW-15WT.

5.4.1.5.4 Geologic Cross-section D-D' (Plan Sheet 15)

Geologic Cross-section D-D' (Section D) is drawn within the north-central portion of the existing landfill and proposed landfill Expansion area and trends west to east. Section D shows a bedrock high within the west in the area of borings B-6 and B-5. The bedrock surface then decreases to the east between borings B-5 and TB-7. The bedrock surface is then relatively horizontal between boring TB-7 and well nest MW-5/MW-5A. Section D shows a bedrock low east of the proposed landfill expansion area and well nest MW-5/MW-5A. A minor and discontinuous loess deposit is present in the area of boring TP-11. Section D shows continuous saprolite in the western portion of the cross-section between boring TP-11 and well nest MW-2/MW-2P. Saprolite is also continuous in the area between boring TB-7 through the eastern extent of the cross-section, with thickening east of well nest MW-5/MW-5A.

5.4.1.5.5 Geologic Cross-section E-E' (Plan Sheet 16)

Geologic Cross-section E-E' (Section E) is drawn within the south-central portion of the existing landfill and proposed landfill Expansion area and trends from west to east. Section E shows a bedrock high in the west near boring B-3, with the bedrock surface decreasing to the east. The bedrock surface decreases significantly east of the proposed landfill expansion area and boring B-20. Section E shows continuous saprolite across the cross-section with thickening in the west near boring B-2 and thickening east of the proposed landfill expansion area and boring B-20.

5.4.1.5.6 Geologic Cross-section F-F' (Plan Sheet 17)

Geologic Cross-section F-F' (Section F) is drawn within the southern portion of the existing landfill and proposed landfill Expansion area and trends from west to east. Section F shows a bedrock high in the west near boring TB-12, with the bedrock surface decreasing to the east. The bedrock surface decreases significantly east of boring TB-6. A minor and discontinuous loess deposit and saprolite are present in the area of boring TB-12. Section F shows continuous saprolite in the area between boring TB-6 through the eastern extent of the cross-section with thickening in the east near well nest MW-16WT/MW-16.

5.4.1.5.7 Geologic Cross-section G-G' (Plan Sheet 18)

Geologic Cross-section G-G' (Section G) is drawn south of the existing landfill and proposed landfill Expansion area and trends from west to east. Section G shows an undulating bedrock surface with bedrock highs near well nest MW-1RZ/MW-1PR/MW-1R and well nest MW-10/MW-11/MW-12. Section G shows a continuous loess deposit between well nest MW-1RZ/MW-1PR/MW-1R and well MW-13P and another minor loess deposit within the area of well nest MW-10/MW-11/MW-12. Section G shows continuous and thick saprolite across the cross-section with thickening in the east near well nest MW-10/MW-11/MW-12 and well MW-17WT.

5.4.1.5.8 Geologic Cross-section H-H' (Plan Sheet 19)

Geologic Cross-section H-H' (Section H) is drawn west of the existing landfill and trends from south to north. Section H shows an undulating bedrock surface with a bedrock low in the south near well nest MW-1RZ/MW-1PR/MW-1R and a bedrock high between borings TB-11 and B-5 and at well nest MW-7/MW-8R/MW-9. Minor and discontinuous loess deposits are present within the area of well nest MW-1RZ/MW-1PR/MW-1R and well nest MW-7/MW-8R/MW-9. Section H shows relatively continuous and thick saprolite within the southern portion of the cross-section between well nest MW-1RZ/MW-1PR/MW-1R and boring B-2 with discontinuous saprolite near well nest MW-7/MW-8R/MW-9.

5.4.1.5.9 Geologic Cross-section I-I' (Plan Sheet 20)

Geologic Cross-section I-I' (Section I) is drawn within the central portion of the existing landfill and trends from south to north. Section I shows a bedrock high in the south near well nest MW-1/MW-1P which is followed with a bedrock low immediately to the north near well MW-13P. The central and northern portion of the cross-section between borings TB-6 and B-17 shows a relatively horizontal bedrock surface. A minor and discontinuous loess deposit is present within the area of well MW-13P. Section I shows continuous saprolite throughout the southern and central portion of the cross-section with thickening in the south near well MW-13P and well nest MW-1/MW-1P.

5.4.1.5.10 Geologic Cross-section J-J' (Plan Sheet 21)

Geologic Cross-section J-J' (Section J) is drawn within the central portion of the proposed landfill Expansion area and trends from south to north. Section J shows an undulating bedrock surface with a bedrock low in the south near boring B-21 and a bedrock high in the north between well nest MW-14/MW-14Z and well nest MW-3/MW-4P/MW-6. Minor and discontinuous loess deposits are present within the areas of well nest MW-10/MW-11/MW-12, boring TB-5, and well nest MW-14/MW-14Z. Section J shows continuous saprolite throughout the southern and central portion of the cross-section with thickening in the south near boring B-21 and well nest MW-10/MW-11/MW-12.

5.4.1.5.11 Geologic Cross-section K-K' (Plan Sheet 22)

Geologic Cross-section K-K' (Section K) is drawn east of the proposed landfill Expansion area and trends from south to north. Section K shows an undulating bedrock surface with a bedrock low in the south within the area of well nest MW-16WT/MW-16 and a bedrock high in the north near MW-14WT. Section K shows continuous saprolite throughout the southern and central portion of the cross-section with thickening in the south near well nest MW-16WT/MW-16 and well MW-17WT. Minor and discontinuous saprolite is present in the north near well MW-14WT.

5.4.2 Site Hydrogeology

5.4.2.1 Hydrostratigraphic Units

As described in Section 5.3.5, the deepest on-site borings terminate within the basal member of the Prairie du Chien Group, meaning that the St. Peter-Prairie du Chien-Jordan aquifer is the only hydrogeologic unit being monitored on-site. Shallow groundwater will generally be assessed in reference to water table conditions, and it has been determined that a perched water table and a regional water table exist on-site.

A summary of the wells and their construction that are located within 300 feet of the proposed expansion used for assessing the groundwater conditions is provided in **Table 5-3**.

5.4.2.2 Water Level Measurements

Groundwater elevations measured in the monitoring wells and piezometers across the entire landfill property between 2018 and 2023 are summarized on **Table 5-4**. Following the 2022 well installations, two of the wells (MW-15WT and MW-16WT) installed have remained dry. Because groundwater conditions could not be observed during drilling, determining an appropriate depth of the proposed water table well at the four drilling locations presented a challenge as described further in **Appendix J**. Although dry wells would appear to have limited value for hydrogeologic investigation purposes, the fact the wells are dry has provided essential information to understanding the site hydrogeology particularly in reference to the perched groundwater system. In other words, the dry wells are indicative of a localized diminishing perched groundwater system. As described in subsequent sections, the dry wells have confirmed the following:

- Perched groundwater conditions diminish along the eastern edge of the site and merge with the underlying regional water table system.
- The merging of the perched and regional groundwater systems occurs within saprolite where competent bedrock elevation decreases within valleys.
- Vertical hydraulic gradients in the formation may bias depth to water measurements (water table versus a potentiometric conditions) during the drilling of deeper borings.

Based on water levels provided in **Table 5-4**, recent groundwater elevations within the perched water table are relatively consistent throughout the five-year period but the wells screened within the regional water table indicate the regional water table has risen across the landfill site by approximately 5 to 10 feet over historical averages in recent years with the greatest increase occurring in 2019 with the higher water levels remaining consistent throughout 2020. Decreases between 2021 and 2023 within the regional water table are observed across the site. The increase is consistent with “groundwater flooding” occurring across the state of Wisconsin as described by the WDNR on their website.

It should be noted that many monitoring wells described as monitoring the regional water table have water levels significantly above the screen interval during wet periods. It was determined that these monitoring wells still accurately represent the regional water table, but data and groundwater interpretations should be qualified to address current and future water levels especially if they continue to rise.

Monthly groundwater measurements were recorded between December 2022 and May 2023. In the six sets of monthly readings, groundwater elevations for the landfill property ranged from approximately 1116.64 feet to 1151.19 feet NAVD within the perched water table and ranged from 1072.54 feet to 1094.46 feet NAVD within the regional water table. The difference between high and low levels for monitoring wells across the landfill site during the six-month baseline monitoring period ranged between 0.72 feet to 5.23 feet within the perched water table and ranged between 4.81 to 5.94 within the regional water table. The highest measurements generally occurred during the May 2023 monitoring event, and the lowest during the January 2023 event.

The static water elevation within the perched water table during the May 2023 event in the design limits of the proposed landfill expansion area ranged from approximately 1115 feet to 1145 feet NAVD. The static water elevation within the regional water table during the May 2023 event in the design limits of the proposed landfill expansion area ranged from approximately 1178 feet to 1193 feet NAVD.

Based on the water levels measured in May 2023, depth to water within the proposed Expansion area ranged from approximately 60 to 115 feet bgs.

5.4.2.3 Groundwater Contour Maps

In accordance with NR512.09 Wis. Adm. Code, groundwater contour maps were created to illustrate the highest (May 2023) and lowest (January 2023) groundwater elevations observed between December 2022 and May 2023 using data provided in **Table 5-4**. The groundwater contour maps were generated for the entire monitoring network across the landfill site in order to include the greatest number of data points and assess the local control on groundwater conditions. The high and low groundwater contour maps for the perched water table are illustrated on **Plan Sheet 4** and **Plan Sheet 5**. The high and low groundwater contour maps for the regional water table are illustrated on **Plan Sheet 6** and **Plan Sheet 7**. In addition, an upper and lower potentiometric map were created to evaluate deeper bedrock groundwater flow and are illustrated on **Plan Sheet 8** and **Plan Sheet 9**, respectively.

5.4.2.3.1 Perched Water Table

The high perched water table contour map generated for the May 2023 monitoring event is included on **Plan Sheet 4** with contours established at a 5-foot contour interval. The perched water table surface slopes generally from north to south-southeast across the site. The highest water table elevations are along the northern boundary of the existing landfill and proposed landfill Expansion area. The lowest water table elevations are on the southeastern edge of the proposed landfill expansion area within a bedrock valley.

The low perched water table contour map generated for the January 2023 monitoring event is included on **Plan Sheet 5** with contours established at a 5-foot contour interval. The low perched water table conditions indicate a flow pattern similar to the high perched water table conditions

(**Plan Sheet 4**) with the highest elevations to the north and the lowest elevations to the southeast.

As discussed above, the perched water table flows to the south-southeast and the head loss decreases dramatically within the southeast edge of the proposed landfill Expansion area surrounding MW-16WT and south of MW-15WT. This is due to the bedrock valley within this area causing the perched water table to diminish as it merges with the underlying regional water table. Geologic Cross-Section K-K', which is presented on **Plan Sheet 22**, illustrates this bedrock low and the merging of the perched and regional water table. The merging of the water table within the region of MW-16WT and MW-15WT, also explains why these two perched water table wells are currently dry. The merging of the water tables in this region “drains” the perched water table leaving the groundwater elevations within this area lower than expected. Monitoring well MW-16WT is directly downgradient of the proposed landfill expansion area and although it is dry due to the perched water table not existing within this area, for landfill monitoring purposes its nested monitoring well MW-16 screened withing regional water table system would provide water quality data downgradient of the perched water table system and upgradient of the regional water table system.

5.4.2.3.2 Regional Water Table

The high regional water table contour map generated for the May 2023 monitoring event is included on **Plan Sheet 6** with contours established at a 5-foot contour interval. The regional water table surface slopes generally from south to northeast across the site. The highest water table elevations are along the southeastern edge of the proposed landfill expansion near MW-16WT and southern boundary of the existing landfill. The lowest water table elevations are on the northeastern edge of the proposed landfill expansion area.

The low regional water table contour map generated for the January 2023 monitoring event is included on **Plan Sheet 7** with contours established at a 5-foot contour interval. The low regional water table conditions indicate a flow pattern similar to the high regional water table conditions (**Plan Sheet 6**) with the highest elevations to the south-southeast and the lowest elevations to the northeast.

As discussed above, the regional water table merges with the overlying perched water table at higher elevations within the southeast edge of the proposed landfill expansion area near MW-16.

5.4.2.3.3 Potentiometric Surface

An upper and lower bedrock potentiometric map was also prepared using the data collected for the May 2023 monitoring event and are included on **Plan Sheet 8** and **Plan Sheet 9**, respectively with contours established at a 5-foot contour interval. The potentiometric groundwater conditions indicate a flow pattern similar to the regional water table conditions with the highest elevations to the south and the lowest elevations to the northeast.

5.4.2.4 Flow Net and Geologic Cross-section J-J'

A flow net of the regional water table is presented on geologic cross-section J-J' (flow net) which trends in the south to north direction throughout the entire proposed landfill expansion area. The location of the flow net cross-section is provided on **Plan Sheet 11** with the flow net included within **Plan Sheet 21**. The purpose of the flow net is to quantifiably illustrate a general flow pattern for the site representing steady groundwater flow. A flow net consists of two sets of lines which must always be orthogonal (perpendicular to each other), flow lines, which show the

direction of groundwater flow, and equipotential lines (lines of constant head), which show the distribution of potential energy.

The flow net was created by applying the following assumptions:

- The regional water table boundary is the upper boundary of an unconfined aquifer and is a line of known and variable head.
- No measurable seepage occurs at the water table given the depth to groundwater, the presence of an intervening perched groundwater system, the barrier provided by landfill development, and the determination that recharge areas locally occur in uplands (Hunt, et al., 2003). Therefore, the water table at this site would largely represent a flow line in which equipotential lines would be perpendicular to the water table.
- The site represents a homogeneous, isotropic system due to its relatively uniform soil classifications and hydraulic conductivity as described in Section 5.4.2.6, 5.4.2.7, and 5.4.2.10; as a result, flow lines and equipotential lines are always perpendicular.
- No impermeable boundaries exist.

Equipotential lines were created by connecting areas of constant head by interpolating between monitoring well points. Due to the vertical exaggeration required to illustrate flow conditions, specific flow net pathways (tubes) were not calculated to scale.

The flow net illustrates equipotential lines ranging across the site from vertical to 80 degrees indicating that groundwater on-site is pre-dominantly horizontal but varies slightly across site with a slight downward gradient.

5.4.2.5 Historical Changes in Water Level in Response to Landfill Operations

Based on the historical water levels recorded since 1988, the groundwater elevations measured in and around the currently permitted Vernon County Landfill have not been affected by landfill operations by any measurable extent. Water level data from 1988 to 2022 is included in water quality information as part of **Appendix Q**. The rise in the regional water table over recent years (**Table 5-4**) is consistent with “groundwater flooding” occurring across the state of Wisconsin as described by the WDNR on their website confirming that the changes in water levels are not in response to landfill development.

5.4.2.6 Horizontal Hydraulic Conductivity

Values of hydraulic conductivity based on the slug tests performed across the landfill property are summarized in **Table 5-5**. The combined historic and new results provide hydraulic conductivity values for the site wells or piezometers. Note that the most recent test data available for each well is presented as the most representative hydraulic conductivity value. Based on the minimum, geometric mean, and maximum values of hydraulic conductivity presented in **Table 5-5**, the hydrogeologic properties for each geologic unit can be described as follows:

- **Loess (0 slug tests):** Groundwater does not occur within loess deposits at the site; no wells are screened in loess and in-field hydraulic conductivity testing cannot be conducted.
- **Residuum (0 slug tests):** Groundwater does not occur within residuum deposits at the site; no wells are screened in residuum and in-field hydraulic conductivity testing cannot be conducted.

- **Saprolite (0 slug tests):** Groundwater generally does not occur within saprolite at the site. Only well MW-16WT is screened in saprolite and this well has been dry since installation and therefore, in-field hydraulic conductivity testing cannot be conducted.
- **Dolostone (24 slug tests):** The hydraulic conductivity of the dolostone varies widely ($2.4\text{E-}5$ cm/sec to $6.7\text{E-}2$ cm/sec); therefore, the wells have been grouped into perched water table wells, regional water table wells, and piezometers. Hydraulic conductivity values for each zone are as follows:
 - **Perched Water Table Wells:** Values vary widely ranging from $2.43\text{E-}5$ cm/sec to $1.18\text{E-}2$ cm/sec, which is reflective of more variable hydraulic conditions. The interbedded nature of the shallower dolostone and sandstone bedrock would provide variable hydraulic conditions depending on the material in the screened interval of each well. Although hydraulic conditions are variable, the hydraulic conductivity testing indicates the formations screened are responding to testing as porous media without turbulent flow.
 - **Regional Water Table Wells:** Values range from $1.86\text{E-}4$ cm/sec to $6.67\text{E-}2$ cm/sec with a geometric mean of $1.84\text{E-}3$ cm/sec, which is reflective of more uniform hydraulic conditions for the uniform bedrock physical properties. The hydraulic conductivity is relatively high but reflective of a uniform porous media.
 - **Piezometers:** Values range from $2.19\text{E-}4$ cm/sec to $3.07\text{E-}2$ cm/sec with a geometric mean of $2.01\text{E-}3$ cm/sec, which is reflective of more uniform hydraulic conditions for uniform bedrock physical properties. The hydraulic conductivity is relatively high and reflective of a uniform porous media.

The horizontal hydraulic conductivity averages cannot be compared to the vertical hydraulic conductivity values described below, due to all groundwater being located within bedrock and representative undisturbed rock core samples could not be collected within the bedrock.

5.4.2.7 Vertical Hydraulic Conductivity

Several samples were analyzed in the laboratory for coefficient of permeability tests during previous investigations and as part of the 2022 investigation which give approximate vertical hydraulic conductivity values. Because all samples were all collected above the perched water table, the values are reflective of unsaturated conditions only. Results of all coefficients of permeability tests are provided on **Table 5-2**. The combined results provide values for assessing vertical hydraulic conductivity values for seven samples associated with loess and residuum deposits. Based on the minimum, geometric mean, and maximum values of hydraulic conductivity presented in **Table 5-2**, the hydrogeologic properties for each geologic unit can be described as follows:

- **Loess (1 Laboratory Result):** The vertical hydraulic conductivity within the one loess sample collected was $2.4\text{E-}7$ cm/sec which is similar to the underlying residuum.
- **Fine-grained Residuum (4 Laboratory Results):** The vertical hydraulic conductivity of fine-grained residuum samples ranges from $1.1\text{E-}6$ to $2.3\text{E-}8$ cm/sec with a geometric mean of $7.0\text{E-}8$ cm/sec.
- **Coarse-grained Residuum (2 Laboratory Results):** The vertical hydraulic conductivity of the two coarse-grained residuum samples greatly ranges from $1.4\text{E-}2$ to $3.0\text{E-}7$ cm/sec with a geometric mean of $6.3\text{E-}5$ cm/sec. This large range is indicative of layering of the residuum with significant changes in the sand and gravel percentages within the coarse-grained residuum.

Although vertical hydraulic conductivity can vary for the loess, fine-grained residuum, and coarse-grained residuum across the site, the overall hydraulic conductivity is relatively low and uniform with the geometric mean of the loess at $2.4\text{E-}7$ cm/sec, the fine-grained residuum at $7.0\text{E-}8$ cm/sec, and the coarse-grained residuum at $6.3\text{E-}5$ cm/sec. The low hydraulic conductivity of any unconsolidated deposits below the landfill would provide additional protection from landfill development to the underlying groundwater.

5.4.2.8 Horizontal Gradients

Groundwater flow is described in detail under Section 5.4.2.3. Horizontal hydraulic gradients for the perched water table and regional water table were calculated across the landfill property using high water table elevation data (May 2023) and the corresponding water table contour map provided on **Plan Sheet 4** and **Plan Sheet 6**, respectively. The horizontal hydraulic gradient measurements were made perpendicular to the direction of groundwater flow.

The horizontal gradient of the perched water table is reflective of a localized system that is more directly tied to precipitation and localized recharge and better mimics local topography. Within the perched water table, the head loss across the landfill property is approximately 40 feet, with the largest head loss in the southeast near MW-16WT where the perched system diminishes and merges with the underlying regional water table. The horizontal gradient for the perched water table is approximately 0.062 to the south-southeast. The hydraulic gradient within the perched water table directly beneath the proposed landfill expansion area is similar at approximately 0.066 toward the south-southeast.

The horizontal gradient of the regional water table is reflective of a regional groundwater system that intercepts and discharges to nearby surface water features. Within the regional water table, the head loss across the landfill property is approximately 17 feet for a horizontal gradient of approximately 0.020 to the north-northeast with flow toward and discharging to Seas Branch Creek more than 1,700 feet to the north. The hydraulic gradient within the regional water table across the proposed landfill expansion area is approximately 0.026 toward the north-northeast.

5.4.2.9 Vertical Gradients

Vertical gradients were calculated for nested wells and all static water elevation data available from 2018 to 2023. Vertical gradients were calculated by subtracting the head in the deeper well from the head in the shallow well and then dividing by the distance between the midpoint of the monitoring well or piezometer screens. The calculated vertical groundwater gradients are provided in **Table 5-6**.

Three different group of vertical gradients were calculated and are summarized below:

- **Perched Water Table vs Regional Water Table:** The average vertical gradients between the perched and regional water table ranges from 0.774 (MW-1P/MW-1) to 1.045 (MW-1PR/MW-1R) downward. Vertical gradients greater than a value of one (1) are indicative of perched groundwater conditions formed due to the presence of low permeability formations restricting downward groundwater movement.
- **Regional Water Table vs Piezometer:** The average vertical gradient between the regional water table and piezometers ranges from 0.023 (MW-1R/MW-1RZ) to 0.100 (MW-14/MW-14Z) downward.

- **Upper Piezometer vs Lower Piezometer:** The average vertical gradient between the upper and lower piezometers ranges from 0.173 (MW-11/MW-10) to 0.232 (MW-3/MW-6) downward.

5.4.2.10 Groundwater Flow Velocity

The average linear flow velocity of the groundwater is calculated using the equation $v = Ki/n$, where v = average linear flow velocity, K = hydraulic conductivity, i = hydraulic gradient, and n = effective porosity. Values for each parameter was established as follows:

- Hydraulic conductivity (K) was established from the results presented above. Since the horizontal hydraulic conductivity of the perched water table is variable, a range of K from $2.43E-5$ cm/sec to $1.18E-2$ cm/sec with a geometric mean of $1.83E-03$ cm/sec are used in flow velocity calculations for the perched water table. The regional water table has a more uniform horizontal hydraulic conductivity value; therefore, the geometric mean of the horizontal hydraulic conductivity values of $1.84E-3$ cm/sec will be used.
- Hydraulic gradient (i) was established from the results presented above. The average horizontal gradient for the landfill property within the perched water table is 0.062 south-southeast as described in Section 5.4.2.8. The average horizontal gradient for the landfill property within the regional water table is 0.020 north-northeast as described in Section 5.4.2.8.
- Effective porosity (n) was estimated using published documents on the effective porosity of the Prairie du Chein Group (USGS, 1985 and Seaberg, 2000). Effective porosity within the Prairie du Chein is mostly secondary porosity since most flow occurs within dissolution cavities and fractures. It was determined that an effective porosity of 20 percent would be used as a conservative value for the perched water table system as the geology varies with sandier to sandstone units present. For the regional water table system, an effective porosity of 15 percent was used as a conservative value as the geology is more uniform with hard, competent dolostone within this zone.

The horizontal average linear flow velocity across the landfill property (applying the geometric mean for hydraulic conductivity) within the perched water table is approximately 587 feet per year. However, upgradient of the landfill in the vicinity of well MW-9 where the hydraulic conductivity is greater, horizontal flow velocities may exceed 4,000 feet per year. The horizontal average linear flow velocity across the landfill property (applying the geometric mean for hydraulic conductivity) within the regional water table is approximately 248 feet per year.

Note that vertical average linear flow velocity cannot be calculated due to no available vertical hydraulic conductivity values within the bedrock.

Flow velocity can vary locally across the site due to variations in hydraulic conductivity and hydraulic gradients with a downward component of flow. The overall horizontal average linear flow velocity is relatively consistent throughout the year ranging at approximately 587 feet per year toward the south-southeast within the perched water table, but is more uniform at approximately 248 feet per year toward the north-northeast within the regional water table.

5.4.3 Water Quality Assessment

The Vernon County Landfill currently has 26 groundwater monitoring wells or piezometers used to assess groundwater conditions at the site. Following is a summary of the 26 wells currently associated with the MSW landfill (WDNR License No. 3268):

MW-1	MW-1PR	MW-4P	MW-7	MW-11	MW-14Z	MW-16WT*
MW-1R	MW-2	MW-5	MW-8R	MW-12	MW-14WT*	MW-16*
MW-1P	MW-2P	MW-5A	MW-9	MW-13P	MW-15WT*	MW-17WT*
MW-1RZ	MW-3	MW-6	MW-10	MW-14		

Note:

(*) - Installed as part of 2022 investigation.

The groundwater monitoring program is conducted in accordance with the WDNR approved plan modification request (WDNR, February 9, 2021). A copy of the approved environmental monitoring plan for the landfill property is located in **Appendix R. Plan Sheet 29** shows the location of each of the monitoring wells and includes a summary of the environmental monitoring requirements. Per the approved monitoring plans, the groundwater wells are sampled semiannually in March and September. Sampling and laboratory analysis are typically conducted by personnel from MSA Professional Services Inc., and laboratory analysis is typically conducted by Eurofins Environmental Testing of University Park, Illinois.

5.4.3.1 Historical Water Quality

With the exception of four Public Health/Public Welfare parameters (iron, fluoride, manganese, nitrate+nitrite), the groundwater quality at Vernon County generally complies with all preventative action limits (PALs) and enforcement standards (ES) set forth in NR140 Wis. Adm. Code. There is currently no evidence that the active MSW Landfill (WDNR License No. 3268) has caused groundwater contamination at the facility.

5.4.3.1.1 Summary of Existing and Proposed Groundwater Quality Exemptions for Existing Wells

As discussed in Section 5.4.3.1, the parameters of iron, fluoride, manganese, and nitrate+nitrite exceed the NR140 Wis. Adm. Code regulatory limits within several wells at Vernon County Landfill. In accordance with NR140.28 Wis Adm. Code, exemptions to select groundwater quality standards have been requested, and approved by the WDNR as part of the 2003 feasibility determination for the last expansion. A summary of the exemptions granted by the WDNR is provided on **Table 5-7**.

Water quality data for existing wells located within 300-feet of the proposed landfill expansion was reviewed for any additional exemptions observed or validated since the 2003 request. One exemption was deemed necessary of nitrate+nitrite at MW-6. Although this parameter was deemed to have “insufficient data” for an exemption at MW-6 within the recent WDNR approved plan modification request (WDNR, February 9, 2021), nine sampling events of nitrate+nitrite are available and all exceed the PAL; therefore, this proposed exemption is warranted. This proposed exemption request is summarized within **Table 5-8**. Tabulated results of historic groundwater analytical data from existing monitoring wells located within 300 feet of the proposed landfill expansion collected through September 2022 are provided in **Appendix Q**.

5.4.3.2 2022 and 2023 Baseline Groundwater Results

Six rounds of monthly baseline groundwater analytical data were collected from the five newly installed groundwater monitoring points (MW-14WT, MW-15WT, MW-16WT, MW-16, and MW-17WT). Note that MW-15WT and MW-16WT were dry during each event and therefore, no groundwater samples could be collected. Groundwater samples collected from these wells were

analyzed for the baseline and detection monitoring parameters summarized on Table 6 within **Appendix J** in accordance with NR507 **Appendix I**, Table 1 and Table 3.

The laboratory analytical results of the baseline groundwater quality monitoring results for the proposed Expansion are provided in Attachment I of **Appendix J**. A summary of the analytical results for the background quality samples collected and analyzed between December 2022 and May 2023 are provided on Table 7 within **Appendix J**. Note that NR140 Wis. Adm. Code groundwater standards are shown on the table and applicable exceedances to the respective ES and/or PAL values have been made evident by underlining or bolding the associated result. Additional monitoring is ongoing to collect sufficient data to present site-specific PALs (for indicator parameters) and/or ACLs (for applicable inorganic parameters). The analytical results for those monitoring events, along with the applicable site-specific PALs and ACLs will be submitted with the Plan of Operation Report.

In accordance with NR507.18(2) Wis. Adm Code, at least four rounds of samples were collected from the baseline wells for the baseline parameters with public health or public welfare standards. A minimum of four additional rounds of samples will be collected from the wells that contained at least two PAL exceedances, or one ES exceedance during the first four rounds of monitoring. The parameters listed below had at least two exceedances of a PAL or one ES exceedance during the baseline monitoring events:

- **Arsenic:** Groundwater from MW-14WT exceeded the PAL (1.0 µg/l) for arsenic during the March 1, 2023, (2.6 µg/l) and March 27, 2023, (1.0 µg/l) sampling events. Arsenic is a common contaminant found in Wisconsin groundwater and the concentration measured in MW-14WT doesn't appear elevated due to any landfill related activities.
- **Manganese:** Groundwater from MW-14WT exceeded the PAL (60 µg/l) or ES (300 µg/l) for manganese during each of the sampling events between December 2023 and May 2023. Manganese is prevalent in groundwater in Wisconsin and is commonly detected in groundwater samples collected from groundwater monitoring wells immediately following their installation. Manganese is often released from soils into groundwater when the soil in contact with groundwater is disturbed, and typically decreases with time.

In accordance with NR507.18(2), a minimum of eight rounds of data will be collected from the above wells for the parameters specified. Depending on the results, ACLs may be proposed for the above parameters and locations in the Plan of Operation Report.

In accordance with NR507.18(3) Wis. Adm Code, at least two rounds of samples were collected from the baseline wells for VOCs. Two additional rounds of VOC data were collected from any well that indicated a valid detection during the first two rounds. Please note that a few VOCs were detected in each of the baseline wells during the December 2022 and January 2023 events but were flagged as the same VOCs were also detected within the trip blanks. Two additional rounds of VOC samples were collected from the baseline wells to confirm the few VOC detections were anomalous. Historic data for wells within 300-feet of the proposed landfill expansion is provided in **Appendix Q**.

Based on the results of baseline and detection monitoring completed for the baseline monitoring wells, exemptions to the groundwater quality standards outlined in NR140.10 and NR140.12 Wis. Adm. Code are requested as outlined on **Table 5-8** and presented in Section 1.3.1.

5.4.4 Subsurface Data Analysis Conclusions

After review of the historic and newly completed subsurface data for the Landfill property the following conclusions can be drawn for the subsurface below the proposed landfill expansion area:

- The uppermost site geologic units have been defined in reference to three primary depositional environments as follows: Unconsolidated deposits including loess and residuum; saprolite; and dolostone bedrock. Geologic units are described as follow:
 - Thickness of loess soils in the vicinity of the proposed landfill expansion area range from 0 to 10 feet with the greatest thickness found along ridges in undeveloped portions of the landfill property.
 - The thickness of the residuum deposits identified in historic borings performed in the vicinity of the proposed landfill Expansion area ranges from approximately 14.0 to 79.5 feet. As described above, the residuum is generally thicker within valleys due to greater weathering occurring as water moves downslope away from more resistant bedrock that forms ridges in the area.
 - Unlike residuum, the saprolite unit still holds the original bedrock structure and is therefore more similar to bedrock than an unconsolidated deposit. As with the residuum, the physical variability of the saprolites is due to layering within the original bedrock prior to weathering.
 - The uppermost bedrock formation in the proximity of the proposed landfill Expansion area has been established as the Ordovician-aged Hager City Member of the Prairie du Chien Group. The Hager City Member is characterized by thin to medium beds of laminated and stromatolitic dolostone with little to no silt or sand (Evans, 2003). The Stockton Hill Member, which is the basal member of the Prairie du Chien Group and is characterized by silty to sandy dolostone and dolomitic sandstone and appears to be encountered on-site as well. As stated previously, all on-site borings terminate within the lower part of the Prairie du Chein Group; based on boring logs from the City of Viroqua municipal wells, the Jordan Sandstone would occur on-site at an elevation of around 1,000 feet NAVD.
- Bedrock coring at the site has resulted in the following observations and conclusions:
 - Dissolution cavities and bedrock fractures associated with dolomitic rock are primarily present above groundwater in bedrock on-site.
 - Dissolution cavities occur primarily as small voids and do not appear to be interconnected.
 - Bedrock, in general, is often highly fractured and the fractures are likely interconnected.
 - Under hydraulic conditions, fractured bedrock above the water table would likely function as a porous media with only localized shale and clay layers providing limitations to the vertical percolation of water.
- Natural gamma radiation geophysics identified five marker horizons (H1 to H5) across the site. Identification of the five marker horizons across the site confirms that the bedrock geology across the site is consistent and predictable and provides correlation between historic boring logs and current boring logs as well as correlation from weathered to unweathered bedrock.

- The St. Peter-Prairie du Chien-Jordan aquifer is the hydrogeologic unit being monitored on-site. Shallow groundwater will generally be assessed in reference to water table conditions, and it has been determined that a perched water table and a regional water table exist on-site. The following has been determined about the groundwater systems on-site:
 - Perched groundwater conditions diminish along the eastern edge of the site and merge with the underlying regional water table system.
 - The merging of the perched and regional groundwater systems occurs within saprolite where competent bedrock elevation decreases within valleys.
 - Vertical hydraulic gradients in the formation may bias depth to water measurements (water table versus a potentiometric conditions) during the drilling of deeper borings.
 - The perched water table, with depth to water ranging from 60 to 115 feet bgs, flows to the south-southeast and the head loss decreases dramatically within the southeast edge of the proposed landfill expansion area surrounding MW-16WT and south of MW-15WT. This is due to the bedrock valley within this area causing the perched water table to diminish as it merges with the underlying regional water table.
 - The regional water table surface slopes generally from south to northeast across the site. The depth to the regional water table ranges from 139 to 172 feet bgs. The regional water table merges with the overlying perched water table at higher elevations within the southeast edge of the proposed landfill Expansion area near MW-16.
 - The potentiometric groundwater conditions indicate a flow pattern similar to the regional water table conditions with the highest elevations to the south and the lowest elevations to the northeast.
- Slug tests were completed across the Landfill Property to aid in historical hydraulic conductivity results.
 - The hydraulic conductivity of the Perched Water Table system varies widely. The interbedded nature of the shallower dolostone and sandstone bedrock would provide variable hydraulic conditions depending on the material in the screened interval of each well. Although hydraulic conditions are variable, the hydraulic conductivity testing indicates the formations screened are responding as porous media without turbulent flow that would be associated with interconnected dissolution cavities or fractures.
 - The hydraulic conductivity of the Regional Water Table and the basal Prairie du Chien (piezometers) are more consistent which is reflective of more uniform hydraulic conditions for the uniform bedrock physical properties. The hydraulic conductivity is relatively high and is reflective of a uniform porous media.
- The vertical hydraulic conductivity can vary for the loess, fine-grained residuum, and coarse-grained residuum across the site, but the overall hydraulic conductivity is relatively low. The low hydraulic conductivity of any unconsolidated deposits below the landfill would provide additional protection from landfill development to the underlying groundwater.
- Flow velocity can vary locally across the site due to variations in hydraulic conductivity and hydraulic gradients with a downward component of flow. The overall horizontal flow velocity is generally consistent throughout the year at approximately 587 feet per year toward the south-southeast within the perched water table but is more uniform at

approximately 248 feet per year toward the north-northeast within the regional water table.

- There is currently no evidence that the active MSW Landfill (WDNR License No. 3268) has caused groundwater contamination at the facility.

6 Waste and Leachate Characteristics {NR 512.12}

This section presents information regarding expected waste types and leachate characteristics in accordance with NR 512.12 Wis. Adm. Code. The Expansion will accept waste from the service area described in Section 2.3 and Section 11. The proposed Expansion will continue to accept the wastes currently approved for the existing landfill. Waste and leachate characterization are discussed in detail in the following sections.

6.1 Waste Characterization

The general waste types anticipated at the proposed Expansion include municipal solid waste from residential, commercial, and industrial sources, C&D waste, and occasional industrial/special wastes. **Table 6-1** summarizes the quantities of each waste type received by WDNR waste category at the existing landfill for the last five years. Of the waste received, on average, approximately 98% consists of MSW (Category 1) and C&D (Category 25) waste (90% MSW, 8% C&D). The remaining 2% consists of publicly owned treatment works (POTW) sludges (Category 5), waste used for ADC (Category 19), and waste generated by a natural disaster (Category 28).

6.1.1 Industrial and Special Waste

6.1.1.1 Industrial Waste

While not a significant source of tonnage, special and industrial wastes are occasionally accepted at the existing landfill and will continue to be accepted during operation of the Expansion. Prior to accepting special or industrial waste, each waste type and generator are thoroughly reviewed in accordance with the approved Special Waste Management Plan to ensure they are appropriate for disposal and will not negatively impact landfill operations. Special waste sources that are not appropriate are rejected as part of the application process and are not received at the facility. This same practice will be followed for the proposed Expansion.

Special and/or industrial wastes that have historically been accepted include those indicated in Section 3.9 used as ADC, and POTW sludges. It is not anticipated that any single stream of special waste or high-volume industrial waste to constitute more than 5% of the design capacity. However, should such a situation occur during the Expansion, the waste would be thoroughly reviewed in accordance with the Special Waste Management Plan and require WDNR approval in accordance with NR 506.09.

6.2 Leachate Characterization and Treatment

6.2.1 Leachate Characterization

Leachate from the proposed Expansion is expected to be similar in composition and strength to leachate from the current landfill due to the similarities in waste composition as described in the previous section. **Table 6-2** summarizes the leachate characterization of the leachate generated

at the landfill over the last five years. Leachate analytical data has been collected since inception of the landfill as part of its ongoing monitoring program.

Recent laboratory test result ranges and summaries from the current leachate testing program (2018-2022) are provided in **Appendix S**.

6.2.2 Leachate Treatment

Currently, leachate collected from the existing landfill is stored in an underground storage tank (UST) and aboveground storage tank, each located at the southwest corner of the landfill. The existing UST can hold up to 15,000 gallons and the AST can hold up to 30,000 gallons. The leachate storage tanks are emptied periodically to maintain at least 4 days of emergency storage in order to prevent a buildup of leachate head on the landfill liner. Hauling trucks pull off the access road onto a leachate loading structure with a concrete spill pad beneath it. Leachate is then pumped from the adjacent tank to the truck and hauled to either the City of Viroqua wastewater treatment plant (WWTP), City of Sparta WWTP, or La Crosse County Landfill.

The Expansion will not require a separate UST or additional leachate loading structure to be installed. The existing leachate loadout, leachate above ground storage tank (AST) and leachate underground storage tank (UST) will have adequate capacity to handle the anticipated worst-case leachate generation rate and maintain a 4-day tank storage capacity in accordance with NR 504.06(5)(o) Wis. Adm. Code. The existing leachate AST has a storage capacity of 30,000 gallons and the leachate UST has a storage capacity of 15,000 gallons, which yields a combined leachate storage capacity of 45,000 gallons. The expected worst-case scenario leachate generation as shown in Section 6.3 is 3.2 gallons per minute, which is an approximate leachate volume of 18,600 gallons during a 4-day time period. Leachate treatment agreements with the City of Viroqua and La Crosse County Landfill are included in **Appendix S**. Vernon County is currently pursuing a formal agreement with the City of Sparta.

6.3 Leachate Generation

The estimated leachate generation rates for the proposed Expansion are summarized in **Table 6-3** for worst case conditions with maximum open areas. The rates are based on an annual infiltration rate of 1-inch for closed areas and 6-inches for open areas in accordance with NR 512.12(3) Wis. Adm. Code. See Section 8.8.1 for further discussion of leachate generation and disposal.

The worst-case scenario anticipates that approximately 9.58 acres will be active, which comprises all proposed Phases VII, VIII and IX and all existing areas of the landfill within the proposed vertical expansion limits. In addition, approximately 5.02 acres will be closed, and accounts for all areas of the existing landfill outside of the proposed vertical expansion limits. The combined leachate generation rate for this scenario is 3.2 gallons per minute or approximately 4,650 gallons per day as shown in **Table 6-3**.

It is anticipated that the landfill during final closure will occupy approximately 14.6 acres and produce 0.8 gallons per minute or 1,087 gallons per day.

7 Constraints on Landfill Development {NR512.13}

7.1 Locational Criteria

In accordance with NR504.04(3) Wis. Adm. Code, no person may establish, construct, operate, maintain, or permit the use of property for a landfill where the limits of filling are or would be within the areas specified, unless an exemption is granted by the WDNR. The following subsections describe the compliance or exemptions needed for NR 504.04(3) locational criteria.

Appendix B includes correspondence from WDNR regarding locational criteria identified within the ISI and ISR for the proposed expansion.

7.1.1 Lakes, Ponds, or Flowages

The proposed Expansion will not be located within 1,000 feet of a navigable lake, pond, or flowage. One sedimentation basin is located within the proposed Expansion area; however, the rule excludes landfill drainage or sedimentation control structures from the setback requirement. The closest lake, pond, or flowage to the existing landfill and proposed Expansion is the Seas Branch Pond located greater than 4,000-feet to the northeast. According to the WDNR SWDV database, the Seas Branch Pond is an approximate 11-acre flood control impoundment with poor water quality.

7.1.2 Rivers or Streams

The proposed Expansion will not be located within 300 feet of a navigable river or stream. The closest such feature is the Seas Branch Stream located greater than 1,000-feet north of the proposed Expansion. Additionally, an unnamed intermittent stream is located approximately 700-feet to the east of the proposed Expansion. The intermittent stream appears to originate on the landfill property near CTH LF and heads northeast towards the Seas Branch Pond.

7.1.3 Flood Plain

The current landfill and proposed Expansion footprint are not located in a flood hazard area or the 100-year floodplain. The closest floodplain to the existing landfill and proposed Expansion is located greater than 1,200-feet the north in the Seas Branch Valley, which is significantly lower in elevation than the proposed Expansion footprint.

7.1.4 State/Federal Highways, Public Park, and Natural Areas

The proposed waste limits are not within 1,000 feet of the nearest edge of the right-of-way of any state trunk highway, interstate, or federal aid primary highway. The closest such feature is U.S. 14/61 and WI 27, which at its nearest point is roughly 13,000 feet west of the proposed waste limits. There are no public parks or state natural areas within 1,000 feet of the limits of current landfill or Expansion footprint.

7.1.5 Airport Safety

The proposed Expansion is located approximately 2.7 miles (>15,840 feet) northeast of the closest runway at the Viroqua Municipal Airport and is not located in the approach or departure path for the airport. Since the Expansion will be located less than 5 miles from the airport, the County issued a letter dated October 23, 2020, to the FAA notifying them of their intent to

expand. A copy of the notification letter was provided in the ISI request which is included in **Appendix B** to this FR.

The Expansion was determined to be exempt from requirements of 49 USC Section 44718(d), since it does not apply to the expansion or modification of an existing municipal solid waste landfill. For further information see Section 4.6 – Federal Aviation Administration.

7.1.6 Public and Private Wells

There are no public or private wells located within 1,200 feet of the existing or proposed Expansion footprint. The well that serves the landfill office and recycling facility is located greater than 1,200 feet from the proposed Expansion area. The facility well is located roughly 1,550 feet to the southwest, and the closest residential well occurs roughly 1,650 feet to the south. An exemption from NR 50404 (3)(f) was granted within the Feasibility Determination for the previous vertical expansion dated June 28, 2004, to allow the expansion to occur within 1,200 feet of the existing private water-supply well that serves the balefill facility. Since this proposed Expansion area is greater than 1,200 feet from all private water-supply wells an exemption is not required. This existing variance is also outlined within Section 1.3.2 and Section 1.4.

7.1.7 Holocene Era Faults

According to the U.S Geographic Survey (USGS) Earthquake Hazards Program Interactive Fault Map, there are no faults within the vicinity of the active or proposed Expansion footprint. No such faults are known to exist within Vernon County.

7.1.8 Seismic Impact Zones

According to the USGS Earthquake Hazards Program U.S Seismic Hazards Map, the active or proposed Expansion footprint, and most of Wisconsin in general, is located in an area of very low seismic hazard.

7.1.9 Unstable Areas

There are no known current or historic data for the site that would suggest that the current landfill or proposed Expansion is located in an unstable area. Further analyses regarding landfill stability will be performed in the forthcoming Plan of Operation.

7.2 Performance Standards

Under the performance standards in NR 504.04(4), a landfill may not be constructed if there is a reasonable probability that it will cause a detrimental effect on the environment. The following subsections identify the specific detrimental impacts which must be prevented under the performance standards and describe the compliance of the proposed Expansion with these standards.

7.2.1 Impacts to Wetlands

The proposed Expansion is not anticipated to have a significant adverse impact on wetlands. There are no wetlands present in the Expansion area and stormwater run-off during construction and operation will be managed in accordance with applicable stormwater regulations.

The proposed Expansion does involve removal of an existing manmade stormwater sedimentation basin located in the proposed Expansion footprint. The WDNR's ISR opinion indicated that the current zoning would not require special applications or variances to facilitate the landfill Expansion as the entire proposed Expansion footprint is located on Vernon County property and does not require the purchase of agricultural land and will not require an Agricultural Impact Statement.

7.2.2 Endangered and Threatened Species

As indicated in the August 18, 2023 renewed ER review conducted by Laura Spears, it appears unlikely that there would be any significant adverse impact on critical habitat areas or endangered or threatened species as previously discussed in Section 4.5.3.

7.2.3 Detrimental Effects to Surface Water

The proposed Expansion is not anticipated to have a detrimental effect on surface water quality assuming the landfill is designed, constructed, and operated in accordance with State regulations and approvals. Storm water will be managed in accordance with applicable regulations and storm water management systems will be designed and maintained in accordance with industry best management practices. Details of the stormwater management system design are provided in Section 8.16.

7.2.4 Detrimental Effects to Groundwater

The proposed Expansion is not anticipated to cause or exacerbate an attainment or exceedance of a groundwater quality standard assuming the landfill is designed, constructed, and operated in accordance with State regulations and approvals. The Expansion will include a "state of the art" landfill liner and leachate collection system to prevent the release of contamination to the subsurface and groundwater. The existing groundwater quality is discussed in detail in Section 5.4.3.

7.2.5 Migration of Explosive Gas

The proposed Expansion is not expected to cause the migration of explosive gases in excess of 25% of the lower explosive limit (LEL) assuming the landfill is designed, constructed and operated in accordance with State regulations and approvals. The Expansion will include a "state of the art" landfill liner and expansion of the landfill gas collection system to minimize the migration of methane to the subsurface. Details of the landfill gas system design are discussed in Section 8.13. Further detail of the LFG extraction system will be provided in the Plan of Operation.

7.2.6 Hazardous Air Emissions

The proposed Expansion is not expected to cause the emission of any hazardous air pollutant (HAP) exceeding the limitations contained in NR 445.07 Wis. Adm. Code assuming the landfill is designed, constructed, and operated in accordance with state regulations and approvals. The Expansion will include a landfill gas collection system, and continued operation of the HHM collection and collection events, to minimize the presence and fugitive emission of HAPs to the atmosphere.

Air emissions will be similar in type to those that are emitted from current operations. Emissions consist of gases or particulate matter generated by decomposition of waste in the landfill,

combustion products from the landfill gas management system, motor vehicles operating on the site, and fugitive dust generated by the wind and vehicle movement.

7.3 Geotechnical Information

This section contains a summary of the geologic, hydrogeologic, topographic and hydrologic characteristics of the proposed Expansion as they relate to the potential for landfill development. The geological setting at the Vernon County Landfill is conducive to the proposed Expansion. The regional geotechnical information is similar throughout the currently permitted site and the proposed expansion.

7.3.1 Geologic

Site geologic conditions which may affect development of the landfill Expansion include the types of soil, the depth to bedrock, type of bedrock, and depth to groundwater. The unconsolidated deposits at the Vernon County Landfill generally consist of loess and residuum deposits overlying dolostone bedrock. In some areas, saprolite (weathered dolostone) separates the unconsolidated deposits from the dolostone bedrock below. Generally, dolostone bedrock is distinguished by refusal during standard penetration testing.

The total thickness of unconsolidated sediments identified within borings completed within 300-feet of the proposed landfill Expansion ranges from approximately 14.0 feet (MW-3/MW-4P/MW-6) to 79.5 feet (MW-10/MW-11/MW-12). The top of saprolite or bedrock is approximately 17 feet below (B-18) to 23 feet below (B-20) the proposed subbase elevations. The variability in unconsolidated soil thickness is a result of the land surface topography and the topography of the upper bedrock surface.

The Vernon County Landfill is in the unglaciated “driftless” zone of southwestern Wisconsin. Loess soils at the Vernon County Landfill vicinity consists of windblown fine-grained sediment deposited during the Late Pleistocene. These deposits are discontinuous at the site. Where present, loess deposits can be generally described as light brown to brown to gray, clayey silt to silty clay to clay with silt (ML to CL). Thickness of loess soils in the vicinity of the proposed landfill Expansion area range from 0 to 10 feet.

Residuum deposits on the landfill site were generated from the weathering of the underlying dolostone bedrock. Although residuum originates from bedrock, the extent of weathering has removed all bedrock structure and it is therefore considered an unconsolidated deposit. The residuum can be generally described as brown to red brown to red, clay (CL) with to trace sand and gravel to clayey sand (SC) with to trace gravel. The thickness of the residuum deposits identified in historic borings performed in the vicinity of the proposed landfill expansion area ranges from approximately 14.0 to 79.5 feet. The distribution of loess and residuum deposits is presented on the site cross-sections (**Plan Sheet 12** through **Plan Sheet 22**).

Saprolite on the landfill site was generated from the weathering of the underlying dolostone bedrock. Unlike residuum, the saprolite unit still holds the original bedrock structure and is therefore similar to a weathered bedrock. The saprolite can be generally described as weathered dolostone to weathered dolostone with silty sand to weathered dolostone with clay.

The uppermost bedrock formation in the proximity of the proposed landfill Expansion area has been designated as the Ordovician-aged Hager City Member of the Prairie du Chien Group. The saprolite and dolostone bedrock surface elevation encountered within the footprint of the

proposed landfill expansion area had elevations ranging from approximately 1221.0 (B-18) to 1195.0 (B-20) feet NAVD. The top of the saprolite and dolostone bedrock is currently approximately 17 feet below (B-18) to 23 feet below (B-20) the proposed subbase elevations. A bedrock surface map, including saprolite, for the entire landfill property is provided on **Plan Sheet 10**.

The bedrock surface in the area of the proposed landfill Expansion generally follows the topography. The site is located on a dolostone ridge that is oriented in the northeast to southwest direction. The bedrock consists of dolostone with small vugs, silty and sandy dolostone, and dolomitic sandstone. As discussed above, a greater than 10-foot separation distance between the bottom of the landfill clay liner and the top of bedrock surface exists within the proposed expansion area.

7.3.2 Hydrogeologic

Site hydrogeologic conditions which may affect development of the landfill Expansion include the depth to groundwater. The aquifer present beneath the proposed landfill Expansion area is the St. Peter-Prairie du Chien-Jordan aquifer. Shallow groundwater will generally be assessed in reference to water table conditions, and it has been determined that a perched water table and a regional water table exist on-site. Based on the water levels measured in May 2023, depth to water within the proposed Expansion area ranged from approximately 60 to 115 feet bgs. Shallow groundwater is found within the perched water table on-site which has groundwater flow to the south to southeast. The groundwater flow within the regional water table is to the north to northeast.

The proposed subbase grade for the proposed Expansion is much greater than 10-feet above the seasonal high groundwater elevation for the perched water table and regional water table. Since the landfill base is above the groundwater surface, the potential for hydrostatic uplift on the composite landfill liner does not exist.

The on-site private water supply well (P-1) for the current balefill facility is located greater than 1,200 feet from the proposed expansion area. One private well (P-2) is also located south of the landfill property and is also greater than 1,200 feet of the proposed Expansion area. Both private water supply wells are sampled semi-annually as described within the Environmental Monitoring and Maintenance Plan (**Appendix R**). No landfill-related impacts have been found within either private well.

7.3.3 Topographic

The vicinity of the proposed landfill Expansion is located in an unglaciated portion of Wisconsin known as the "Driftless Area." Topography within this area is typified by systems of bedrock ridges cut by stream and river valleys. A system of bluffs forms the higher elevations generally through the central portion of the site. The proposed horizontal expansion area is along the top of this bluff system. The subsurface geology consists of silty loess as well as clay soils generated from weathering of dolomite bedrock (ridges) along with alluvium and lake deposits in the river and stream valleys. Unconsolidated deposits are of varying thickness depending on location. Ordovician aged dolomites of the Prairie du Chien group underlie the unconsolidated deposits and Cambrian age sandstone underlies the dolomite. Regional groundwater on-site flows immediately to the north to Seas Branch Creek and eventually flows to the south-east towards the Kickapoo River located approximately three miles east of the site.

Site topographic features will be affected by the proposed Expansion. The Expansion will be expanding into the wooded area east of the existing landfill. This area is sloped to the southeast ranging in elevation from 1250 ft NAVD 88 on the north side of the expansion area to 1150 NAVD 88 to the east of the expansion area. This area will be cleared and backfilled to the landfill subbase as shown on **Plan Sheet 23, "Phase VII through IX Clay Subbase Grades"**. The uncleared wooded area will be left as-is to provide separation between the landfill and adjacent properties.

7.3.4 Hydrologic

The site is located within the West Fork Kickapoo River Watershed, which is part of the Lower Wisconsin River Drainage Basin with regional surface water eventually draining to the Mississippi River approximately five miles south of Prairie du Chien, Wisconsin (Wojahn, 2019). Surface water in the area drains to the Seas Branch (north of the site) and an unnamed drainage (southeast portion of the site) which both feed into the West Fork of the Kickapoo River. The West Fork of the Kickapoo River flows to the south, meeting the Kickapoo River, and eventually the Wisconsin River. Significant surface water bodies near the site include Seas Branch, and an associated impoundment (5 Reservoir), which is approximately one quarter to one half mile north and northeast of the site respectively, an unnamed discontinuous drainage way flowing through the southeast portion of the site, and the West Fork of the Kickapoo River, which is approximately three miles east of the site. Other than the impoundment of Seas Branch (Reservoir 5), no significant lakes are present in the immediate vicinity of the site. Additional unnamed drainage ways are also present in small valleys and swales throughout the region.

The Wisconsin Wetland Inventory Map does not identify wetlands within the proposed landfill Expansion area. A wetland area is identified on the shorelines of Seas Branch just west of the impoundment area, approximately ½ mile northeast of the site. Six wetland class points too small to delineate are located along the shoreline of Seas Branch to the northwest, north and northeast of the site. Three wetland class points identified as dammed pond are identified on the landfill property to the southeast of the proposed landfill expansion area. No other wetlands were identified in the immediate proximity of the proposed landfill expansion area.

7.3.5 Construction and Operation

No constraints regarding material or support services necessary to construct and operate the proposed Expansion have been identified. Construction and operational support requirements are expected to be similar to the currently permitted landfill. No specialized engineering structures outside of the requirements of NR 500 are anticipated to support landfilling activities.

7.3.6 Construction and Operations Materials

On-site excavation and existing stockpiles will provide sufficient and suitable material for general fill for subgrade and berm construction, rooting zone soil required for the final cover, topsoil, and daily and interim cover soil. Other materials, such as the granular drainage layer material for final cover and stone for the leachate collection system are available locally from commercial sources. The geomembrane and other geosynthetics needed for construction are commercially available.

Clay for liner and cover construction are located in an on-site approved clay borrow source which will require excavation and segregation of soils. A 5-foot-thick clay liner is proposed for the expansion, which exceeds the minimum 4-foot-thick clay liner required in NR504.06(2)(e) Wis. Adm. Code and is similar in design to the original, existing clay composite liner installed at the

Landfill. This design was approved to ensure additional protection to nearby residents and environmental resources. The clay used will consist of clay meeting the requirements of NR 504.06(2)(a). The minimum 2-foot-thick clay capping layer [NR 504.07(4)] of the final cover will consist of clay meeting the same requirements as the liner material.

7.3.7 Support Services

The existing landfill has the facilities, equipment, infrastructure, and personnel power necessary to operate the Expansion effectively and efficiently, and other services provided. Existing infrastructure that will be used for the proposed Expansion includes:

- Landfill scale
- Access roads
- Landfill office and recycling facility
- Public drop off
- Leachate collection, conveyance, and storage infrastructure
- Environmental monitoring network (monitoring wells, gas probes, leachate headwells, lysimeters and side slope riser)
- Storm water management structures

The landfill presently has the employees, via direct employment through Vernon County to operate the Expansion. Presently the solid waste department staff consists of 3 full-time employees and one part-time employee consisting of a Director and operational support staff to address administrative requirements, scale attendance, program administration, environmental monitoring and reporting, facility operations coordination, and planning.

The landfill also utilizes engineering consulting to assist with solid waste design, planning and compliance, and operations and monitoring.

7.3.8 Leachate Collection and Treatment

The Vernon County Landfill has an on-site underground storage tank and above ground storage tank. Leachate generated within the MSW landfill is discharged to these tanks through a lift station at the southeast corner of the existing MSW landfill. The underground storage tank and above ground storage tank is located southwest of the MSW landfill near the leachate loading structure. The leachate loadout pad can handle a 5,000-gallon tanker truck to load leachate and haul to the City of Viroqua WWTP, City of Sparta WWTP, or La Crosse County Landfill.

Appendix S contains a copy of the current leachate treatment agreements in place.

Additionally, Vernon County disposes of its generated leachate to the La Crosse County Landfill (License No. 3253). The La Crosse County Landfill through its research, development, and demonstration (RD&D) plan is approved to utilize Vernon County Landfill leachate for RD&D liquids application.

7.4 Existing Facility Performance

NR 512.13(4) requires expansions of an existing landfill to include an evaluation of the existing facility's compliance status and performance. As discussed in more detail below, the Vernon County Landfill consistently maintains compliance with all known applicable regulations, orders, and administrative rules.

As part of landfill's conditional plan of operation approval (WDNR, July, 2005) requirements, annual reports are submitted to the WDNR that summarize the facility's operational data and compliance status. In accordance with NR 506.19(1), the landfill issues annually a compliance certification to the WDNR asserting their compliance status with respect to approved plans, WDNR conditions of approval, and applicable solid waste statutory and administrative rules. Copies of WDNR annual tonnage reports for 2016 through 2022 are included in **Appendix E**.

7.4.1 Operational Issues and Remedies

Routine operation issues have occurred at the landfill since issuance of the Plan of Operation. These issues were primarily related to environmental issues or human error. These issues are common to landfills and have been resolved with no known or lasting environmental impacts. Examples of the resolved operational issues and the associated remedies include the following:

- Erosion: strategic location of culverts, berms, and riprap; consistent use of flumes/energy dissipaters in high erosion area; expedited vegetative establishment and aggressive use of erosion blanket.
- Wind-blown waste from high winds: instructed operations staff to collect wind-blown trash; repaired damaged wind screens and fences.
- Leachate side slope seeps: avoid using fine grained soil (<15% by weight passing the P200 sieve) as daily; diverted leachate seeps to the leachate collection system; implemented policies to keep highly impermeable items (plastic film, ag bags) from side slopes; and increased intermediate cover; minimized temporary access roads and landfill access points.

7.4.2 Conclusions

Review of the compliance status and performance of the existing facility indicates that the existing facility is performing well and in consistent compliance with existing permits, approvals, and applicable regulations. The proposed Expansion to the existing landfill has been designed to meet the requirements of NR 500 and the intent of existing solid waste regulations. The site has established procedures, trained personnel, and existing infrastructure to support the Expansion. The design, construction and operation will be similar to the existing landfill, and therefore, the Expansion is anticipated to meet the requirements of the forthcoming permits for the site.

8 Engineering and Design {NR 512.14}

8.1 General

This section presents the preliminary design concepts for the proposed Expansion. The preliminary design conforms to the requirements and standards of NR 504 Wis. Adm. Code, unless otherwise noted. The following sections include a discussion of the specific design concepts proposed. **Plan Sheets 23 through 28, along with details on Plan Sheets 29 through 33**, graphically illustrate the proposed design.

8.2 Design Capacity and Site Life

The proposed Expansion will create an additional 427,355 CY of permitted airspace. It is anticipated that the proposed Expansion will extend the existing facility airspace capacity by 15 years. Site life is discussed below in Section 11.6.

8.3 Site Access and Traffic

Solid waste will be hauled by WDNR licensed vehicles to the landfill via major highways within the service area in accordance with applicable weight restrictions. The current traffic routes being used for the existing facility will be used for the proposed Expansion. A discussion of traffic routes is provided in Section 4.7 Transportation and Access.

8.4 Site Screening

Screening is required by NR 504.04(3)(d) Wis. Adm. Code for sites within 1,000 feet of the nearest right-of-way of any state trunk highway, interstate or federal aid primary highway, public park, or state natural area. No such features are within 1,000-feet of the existing landfill or Expansion, however natural screening is provided by a combination of topography, woodlands, and phased vegetated intermediate and final cover.

8.5 Subbase Design

The proposed subbase grades representing the bottom of the five-foot clay liner are provided on **Plan Sheet 23**. Proposed elevations of the subbase range from approximately 1203 feet in the proposed Phase VII to approximately 1255 feet on the northern limits of Phase IX. Soil excavated in establishing subbase grade will be used in construction of the site (i.e., perimeter berms, daily, intermediate, and final cover, access roads or other features), or stockpiled for later use. The sump invert elevation will be four feet below the leachate collection trench flow line. Sump details are shown on **Detail 1 on Plan Sheet 30**.

The subbase grades are designed to provide a minimum ten feet of separation between the bottom of the clay liner and the seasonal high groundwater condition (see **Plan Sheet 4**) and the bedrock surface map (See **Plan Sheet 10**). Given the hydrogeology of the site, the nearest seasonal high water table elevations are between 60 to 100 feet below the bottom of the proposed Expansion clay liner.

8.5.1 Bedrock Separation

The top of the saprolite and dolostone bedrock is approximately 17 feet below (B-18) to 23 feet below (B-20) the proposed subbase elevations; therefore, a greater than 10-foot separation distance between the bottom of the landfill clay liner and the top of bedrock surface exists within the proposed Expansion area as shown on **Plan Sheet 21**. Boring information demonstrates that materials separating the proposed clay liner from bedrock are soils and weathered bedrock with relatively low hydraulic conductivity. Geotechnical data indicates that in all areas except proximal to MW-14Z at the far north end of the proposed Expansion weathered saprolite with silty sand or clay overlies the bedrock. Overlying the weathered saprolite in all areas beneath the proposed Expansion is loess and residuum. The vertical hydraulic conductivity can vary for the loess, fine-grained residuum, and coarse-grained residuum across the site. The overall hydraulic conductivity of these unconsolidated deposits are relatively low.

If bedrock were encountered during landfill subbase excavation, all bedrock within the 10-foot depth below the clay liner subbase would be excavated and the intermediate space left void by bedrock backfilled with soils or crushed bedrock meeting geotechnical subgrade compaction and grain size design requirements and tested in accordance with NR 516.07 (1m) Wis. Admin. Code.

8.6 Base Grades

The proposed base grades, representing the top of clay liner elevations, are presented on **Plan Sheet 24**. Elevations of the base grades range from approximately 1208 feet to 1260 feet NAVD 88. The interior sidewalls are designed at a maximum three horizontal to one vertical (3H:1V) slope from the landfill base to the top of the berm.

The base grades are designed with an approximate 5 percent slope toward the leachate collection pipe, with the drainage patterns in a herringbone pattern. The proposed design meets the requirements of NR 504.06(2)(d) Wis. Adm. Code specifying a minimum 2% slope of the liner toward the leachate collection lines, and NR 504.06(5)(a) Wis. Adm. Code requirements which limit flow distance across the base liner to not more than 130 feet before entering a perforated leachate pipe. The leachate collection trench is designed to maintain a 5 percent slope. Refer to **Plan Sheet 24** which shows the leachate collection system pipe spacing and base grade slopes.

8.7 Liner System

A composite liner system consisting of a 5-foot-thick compacted clay liner overlain with 60-mil textured HDPE geomembrane will be installed within the entire proposed Expansion area. This composite liner system will function as the primary containment system.

8.7.1 Clay Liner

All clay will be obtained from a pre-approved source meeting NR 504.06(2)(a) Wis. Adm. Code. The clay liner design for the proposed Expansion will meet the material and placement requirements of Wis. Adm. Code NR 504.06(2), as follows:

- Minimum thickness of five feet (5-feet)
- Unified Soil Classification System: Group Symbol CL or CH
- Percent passing the No. 200 sieve: >50%
- Liquid Limit: average 25 or greater with no samples below 20
- Plasticity Index: average 12 or greater with no samples below 10
- Compaction: 95 percent of the Standard Proctor (ASTM D698) or 90 percent of the Modified Proctor (ASTM D1557) maximum dry density
- Moisture content at compaction: wet of optimum moisture content for Standard Proctor or minimum 2% above optimum for Modified Proctor
- Lift Thickness: construct in 6-inch compacted lifts
- Maximum laboratory hydraulic conductivity: 1×10^{-7} cm/sec

The final lift of the clay liner will be smooth rolled with a smooth drum roller. All coarse gravel or cobbles larger than two inches in diameter will be removed from the surface prior to placement of the geomembrane.

8.7.2 Geomembrane

High density polyethylene (HDPE) is the resin to be used for the liner geomembrane. The reasons for this selection, as well as the basis for selection in the future, are:

- Compatibility with the MSW and anticipated leachate from the facility.
- Longevity of the materials.

- Experience in the industry from the perspective of manufacture and installation including manufacturing quality control (MQC) and manufacturing quality assurance (MQA).
- Experience in the engineering community from the perspective of construction quality control (CQC) and construction quality assurance (CQA).
- Availability and competitive pricing of the liner.

A 60-mil HDPE geomembrane liner will be placed directly above the 5-foot-thick compacted clay liner. Textured geomembrane will be installed over the entirety of the landfill footprint for added surface interface friction. HDPE flat stock sheet will be installed under the side slope riser pipe base.

Prior to installation of the geomembrane, the surface of the compacted clay liner will be rolled smooth, and free of stones and construction debris which may be damaging to the geomembrane. The clay surface will be sufficiently dry and free of ruts. Depressions and large cracks will be filled with tamped clay or bentonite.

8.8 Leachate Management System

The leachate collection system (LCS) for the horizontal component of the Expansion will include a granular drainage layer placed over the composite liner. The drainage layer directs leachate at an average slope of 5% to the collection trench consisting of a 6-inch diameter perforated HDPE pipe placed in a V-type trench. Maximum flow distance of leachate along base grades to the leachate collection trench is 130 feet. Leachate generated within the vertical Expansion will continue to be controlled by the existing leachate collection system.

The maximum leachate collection pipe length as measured to the toe of the opposite slope from the end of a cleanout in Phases VII to IX is less than 820 feet. The Eastern Expansion does not need to comply with NR504.07(6) Wis. Adm. Code regulations for extended collection lines. The leachate collection trench will route the leachate to an extraction sump constructed at the low point in the base grades. A submersible pump will extract leachate from the sump and discharge it to a double-encased transfer pipe located along the perimeter berm. The transfer pipe will convey leachate to a leachate manhole and then to an existing leachate storage tank on-site. The transfer pipe will be double encased from the point it leaves the leachate extraction manhole to the leachate storage tank. The proposed LCS is shown on **Plan Sheet 24**. Details are provided on **Plan Sheets 30 through 32**.

8.8.1 Leachate Generation, Recirculation and Disposal

Leachate quantities are summarized in **Table 6-3** for open and closed conditions in accordance with the established guidelines in NR 512.12(3)(a) and (b) Wis. Adm. Code. This calculation assumes six inches of leachate generation for open areas and one inch of leachate generation for closed areas with installed final cover. Closure of landfill areas will be phased with landfill construction. See **Plan Sheet 26** for closure phasing. As Phase VII is constructed, Closure C-1 will occur. As cells are developed and final grades are reached, closure will progress from west to east over the existing landfill footprint, and south to north over the proposed Expansion footprint.

The worst-case condition of leachate generation during operation of the Expansion will occur following construction of Phase VII, VIII and IX of the proposed Expansion and prior to completion of final cover construction sequences C-2 and C-3. After construction of Phase IX of the proposed Expansion and prior to closure of areas C-2 and C-3, there will be approximately

5.0 acres of open area and 9.6 acres of closed area. Based upon these conditions, the calculated leachate generation for open and closed conditions is approximately 4,650 gallons per day, in total. Leachate generation after final closure of the existing landfill and proposed Expansion is anticipated to be 1,100 gallons per day.

These open and closed area scenarios and calculations are presented in **Table 6-3**. The actual leachate generation rate during site operations will be dependent on the waste filling rate, intermediate cover placement, the total annual precipitation and evaporation rate, and the waste's moisture holding capacity.

There will be storage on site for the worst-case leachate generation scenario for approximately 9.7 days since there is currently a 15,000-gallon underground storage tank and a 30,000 gallon above ground storage tank. This provides a combined leachate storage capacity of 45,000 gallons, which exceeds the required minimum 4-day leachate storage capacity per NR 504.06(5)(o) Wis. Adm. Code.

A proposed leachate recirculation plan and Organic Stability Plan in accordance with NR 514.07(9) Wis. Adm. Code will be included in the Plan of Operation for the Expansion contingent on the approval of this FR.

8.8.2 Leachate Collection System

The leachate collection system consists of a 1-foot-thick granular drainage layer which directs leachate to a series of leachate collection trenches in accordance with NR 504.06(5)(a) through (i) Wis. Adm. Code. The system is designed to eliminate all vertical liner perforation of the landfill liners. The components of the leachate collection system are described below.

8.8.2.1 Geotextile

Geotextile fabric will be placed above the geomembrane and beneath the granular drainage layer. The geotextile will be sized to meet puncture and loading requirements.

8.8.2.2 Granular Drainage Layer

The granular drainage layer will consist of a minimum 1-foot thickness of material meeting the following specifications:

- Washed aggregate, <5% passing the No. 200 sieve
- Calcareous limestone or dolomite concentration <5%
- Washed granular material with a uniformity coefficient (D60/D10) of less than or equal to 4.0
- Hydraulic conductivity which is greater than or equal to 1 cm/sec (ASTM D5856)
- Sieve analysis (ASTM C136, ASTM C117) of drainage material for the leachate drainage layer shall be as follows:

Sieve Size	Percent Passing
1-inch	100
3/4-inch	95-100
1/2-inch	20-55
3/8-inch	0-15
No. 4	<5
No. 200	<2

Placement of the drainage layer will be performed with low-ground pressure bulldozers. A minimum of 1 foot of drainage layer material will be maintained beneath equipment with a ground pressure of less than 5 psi. A minimum of two feet will be maintained for all other tracked or floatation tire type vehicles. A minimum of three feet will be maintained beneath haul trucks.

8.8.2.3 Collection Trenches

Leachate collection trenches consisting of a HDPE perforated pipe installed in a V-type trench will be constructed in the locations shown on **Plan Sheet 24**. Details of the trench are provided in **Plan Sheet 30**.

In accordance with NR 504.07(6) and NR 504.06(5)(tm), pipe bedding material shall be composed of coarse, uniform gravel with a hydraulic conductivity that is greater than 1 cm/sec. A maximum six inches of pipe bedding material consisting of 1-1/2-inch washed stone material with a uniformity coefficient less than 4 will be placed under the pipe. A non-woven geotextile will be placed beneath the pipe bedding to protect the underlying geomembrane. Pipe diameter, SDR and geotextile sizes will be determined during the Plan of Operation as part of the pipe strength and leachate flow capacity calculations and design.

Cleanouts will be installed on both ends of each pipeline segments. Details of a typical cleanout are shown on **Plan Sheet 30**. The east cleanout located on the east end of the east-west leachate collection trench located along the south end of the existing landfill will be encroached upon by the Expansion construction. The outlet for this cleanout will be extended to a location to the south as shown on **Detail 1 on Plan Sheet 33**.

8.9 Leachate Removal and Transfer System

The leachate removal and transfer system proposed for the Expansion consists of a leachate collection sump, a sideslope riser pipe equipped with a submersible pump, a pump building and secondary containment transfer piping. Leachate will be transferred from the proposed system through the existing lift station and leachate forcemain on-site to existing underground and aboveground storage tanks. An above ground leachate loadout structure is used to load tanker trucks for offsite disposal. The individual components are described below.

8.9.1 Leachate Extraction Sump

Leachate collected in the leachate collection piping of the proposed Eastern Expansion will drain to a sump at the low end of Phase VII as shown on **Plan Sheet 24**. The leachate collection sump will be approximately four feet deep (three feet below the incoming leachate collection pipe). The sump will be filled with bedding material, and the bottom of the sump will be lined with non-woven geotextile to protect the geomembrane. Sump and pump sizing calculations will be provided in the Plan of Operation.

8.9.2 Sideslope Riser Piping and Submersible Pump

Sideslope riser piping consisting of an 18-inch diameter SDR 11 high density polyethylene (HDPE) pipe will be installed at the base of the sump and will extend to the top of the perimeter berm. The piping serves as an access point for the submersible pump. Details of the piping are provided on **Plan Sheet 31**. The pump will be designed to facilitate installation and removal through the inclined riser pipe and is designed to be maneuvered from the top of the riser pipe by lift cables. The pump's normal on-and-off operations will be controlled by a pressure transducer located on the end of the pump.

8.9.3 Leachate Pump Building

A leachate pump building will be installed at the top of the perimeter berm at the sump location. The building will provide an extraction point for maintenance of the pump and sampling of leachate. The pump controls and alarm will be centrally located on a control panel located near the building. An alarm light will be provided to indicate a malfunction of the pump. Manual pump controls for pump testing and sampling will be located at each pump building. All electrical equipment, including the pump, flow meter, transducer, and associated wiring will be intrinsically safe. Locations of the building is shown on **Plan Sheet 24**. Details are provided on **Plan Sheet 32**.

8.10 Leachate Transfer and Storage System

Leachate will be transferred from the leachate extraction building through a double-walled pipeline into a connector leachate manhole through another double-walled pipeline into an existing leachate lift station, which pumps the leachate through a leachate force main to a leachate storage tank, as shown on **Plan Sheet 24**. The proposed leachate transfer pipelines will consist of a HDPE carrier pipe within a HDPE containment pipe. The pipes will be installed in a trench and will be located below the frost line. Pipe SDR and diameters will be determined during the Plan of Operation.

8.10.1 Existing Leachate Lift Station, Forcemain Piping and Storage Tanks

8.10.1.1 Forcemain Piping

The existing leachate force main pipe between the existing lift station and the underground leachate storage tank consists of 4-inch HDPE forcemain within an 8-inch HDPE containment pipe.

8.10.1.2 Lift Station

The lift station is encased in 60-inch-thick clay soils. The existing leachate lift station has two pumps and controls. Leachate is pumped from the lift station wet well manhole to the storage tank until the leachate level drops below 1-foot above the floor of the manhole. If leachate levels reach above the 5-foot level mark, a second alternate pump starts, and runs simultaneously. Similarly, if a problem occurs with one of the pumps while pumping, the other pump will activate. Check valves are in place in the forcemain piping to prevent any back draining of leachate from the storage tank to back into the lift station manhole.

8.10.1.3 Leachate Storage Tanks

The leachate underground storage tank (UST) is a 15,000-gallon double walled fiberglass reinforced plastic (FRP) tank. The tank has two gas vent pipes. The tank is encased in 2-foot

thick compacted clay liner. Leachate is pumped from the UST to the leachate loadout structure. The tank has a high level warning system and interstitial leak detection alarm.

The leachate aboveground storage tank (AST) is a 30,000-gallon double walled steel structure. The tank functions primarily as an auxiliary tank receiving leachate pumped to it from the UST. The tank has a high-level tank alarm, interstitial monitoring probe and intake pump shut off system.

8.10.2 Leachate Loading Structure

The leachate loading system is designed to pump leachate from the leachate storage tanks into a tanker truck. The leachate loading structure consists primarily of 4-in ductile iron (D.I.) forcemain piping, elevated piping stand and footing, concrete slab, catch basin, casting, and PVC drainage piping. A 36-inch diameter catch basin is located underneath the pad to contain any spills or truck overflow conditions.

8.11 Leachate Treatment

Primary leachate treatment will be provided by the City of Sparta WWTP and the La Crosse County Landfill (through their currently approved RD&D Plan). The City of Viroqua WWTP is also capable of treating Vernon County leachate and is currently a tertiary option as Sparta WWTP and La Crosse County Landfill provide the bulk of leachate treatment for Vernon County. The volume of leachate discharged to the treatment facility will be recorded and submitted to the WDNR. Leachate treatment agreements are located in **Appendix S**.

8.12 Leachate Headwells

Leachate head monitoring wells (headwells) will be installed to monitor the hydraulic head of the leachate generated in the Expansion area. Two headwells will be installed on either side of the sump in Phase VII. The proposed locations of the headwells are shown on **Plan Sheet 24**. The proposed headwells will consist of a 4-inch diameter SCH 80 non-perforated PVC pipe with a 10-foot slotted pipe section for the screen. The 4-inch diameter sidewall riser pipe will provide a conduit for standard measurement equipment access. Details of leachate headwell construction are provided on **Plan Sheet 30**.

8.13 Landfill Gas Management System

No landfill gas management system has been installed at the current Vernon County Landfill. SEH submitted the Vernon County Landfill (Lic. #3268) Landfill Gas System Plan Modification on November 4, 2022, for a Passive Landfill Gas Management System with option to convert to an active collection system. This Plan Modification was approved by WDNR on January 30, 2023.

A passive LFG system was proposed for the existing landfill due to the low HAP emission potential of the existing landfill which can primarily be attributed to the small size of the landfill. The WDNR air program recognized in a letter dated November 13, 2015 that the existing landfill is able to meet applicable requirements of NR 445 without installing and operating an active LFG collection system. Additionally, the low LFG generation potential for the existing landfill could limit the ability of a traditional candlestick flare skid to sustain combustion.

However, for the proposed Expansion, it is anticipated an active gas system will be installed in accordance with NR 504.08 Wis. Adm. Code. A detailed design of the LFG extraction system for the proposed Expansion will be provided in the forthcoming Plan of Operation. The LFG design

including the need for treatment devices (i.e., a flare) will be based on anticipated HAP emissions, LFG generation potential, leachate recirculation, and operational considerations such as odor control. The system design may consist of vertical LFG extraction wells, horizontal wells, blower, LFG condensate management structures such as drip legs, header and lateral piping, and potentially a treatment device that will be suited to control anticipated HAP and LFG emissions.

8.14 Final Cover System

A composite final cover system consisting of a grading layer above the final waste grades overlain by a two-foot thick compacted clay capping layer, 40-mil textured LLDPE geomembrane, one-foot sand drainage layer, two-foot-thick rooting zone layer, and six inches of topsoil will be installed over the entire proposed Expansion area. This composite final cover system will function as the primary stormwater infiltration deterrent.

8.14.1 Grading Layer

A minimum one-foot grading layer consisting of compacted on-site borrow soils of USCS SW, SP, SM, SC, or combinations thereof will be proof rolled prior to installation of clay layer materials.

8.14.2 Clay Capping Layer

Clay used in the clay capping layer will be pre-approved meeting NR 504.06(2)(a) Wis. Adm. Code. The compacted clay layer design for the proposed expansion will meet the material and placement requirements of NR504.07(4) Wis. Adm. Code, as follows:

- Minimum thickness of two feet
- Unified Soil Classification System: Group Symbol CL or CH
- Percent passing the No. 200 sieve: >50%
- Liquid Limit: average 25 or greater with no samples below 20
- Plasticity Index: average 12 or greater with no samples below 10
- Compaction: 95 percent of the Standard Proctor (ASTM D698) or 90 percent of the Modified Proctor (ASTM D1557) maximum dry density.
- Moisture content at compaction: wet of optimum moisture content for Standard Proctor or minimum 2% above optimum for Modified Proctor
- Lift Thickness: construct in 6-inch compacted lifts
- Maximum laboratory hydraulic conductivity: 1×10^{-7} cm/sec

The final lift of the clay capping layer will be smooth rolled with a smooth drum roller. All coarse gravel or cobbles larger than two inches in diameter will be removed from the surface prior to placement of the geomembrane.

8.14.3 Geomembrane

Linear Low-Density Polyethylene (LLDPE) is the resin to be used for the liner geomembrane. The reasons for this selection, as well as the basis for selection in the future, are:

- Compatibility with the municipal solid waste and anticipated leachate from the facility.
- Longevity of the materials.

- Experience in the industry from the perspective of manufacture and installation including manufacturing quality control (MQC) and manufacturing quality assurance (MQA).
- Experience in the engineering community from the perspective of construction quality control (CQC) and construction quality assurance (CQA).
- Availability and competitive pricing of the liner.

A 40-mil LLDPE geomembrane liner will be placed directly above the 2-foot-thick clay capping layer. Textured geomembrane will be installed over the entirety of the landfill cap for added surface interface friction. Prior to installation of the geomembrane, the surface of the compacted clay capping layer will be rolled smooth, and coarse gravel or cobbles large than 2 inches in diameter will be removed from the surface. The clay surface will be sufficiently dry and free of ruts. Depressions and large cracks will be filled with tamped clay or bentonite.

8.14.4 Sand Drainage Layer

The sand drainage layer will consist of a minimum of one-foot with a minimum hydraulic conductivity of 1×10^{-3} cm/sec per NR504.07(6)(a). Final material specification will be presented in the Plan of Operation.

The sand drainage layer will be placed at the base of the slope and pushed upward in one lift by equipment with low ground pressure tracks at a maximum of 5 psi ground pressure to ensure integrity of the underlying geomembrane. Equipment shall operate on a minimum of 1-foot of material. Should haul roads be required for placement, rubber-tired equipment will only be allowed on areas of minimum 3-foot thickness.

Perimeter drainage pipes are proposed at the toe of the slope of the sand drainage layer as required in NR504.07(6)(b) Wis. Adm. Code and are detailed on **Plan Sheet 34**. These perimeter drainage pipes daylight to the surface on 200-ft intervals on center. Riprap will be provided at the outlet of each perimeter drainage pipe to prevent scouring.

8.14.5 Rooting Zone Layer

A rooting zone layer consisting of a minimum 2-foot thick layer of general fill material will be placed over the sand drainage layer in an uncompacted state in accordance with NR504.07(6) Wis. Adm. Code. Rooting zone soil will consist of on-site material if available or commercially provided material at time of construction.

8.14.6 Topsoil

A minimum 6-inch-thick layer of topsoil will be placed uncompacted over the rooting zone layer as required by NR 504.07(7) Wis. Adm. Code. The topsoil will consist of material stripped from on-site stockpiles, borrow areas, and from topsoil stripped during the proposed expansion development.

8.14.7 Vegetation

As required in NR 504.07(8) Wis. Adm. Code, all topsoiled areas will be vegetated using seed mixtures and application rates in accordance with Section 630 of the Wisconsin Department of Transportation Standard Specifications for Road and Bridge Construction (Wis DOT specs).

8.15 Preliminary Material Balance

Liner construction for Phases VII, VIII and IX of the proposed expansion will require approximately 37,810 cubic yards of clay (compacted in-place volume) for a 5-foot liner, which corresponds to the following phase developments:

- Phase VII will require approximately 12,370 cubic yards of clay
- Phase VIII will require approximately 12,730 cubic yards of clay and
- Phase IX will require approximately 12,710 cubic yards of clay

Final closure of the existing and proposed facility will require approximately 48,260 cubic yards of clay (compacted in-place volume) for a 2-foot liner.

- Closure C-1 will require approximately 17,050 cubic yards of clay
- Closure C-2 will require approximately 15,120 cubic yards of clay
- Closure C-3 will require approximately 16,090 cubic yards of clay

Preliminary soils balance volumes are presented in **Table 8-1**. Section 9 provides additional information regarding clay liner borrow sources and field and laboratory investigations in accordance with NR 504.075 Wis. Adm. Code. Soil/aggregate needed for drainage layer materials for the existing and proposed Expansion are available from nearby commercial sources.

8.16 Surface Water Management

The Vernon County Landfill is planning to expand the landfill area to the east, encompassing areas that are currently occupied by mostly woodland, grassy areas and an existing stormwater management basin. The Expansion will require stormwater management controls to provide stormwater treatment to meet the DNR standards associated with NR 151, NR 504.09, and NR 216 Wis. Adm. Code. The sedimentation basin outlets and stormwater collection and conveyance systems will be designed in the Plan of Operation. Sedimentation basin storage design is discussed below.

BMP's and good practices in accordance with Technical Standards 1001 and 1064 will be followed as described below:

- Grading and construction shall be scheduled to minimize soil exposure. Only the areas required for landfill construction, access roads and stormwater management structures will be disturbed. Other areas will remain undisturbed.
- Existing vegetation shall be retained whenever feasible.
- Disturbed areas shall be vegetated and mulched. All disturbed areas such as exterior berms, drainage ditches (where velocities do not exceed the erodible velocity for vegetation) and other areas disturbed will be permanently fertilized, seeded, and mulched.
- Runoff shall be diverted away from disturbed areas and active fill areas. **Plan Sheet 28** shows the stormwater drainage ditches or berms which will divert surface water from the proposed Eastern Expansion area. The diversion structures will be built sequentially as site development occurs. The landfill area currently has containment berms which divert water from the active fill areas.

- Sediment shall be trapped on-site. Surface water runoff from disturbed areas, including access roads, screening berms, borrow areas and exterior landfill berms will be diverted or channeled to the sedimentation basins on the landfill property.
- Runoff control structures shall be inspected and maintained. The operation and maintenance of the surface water management features, which generally include cleaning, repair and/or replacement of stormwater management features, will be conducted on an as-needed basis. Operation and maintenance will be described in more detail in the Plan of Operation.

8.16.1 Diversion Berms

Diversion berms will be incorporated on the final cover system to collect and transfer water to the receiving perimeter ditches. The berm flow lines will intermittently discharge into downslope channels to convey water into the perimeter ditch system. To minimize erosion or scouring, diversion berms will be located and sized to maintain flow rates and velocities to prevent erosion. The diversion berms will be designed to convey the 25-year, time of concentration flow rate. Further diversion berm designs will occur during the Plan of Operation.

8.16.2 Downslope Channels

Downslope channels will collect and convey surface water from diversion berms to the perimeter ditches. These channels will be designed to accommodate 25-year, 24-hour storm events over the specific collection areas and discharge to energy dissipating riprap. Downslope channels will be designed to meet design storm flow rates. The downslope channels will be installed above the final cover to simplify vegetation maintenance. Further downslope channel designs will occur during the Plan of Operation.

8.16.3 Ditches

Ditches will be designed around the perimeter of the landfill and up to the proposed sedimentation basin. Flow will be directed off the slopes to ditches to convey flow to the sedimentation basin in the southeast area of the site. See **Plan Sheet 21** for the proposed storm water management system.

The ditch drainage system will be evaluated and designed for the peak flow rates from a 25-year, time of concentration storm. Velocities for grass-lined ditches will be limited to four feet per second (fps). In areas where velocities exceed four fps, erosion matting, or riprap will be proposed to reinforce the surface and prevent breeches or washouts by reducing velocities. Site infiltration requirements of Ch. NR 151 Wis. Adm. Code for the site will be met using ditching if required to maintain site limits.

8.16.4 Sedimentation Basins

Sedimentation basin storage requirements have been designed for the Expansion. Preliminary pond grading is presented in this report. The outlet design will be finalized in the Plan of Operation. The calculations are presented in **Appendix U**.

The storage volume of the proposed sedimentation basin will provide the required stormwater treatment to meet all applicable standards in NR 504.09, while the facility is exempt from NR 151 requirements per NR 151.121(2)(a), since the post-construction site will have less than 10 percent connected impervious area and less than 1 acre of sumulative impervious surface. The

size of the basin is included on the proposed grading plans on **Plan Sheet 24**. Additional details regarding sedimentation basin sizing is provided in **Appendix U**. The pond sizing was completed to meet the following requirements:

NR 504.09 Standards

1. Settle the 0.015 mm size particles for all storms up to and including the 25-year, 6-hour storm.
2. Calculate the surface area of the sediment basin based the intensity of a 25-year, 6-hour storm event.
3. Principal spillways designed to pass a 25-year, 6-hour time of concentration storm event.
4. Emergency spillways designed to pass the 100-year, 24-hour time of concentration storm event.
5. Design of the dewatering structures for sediment basins shall be dewatered in no less than 3 days.

The watershed for the proposed sedimentation basin consists of only the landfill site, which was delineated based on the completed grading design for the landfill expansion. A HydroCAD version 10.20-3c model was created using the delineated watershed, MSE4 distributions, and Atlas 14 rainfall depths for post-development scenarios.

The post-development model includes the landfill expansion and the land uses associated with the expansion. For the landfill areas a hydrologic soil group of D soils was utilized to account for compaction during construction. The proposed sedimentation basin along with the proposed outlet structures were included in the modeling. The proposed sedimentation basin will utilize a similar outlet structure to that which is in-place in the existing sedimentation basin.

8.17 Site Development and Operations

8.17.1 Development

Upon approval, the proposed Eastern Expansion will be developed and operated in three additional phases, Phase VII, VIII and IX to the east of the currently permitted landfill. Phases will be constructed south to north beginning with Phase VII. Closure area development and leachate generation are discussed in Section 8.8.1.

Prior to reaching final waste grades, areas not receiving wastes for a period of 6 months will be covered with a 12- to 18-inch-thick layer of intermediate cover and topsoil. Each phase will be filled to its approved final waste grades and covered with final cover. Capping is estimated to commence in the phasing shown on **Plan Sheet 25**. Temporary phase delineation berms will be constructed between phases to control surface water run-on into the active areas. Details of the filling plan and site development will be shown in the Plan of Operation.

8.17.2 Operations

Daily operations will be confined to as small a landfill area as possible. Filling will proceed from the low point on the base of each phase. Daily cover consisting of soil or an approved alternate daily cover material will be placed over the waste at the end of each day of operation. Intermediate waste grades and slopes for each phase and cell may vary from the final design waste grades and slopes. Final waste grades will be 5.5 feet below the final cover grades shown on Plan Sheet 26, including the 1-foot sand grading layer.

8.17.2.1 5% Overfill

It is proposed that the intermediate waste grades of outboard slopes may at times be as much as 5% higher than the final waste grades, when compared to the total depth of waste at a given location. Prior to the placement of final cover in a given area, waste grades will be surveyed and regraded as necessary to accommodate placement of the composite cover to permitted 4H:1V final grades. At no time during the life of the landfill will waste volume exceed the permitted capacity of the landfill. This overfill depth will be included in slope stability analyses in the Plan of Operation.

This filling approach provides for more efficient waste placement by allowing for settlement of the waste before final cover construction. If waste can only be placed up to the final waste grades, then settlement that inevitably occurs prior to final cover construction lowers the top-of-waste surface below the approved grades, resulting in lost airspace.

Settlement below approved final grades presents problems with landfill gas collection systems, and final cover increments that are designed based on approved final grades. Additional airspace is lost when filling up to a final cover tie-in that has settled below permitted final grades. Pipe slopes decrease as a landfill settles increasing the likelihood that water will collect in the pipe. These problems can be alleviated by increasing the initial slope and allowing it to settle back to the design grades.

5% overfill waste grades are shown on **Plan Sheet 25**.

8.18 Environmental Monitoring Program

An environmental monitoring program will be implemented during the operation of the proposed expansion. Monitoring point locations are summarized in **Plan Sheet 29**. A copy of the environmental monitoring plan for the entire facility is in **Appendix R**. Components of the monitoring program include groundwater, leachate, landfill gas, and surface water. The program presented in this report is consistent with the existing environmental monitoring program for WDNR License No. 3268 and includes additional monitoring points installed for the proposed expansion. The monitoring program described in the remainder of this section is for the proposed expansion only and does not include the closed demolition landfill. The post-closure monitoring program is anticipated to be similar to the program conducted currently, but possibly at a less frequency than current and/or potential elimination of points that may no longer be needed. The post-closure monitoring program will be determined in cooperation with WDNR at the time of site closure.

8.18.1 Groundwater Monitoring

The existing groundwater monitoring network for WDNR License No. 3268 will be maintained and expanded upon as part of the proposed expansion. Five additional groundwater monitoring wells were installed for the proposed expansion, which included four perched water table monitoring wells and one piezometer. Ten existing monitoring wells and piezometers located within 300-feet of the expansion footprint were utilized to fulfill the requirements of s NR512.09(2) Wis. Adm. Code. One existing perched water table monitoring well (MW-5A), two existing regional water table monitoring wells (MW-5 and MW-14), and one existing piezometer (MW-14Z) will be abandoned during subsequent construction activities. Replacement wells MW-5R, MW-5AR, and MW-14R are proposed to be installed once the existing wells are abandoned. New wells will be added to the existing network.

The groundwater monitoring plan proposed in this section is for detection monitoring during operation of the proposed expansion. The proposed groundwater monitoring wells for the detection monitoring program are listed in **Plan Sheet 29**. Note that no changes to the existing Subtitle D designated wells are requested as part of the proposed expansion but two additional Subtitle D designated wells were installed during 2022 (MW-16WT and MW-17WT).

The detection monitoring parameters to be analyzed semi-annually as per Wis. Adm. Code NR 507.19, **Appendix I**, Tables 1 and 2 are as follows:

- Field temperature
- Field Conductivity (@25°C)
- Field pH
- Color, Odor, and Turbidity
- Groundwater Elevation
- Alkalinity
- Chloride
- Hardness
- Dissolved Iron
- Volatile Organic Compounds (Annually for non-Subtitle D wells)

8.18.1.1 Groundwater Sampling Procedures and Parameters

Groundwater sampling and decontamination procedures will follow the guidelines established by the WDNR in the Groundwater Sampling Desk Reference PUBL-DG-037- 96 (WDNR, 1996). Groundwater samples will be collected at the frequency, typically semi-annually, specified by the WDNR in the current plan of operation approval and summarized in **Appendix R**.

VOCs and inorganic parameters will be analyzed by the laboratory in accordance with methods in the latest edition of "Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846" (USEPA, 1995) by a Wisconsin Certified laboratory.

To evaluate data quality, one duplicate groundwater sample will typically be collected for each group of 10 samples. These samples will be collected from a well which is downgradient of the facility. Field and trip blanks will be collected/transported during groundwater sampling to evaluate decontamination procedures. The field blank will typically be collected after the sampling of a downgradient well. All samples will be tracked on chain-of-custody forms.

8.18.2 Leachate Monitoring

Monitoring includes analysis of leachate quality, monitoring of leachate head on the liner, and monitoring of leachate volumes managed. Additional monitoring needed for leachate recirculation will be developed during the Plan of Operation.

8.18.2.1 Leachate Sampling Points

The leachate collection system for the proposed Expansion is designed to drain to the south to a leachate collection sump and pump located along the south berm (Plan Sheet 19). The sump will pump leachate to an external leachate header pipe, which will transfer leachate to either an UST or AST. Leachate is currently sampled from the underground storage tank.

8.18.2.2 Leachate Sampling Parameters

The leachate samples obtained semi-annually will be analyzed for the following:

- NR 507 Wis. Adm. Code, **Appendix I**, Table 4 (detection leachate monitoring for all landfills) including parameters listed for municipal solid waste.
- Leachate volume will be tabulated monthly and reported annually.

The existing leachate sampling program for the active landfill will also be continued.

8.18.2.3 Leachate Head Monitoring

Leachate head monitoring is proposed in Phases VII (two wells) of the proposed Expansion. **Plan Sheet 29** shows the location of the existing leachate head monitoring wells, and cleanouts used for leachate head measurements, CO-3S through LCH-6 and proposed leachate head monitoring wells LCH-7 and LCH-8, which will be constructed as shown in detail on **Plan Sheet 30**.

Expansion construction will encroach on two existing headwell risers. Existing headwell LCH-5 and LCH-6 are proposed to be abandoned as part of Expansion construction. CO-9S will be used to measure head in Phase 3 at approximately the same base elevation as LCH-5 replacing LCH-5. Existing leachate headwell LCH-6 is located at a position in Phase 3 that doesn't allow meaningful leachate measurement. Leachate would need to be several feet high above the liner to be detected at this location. It was installed below a temporary confinement berm that was removed as part of a phased construction so no longer is useful. This proposal to use a cleanout for leachate head monitoring is in accordance with precedence set in the Conditional Plan of Operation Approval Modification for the Vernon County Sanitary Bafefill Landfill, Town of Viroqua, Vernon County, License No. 3268 plan modification to revise leachate elevation monitoring and update long term care costs for the Vernon County Sanitary Bafefill Landfill.

The leachate head in each well will be measured quarterly as part of the routine environmental monitoring program.

8.18.3 Landfill Gas Monitoring and Gas Probes

LFG extraction devices will be monitored monthly, adjusted, and operated in accordance with any air permits that may be required. Monitoring will determine if collection system adjustments are necessary to optimize system performance and maintain compliance with applicable requirements. The LFG extraction system, including well locations and conveyance will be designed and presented as part of the Plan of Operation. A preliminary LFG extraction system layout is shown on **Plan Sheet 27**. Gas probe monitoring will be conducted quarterly at existing and proposed gas monitoring probes located on the perimeter of the site. Each probe will be monitored for percent methane and percent oxygen, field temperature, and atmospheric conditions (barometric pressure/trend). The results will be reported to the WDNR along with the semi-annual groundwater data. The preliminary gas monitoring probe program is shown on **Plan Sheet 29**, and includes the following:

- Construction of new gas probes GP-4
- Monitoring of existing gas probes GP-1, GP-2R and GP-3.

8.18.4 Air Monitoring

The proposed Expansion will be required to obtain a construction permit under s. 285.60(1)(a), Wis. Stats., prior to the beginning of construction. The air construction permit application will be submitted at least six months prior to the estimated date of the start of construction.

The construction permit includes all applicable air requirement including pollutant emissions (i.e., particulate matter, VOCs, CO, SO₂, and NO_x), fugitive dust, hazardous air pollutants, and odors. The construction permit may include emission rate limits, testing requirements, monitoring procedures, recordkeeping, and reporting. The construction permit application will likely be submitted in the Plan of Operation and/or at least six months prior to the start of construction of Phase VII.

8.18.5 Surface Water Monitoring

Stormwater from the proposed Expansion will flow to the proposed sedimentation basin as shown on **Plan Sheet 29**. Each stormwater discharge will be inspected and documented after each major precipitation event resulting in a surface water discharge. The inspection point (Sedimentation Basin) as shown on **Plan Sheet 29**, will include observation and recording of the discharge water for color, odor, turbidity, floating solids, foam, oil sheen and other indicators of potential stormwater contamination. In addition, the surface water management structures (e.g., ditches, inlets, outfalls) will be inspected for erosion, siltation, scouring, etc. These observations will be recorded and submitted with the semi-annual monitoring data.

8.18.6 Well Abandonment

Select groundwater monitoring wells installed within, or near the proposed Expansion footprint will need to be abandoned to facilitate construction. Well abandonment will be completed in accordance with s. NR 141.25 Wis. Adm. Code. Currently, the monitoring wells scheduled to be abandoned include MW-5, MW-5A, MW-14 and MW-14Z, as identified on Plan Sheet 23. Some monitoring points around the periphery of the landfill may need to be extended during construction. The Plan of Operation for the proposed Expansion will present information regarding proposed groundwater monitoring well and gas probe abandonments.

8.18.7 Settlement Monitoring

Settlement monitoring will be conducted annually in closed areas using traditional or GPS based survey equipment. Horizontal and vertical control points on the landfill final cover will be utilized to monitor settlement.

8.19 End Use

Once waste disposal activities cease at this site, there will still be considerable acreage left undeveloped. Because much of the land will be wooded, it would be most suitable for use as a park or natural area. The landfill itself should remain undeveloped, as the side slopes and unstable fill would preclude its use for agriculture or residential construction.

9 Clay Borrow Source {NR 512.15}

The proposed Expansion will be constructed in phases utilizing clay from pre-approved on-site clay borrow sources. Off-site borrow areas will be developed, managed and restored under

separate local and state regulatory requirements, if on-site clay borrow sources prove insufficient. As indicated in the materials balance summary in Section 8.15 and **Table 8-1** sufficient clay material that meets liner requirements in NR504.06(2)(a) Wis. Adm. Code is available on-site for final closure and phase liner construction requirements for the existing permitted and proposed Expansion.

9.1 Clay Borrow Sources

The Vernon County landfill currently has two approved clay borrow sources, which will be designated Clay Borrow A and Clay Borrow B and are located on-site as shown in **Plan Sheet 3**. Clay Borrow A is the original borrow source for the landfill, which was approved with the original Feasibility Study for the site in February 1992. During the feasibility determination for vertical expansion of the existing landfill in June 2004, it appeared that Clay Borrow A contained less clay than had been estimated when the borrow source was approved, therefore, to ensure that an adequate clay volume would be available, Clay Borrow B was investigated and later approved in May 2011. Both clay borrow sources are in accordance with soil borrow source and clay liner requirements specified in NR 504.075 and NR 504.06(2) Wis. Adm. Code.

9.1.1 Clay Borrow A

On October 19, 1989, excavation of 29 test pits were conducted in the proposed clay borrow source area. This area encompasses approximately 25 acres on-site, with a significant portion being located within the existing landfill waste limits. The 29 test pits used to characterize the clay borrow source exceeded the minimum number required by NR 512.15(2)(a) for a 25 acre borrow source (minimum number is 17 test pits). The depths of test pits varied between 5 and 14 feet, with most test pits extending between 8 to 9 feet below existing ground elevation. Each major unit encountered in these test pits was described based on field observations and the results of analyzing samples in the laboratory. Test pit logs are provided in **Appendix T**.

A total of 45 samples from 18 test pits were analyzed for grain size distribution and Atterberg limits. The Proctor method was used to test the relationship between moisture content and dry density on 8 samples (each from a different test pit) and developed 5-point Modified Proctor Curves and falling-head permeability tests. Laboratory sample analysis are provided in **Appendix T**.

Only 4 of the 45 samples submitted for grain size distribution analysis did not meet the requirements in NR 504.06(2)(a) Wis. Adm. Code of having at least 50 percent by weight pass the 200 sieve (average P-200 for all samples is 82.8 percent, and average clay content is 31.3 percent). Three of the four samples that did not meet requirements were collected from the bottom of the test pit, beneath the acceptable clay material. Atterberg limit tests showed that all samples that met the previous NR 504.06(2)(a) requirement, or had greater than 50% percent passing P-200, had a liquid limit greater than 25 percent (average is 55.1 percent) and a plasticity index greater than 12 percent (average is 21.1 percent). This exceeds the requirements in NR 504.06(2)(a) for acceptable clay liner material. Eight samples submitted for Modified Proctor tests indicated maximum dry densities that range between 109 and 118 lbs/ft³ (average is 114.5 lbs/ft³) and optimum moisture contents between 13 to 19 percent (average is 16.2 percent). Two samples were selected for falling-head permeability tests from the pool of samples collected for Proctor tests and yielded saturated hydraulic conductivity values between 9.47×10^{-9} and 1.03×10^{-8} cm/sec. These results exceed the minimum hydraulic conductivity specified in NR 504.06(2)(a) 2 Wis. Adm. Code.

The original isopach map showing the thickness of acceptable clay material, indicated that approximately 315,300 cubic yards of clay was available prior to excavation. Since then, numerous construction events have taken place, reducing the amount of remaining acceptable clay present. An updated isopach was developed which estimates that approximately 119,190 cubic yards of acceptable clay is still present in accessible areas of Clay Borrow A.

9.1.2 Clay Borrow B

On December 3, 2004, excavation of 15 test pits were conducted in the proposed clay borrow source area. This area encompasses approximately 11 acres on-site. This borrow source is situated to southwest of the existing landfill along the landfill entrance road from CTH LF. The 15 test pits used to characterize the clay borrow source exceeded the minimum number required by NR 512.15(2)(a) for a 11 acre borrow source (minimum number is 12 test pits). The depths of test pits varied between 2.5 and 9.5 feet, with most test pits extending between 8 to 9 feet below existing ground elevation. Each major unit encountered in these test pits was described based on field observations and the results of analyzing samples in the laboratory. Test pit logs are provided in **Appendix T**.

In accordance with NR 512.15(2)(b) Wis. Adm. Code, two representative samples from each pit were analyzed for grain size distributions and Atterberg limits. A total of 31 samples from 15 test pits were analyzed for grain size distribution and Atterberg limits. Three samples were collected for 5-point modified Proctor tests to test the relationship between moisture content and dry density. Laboratory sample analysis are provided in **Appendix T**.

The geological materials or major soil units encountered in the 15 test pits is the same as what has been found elsewhere onsite during previous soil investigations. The upper 10 feet of subsurface material is loess (windblown deposits of silt and clay) and residuum (ranging from silty clay to clayey sand) that is derived from weathering of the underlying bedrock. Although these fine-grained materials have different geologic origins, each includes clay rich horizons which meet the clay liner requirements defined in NR 504.06 Wis. Adm. Code.

Only 1 sample (S-3 from TP-3) from all 31 samples did not meet the requirements in NR 504.06(2)(a)(1) Wis. Adm. Code of having at least 50 percent by weight pass the 200 sieve (average P-200 for all samples is 91 percent). The one sample that did not meet this requirement was collected from the bottom of the test pit, beneath the acceptable clay material. Atterberg limit tests showed that all 30 samples that met the previous NR 504.06(2)(a)(1) requirement, or had greater than 50% percent passing P-200, had a average liquid limit greater than 25 percent (average is 42 percent), with no values less than 20 percent, and an average plasticity index greater than 12 percent (average is 19.2 percent). However, seven of these samples had plasticity indexes less than 10 percent and therefore do not meet the standards for landfill clay liner material. Three of the seven samples (S-2 / TP-4, S-2/TP-5 and S-2/TP-9) were collected at the bottom of the test pit, beneath the layer of acceptable clay material. Two of the samples came from the same test pit (TP-14), suggesting that none of the material at this location is acceptable for use as clay liner material. The remaining two samples (S-1/TP-8 and S-1/TP-15) are shallow samples collected from above acceptable clay material. Therefore, 23 samples of the 30 samples that met NR 504.06(2)(a)(1) requirements for a minimum 50% by weight passing No. 200 sieve, also met Atterberg limit requirements in accordance with NR 504.06(2)(a)(3) and (4) for acceptable clay liner material. Three samples submitted for Proctor tests (ASTM D1577-78, Method A) indicated maximum dry densities that range between 104 and 113 lbs/ft³ (average is 109 lbs/ft³) and optimum moisture contents between 14 to 19 percent

(average is 16.5 percent). Falling-head permeability tests conducted on these samples yielded saturated hydraulic conductivity values between 1.08×10^{-8} and 9.12×10^{-8} cm/sec. These results exceed the minimum hydraulic conductivity specified in NR 504.06(2)(a)(2) Wis. Adm. Code.

The original isopach map showing the thickness of acceptable clay material, indicated that approximately 69,750 cubic yards of clay was available prior to excavation. Since then, excavation has occurred in the northern sections of the borrow area, reducing the amount of remaining acceptable clay present. An updated isopach was developed which estimates that approximately 28,580 cubic yards of acceptable clay is still present in accessible areas of Clay Borrow B.

9.1.3 Stockpiling

A methodology for separating acceptable from unacceptable soil material is required in NR 512.15(3)(d) Wis. Adm. Code. During excavation of the borrow source, a qualified technician will be present to supervise the excavation and determine whether to accept or reject the material based on visual inspection based on USCS soil types in the field. Accepted clay material will either stockpiled onsite or used in construction depending future circumstances. Periodically samples will be collected from this stockpile and sent to a laboratory for testing to provide quality control on the visual identification and segregation process. Unacceptable material will be further segregated in either topsoil or common fill stockpiles onsite.

9.1.4 Borrow Site Reclamation

A Vernon County Nonmetallic Mine Reclamation Application Permit will be completed and submitted for approval if it is deemed necessary. All applicable local, state, county and federal permits will also be obtained prior to the initiation of clay mining. Proposed final grades for Clay Borrow A and Clay Borrow B source areas is provided in **Appendix T**, which shows the proposed elevations after the required clay has been excavated.

Each phase of construction will be reclaimed to final grades and cover at the end of each excavation. Reclamation activities will include:

- Grading the limits of the mine area to slopes typically around 4H:1V, but not steeper than 3H:1V.
- Grading the base of the mined area to slopes that vary from 1 to 6%.
- Restoring the topsoil previously removed in an even thickness across the entire mined area.
- Seeding, mulching and fertilizing to vegetate the mined area with native forbs and grasses.
- Cleaning and maintaining the sedimentation basin at the end of each construction phase to assure continued functionality.
- Maintaining a silt fence at least until the disturbed area is revegetated.
- Removing the tracking pad when the final reclamation activities are completed.

To minimize erosion, all existing vegetation will be left intact wherever feasible. After the final grades are achieved at the end of a construction event, the topsoil will be seeded for permanent erosion control. Seeding efforts may include both mulch and/or fertilizer where appropriate. Erosion mats will be used to hold seed and mulch on steep surfaces and to reduce wind erosion

of loose mulch. New slopes will be monitored periodically during the reclamation period to ensure adequate vegetative cover has developed.

9.2 Clay Volume Requirements

As indicated in the materials balance summary in Section 8 and **Table 8-1**, approximately 85,980 cubic yards of clay is needed to complete all phase development liner constructions and final closure of the existing and proposed expansion. Section 8 provides the phased development clay volume requirements for Phase VII, VIII and IX liner construction.

In-situ acceptable clay volumes is estimated to be 119,190 cubic yards for Clay Borrow A and 28,580 cubic yards for Clay Borrow B. This means that there is approximately 147,770 cubic yards of acceptable clay in approved on-site clay borrow sources, which yields an estimated 61,790 cubic yard clay surplus after all projected clay requirements have been satisfied. It is likely that Clay Borrow B is underestimated, since the updated clay borrow isopach extend only to the exterior test pits, whereas the initial excavation limits are significantly larger. Updated clay borrow isopachs are provided in **Appendix T**.

10 Environmental Review {NR 512.16}

In accordance with NR 512.16, the following evaluation summarizes the potential environmental impacts of the proposed Expansion as well as efforts through design and construction to avoid, minimize, or mitigate such impacts.

10.1 Project Summary

10.1.1 General Description

The Vernon County Landfill (WDNR License No. 3268) proposes to expand the existing landfill to continue to provide solid waste disposal services to Vernon County. The proposed Expansion footprint is located within the 250-acre property owned by the County in the Town of Viroqua. The proposed Expansion consists of a contiguous 4.0-acre horizontal expansion to the east of the currently permitted active landfill (WDNR License No. 3268) and a vertical expansion over portions of the currently permitted active landfill. The proposed Expansion will be constructed in three phases (Phase VII, Phase VIII, and Phase IX) and will add approximately 427,355 CY of additional airspace.

On November 17, 2021 Vernon County submitted an Initial Site Report (ISR) to the WDNR for the proposed Expansion (SEH, November 2021). The WDNR ISR response, dated February 15, 2022, indicated the proposed Expansion has potential for development of a solid waste disposal facility. The WDNR ISI and ISR response letters are provided in **Appendix B**.

In accordance with NR 500 Wis. Adm. Code requirements, the proposed Expansion design includes a composite landfill liner, leachate collection system, landfill gas management system, composite final cover system, and surface water management system. Vernon County proposes to utilize approved clay borrow sources on-site for all liner and closure construction. Soil materials will also be obtained from the footprint of the horizontal expansion and off-site commercial sources, as needed.

10.1.2 Purpose and Need

To determine the need for expansion, the waste disposal rates for the service area were calculated based on a per capita method using statewide waste disposal data and applying it to the service area and based on historical tonnage data recorded at the existing landfill. As presented in **Table 11-6**, without the proposed Expansion, the estimated site life and disposal capacity within the service area will be consumed this year (2023) based on per capita disposal rates. Utilizing airspace consumption rates based on historic tonnage data, the existing landfill will reach capacity in 2024, which is likely the more realistic timeframe. Additionally, these disposal rates already reflect the impact of waste reduction and recycling initiatives as they exclude recyclable materials.

While it is likely that other landfills in the region could take Vernon County waste beyond 2024, it would likely result in impacts to those facility's site life assumptions and add additional costs to the service area residents (i.e., Vernon County) due to significant increases in waste hauling distances. As presented on **Table 11-5** and **Table 11-7**, with an approved expansion, the available disposal capacity to the service area will be extended to 2039 when utilizing historic waste disposal rates tracked at the facility or 2030 when utilizing per capita waste disposal rates. In either approach, the additional site life from the proposed Expansion would be less than the 15-year site life limit noted in state statute section 289.29(1)(d).

As shown in **Table 11-8**, the statewide disposal capacity is projected to last approximately 10 years beginning in 2024. With current disposal rates and current available disposal capacity, not including pending landfill expansions, landfill disposal capacity will be reached in Wisconsin during 2034. This indicates not only the need for the proposed Expansion of the Vernon County Landfill but also the need for other landfills to be developed or expanded in Wisconsin.

It is expected that the waste disposal rate at Vernon County Landfill will increase during the next 15 years. As a result, consumption of airspace will increase over time as demonstrated by historic tonnage data since inception of the landfill. The factors that have caused most landfills in Wisconsin to reach capacity sooner than projected during the permitting process are challenging to define. Factors that can increase waste disposal rates include economic trends and local/global population increases. Changes in global recycling markets may cause increased waste disposal rates in the future. Natural or anthropogenic disasters can also significantly increase disposal rates for short periods. In 2018, flooding events contributed to an additional 1,784 tons of non-MSW waste being landfilled in Vernon County than the previous year.

The anticipated site life of the proposed Expansion is calculated by dividing the net landfill air space (430,000 CY) by the annual service area demand, with consideration of service area demand increases. Future service area demand projections are calculated using the average airspace consumption rate observed at the landfill between 2018 and 2022, plus the average annual waste growth rate between 2007 and 2022 of 1.56% (**Table 11-2**). Under this scenario, the proposed Expansion volume and currently existing landfill capacity as of January 1, 2023 is projected to be consumed in early 2039.

The need for the Vernon County Landfill Eastern Expansion is justified based on the projected site life for the Vernon County Landfill, and that landfills in Wisconsin have a limited capacity that will be reached in 2034 should no new landfills be sited, or Expansions permitted. The publicly owned Vernon County Landfill will continue to provide competition to other private municipal solid waste landfills in Wisconsin. Competition ensures Wisconsin residents can access reasonably

priced waste disposal. If public landfills are not allowed to expand, their capacity will eventually be depleted. Reduced competition will allow private landfills to substantially increase their fees for disposal. Competition in a marketplace that has seen numerous mergers is needed to provide efficient, cost-effective, waste disposal. The proposed Expansion will ensure that the landfill continues to provide cost-effective and environmentally conscious waste management services for residents within the service area.

10.1.3 Statutory Authority and Approvals

A list of statutory authorities/approvals required for the proposed Expansion is provided in **Table 10-1**.

Vernon County is pursuing WDNR approval of the FR under NR 512, Wis. Adm. Code. NR 512.06(1) requires a landfill applicant to submit a written request for all applicable local approvals to each affected municipality (as defined under s. 289.01(1)) at least 120 days prior to submitting the FR to the WDNR. Copies of correspondence regarding notification to the affected municipalities are included in **Appendix C**. The affected municipalities include Vernon County and the Town of Viroqua. Vernon County will participate in good-faith negotiations with representatives of the Town of Viroqua to develop a siting agreement. The Town of Viroqua has submitted siting resolutions and negotiations with the Town of Viroqua have commenced.

10.1.4 Exemptions, Zoning Changes and Special Permits

Requested exemptions are listed in Section 1.3. No zoning changes or special permits are anticipated for the proposed Expansion.

10.1.5 Locational Criteria and Performance Standards

10.1.5.1 Locational Criteria

As indicated within the ISR and as described in NR 504.04(3)(a) to (i), Wis. Adm. Code, there are several locational criteria that apply to the proposed Expansion. The proposed limits of filling may not be located within:

- a) 1,000 feet of any navigable lake, pond, or flowage. The ISI request states that there is not a navigable lake, pond, or flowage within 1,000 feet of the proposed Expansion. The WDNR indicated that the landfill's existing sedimentation pond, a manmade structure is exempt from this setback requirement on November 1, 2021 in the ISI response letter.
- b) 300 feet of any navigable river or stream. The WDNR web-based surface water data viewer map indicates that the proposed Expansion is not within 300 feet of a navigable river or stream.
- c) A floodplain. The proposed Expansion is not within a floodplain. The WDNR's web-based surface water data viewer map also indicates this area is not in a floodplain and the closest floodplain, which is the floodplain for Seas Branch is greater than 1,500 feet to the north.
- d) 1,000 feet of the nearest edge of the right-of-way of any state trunk highway, interstate or federal aid primary highway or the boundary of any public park or state natural area, unless the landfill is screened. There are no state trunk highways, interstates, or federal aid primary highways within 1,000 feet of the proposed site. U.S. Highway 14/61 and Wisconsin State Highway 27 will be the closest feature and will be over 13,000 feet from

the proposed site. Additionally, no public parks or state natural areas are within 1,000 feet of the limits of the current landfill or Expansion footprint.

- e) An area where the design or operation of the landfill would pose a significant bird hazard to aircraft. There are no airport runways within 10,000 feet of the proposed Expansion. The closest runway at the Viroqua Municipal Airport is located approximately 15,840 feet (3.0 miles) southwest of the proposed Expansion. Because the proposed Expansion is within 5 miles of this runway, notification to the FAA was completed. On October 23, 2020, Vernon County issued notification to FAA of their intent to expand their MSW landfill and requested concurrence with the understanding that the landfill is not subject to the requirements of 49 USC Section 44718(d). Additionally, the letter was intended to document the County's compliance with the FAA's compatibility review and conditions specified during the previous expansion notification.

In a letter dated March 19, 2021 Bobb Beauchamp, Environmental Protection Specialist with the FAA, confirmed that the landfill Expansion is exempt from the requirements of 49 USC Section 44718(d) and encouraged the continued use and implementation of the Plan. The FAA also suggested that the Plan be expanded to include periodic coordination with the Viroqua Municipal Airport to minimize the potential bird hazard to aircraft.

- f) 1,200 feet of any public or private water supply well. No public or private wells are located within 1,200 feet of the proposed expansion boundary.
- g) 200 feet of a fault that has had displacement in Holocene time. The proposed Expansion is not within 200 feet of a fault that has had displacement since Holocene time.
- h) Seismic impact zone. The site is not in a seismic impact zone based on United States Geological Survey (USGS) information.
- i) Unstable areas. There is no evidence of unstable conditions at the site based on known current or historical data.

10.1.5.2 Performance Standards

The performance criteria outlined in NR 504.04(4)(c) through (f), Wis. Adm. Code include evaluation of surface water, groundwater, gas migration, and air contaminant impacts.

- a) Wetland Areas - No regulated wetlands were identified within the proposed project area at this time.
- b) Critical Habitat Areas - Based on a review of the Natural Heritage Inventory by Wastewater Specialist Laura Spears, it appears unlikely that there would be any significant adverse impact on critical habitat areas or endangered or threatened species.
- c) Surface Water - Development and operation of the proposed Expansion is not expected to have a significant adverse impact on surface water in accordance with NR 504.04(4)(c). The nearest surface water feature to the site is located more than 1,500 feet from the active MSW landfill footprint and the proposed Expansion footprint. The proposed Expansion will be designed to include a sedimentation/infiltration basin that will limit the release of sediment in accordance with applicable soil erosion and stormwater runoff regulations. There are no direct discharge points to nearby wetlands from the surface water control system.
- d) Groundwater Quality - Due to the design criteria required for the proposed landfill Expansion, including an engineered liner/cover and leachate collection, the proposed Expansion should not adversely impact groundwater quality. The existing groundwater quality is discussed in detail in Section 5.4.3.1.

- e) LFG Migration - The proposed Expansion will be designed to prevent the migration and concentration of explosive gases above the lower explosive limit in the air and soil within 200 feet of the property or beyond. The composite liner and cover systems provide an impermeable barrier, which will prevent LFG migration into the air beyond the limits of filling. The revised LFG collection system may contain LFG extraction wells, conveyance laterals and header system, and LFG treatment devices. The migration and concentration of explosive gases in the soils will be monitored with gas probes on every side within 150 feet of the limits of filling per NR 507.11 Wis. Adm. Code.
- f) Emissions - Air emissions will be similar in type to those that are emitted from current operations. Emissions consist of gases generated by decomposition of waste in the landfill, combustion products from the landfill gas management system, motor vehicles operating on the site, and fugitive dust generated by the wind and vehicle movement. The proposed Expansion is not expected to cause emission of any hazardous air contaminants above the NR 445.03 limitations and will remain in compliance with NR 504.04(4)(f).

10.2 Proposed Physical Changes

10.2.1 Terrestrial Resources

The approximate 4.5-acre horizontal expansion area is currently vegetated, vacant, and undeveloped. The vertical expansion will overlay portions of the eastern slope of the existing MSW landfill. The existing sedimentation pond in the southeast is located in the proposed waste limits of the Expansion and will be relocated further to the east.

From the proposed waste limits, the final cover system will project upward at sideslopes of 4H:1V for vertical elevations starting at 1230 feet on the south side, 1266 feet on the northern side, and a high of 1266 feet and low of 1230 feet on the eastern side to a peak of 1334 feet as shown on **Plan Sheet 26**. The western side will tie into the existing landfill. The anticipated final peak elevation of the proposed expansion is 1334 feet NAVD 88.

Modifications to the existing terrestrial setting will be primarily due to soil removal and backfill and tree removal to prepare the landfill subgrade, waste placement during operations, final cover placement, and construction of stormwater management and perimeter berms and access roads.

Preliminary soil balances are provided in Section 8.15 and **Table 8-1**, namely the required quantity of acceptable clay needed for liner and closure construction. On-site clay borrow sources and estimated quantities are provided in Section 9. Clay soils are anticipated to be completely obtained from on-site sources. Drainage layer material for liner and closure construction, which is estimated at 32,580 cubic yards (sand and rock) will be obtained from an off-site borrow source. Topsoil needed for closure construction, estimated at 13,180 cubic yards, will be provided by scarification of the proposed Expansion limits and an existing on-site borrow source. All on-site borrow sources will be reclaimed after the required soil quantities have been excavated as described in Section 9.1.4.

A net common fill shortage is expected to reach subbase grades and tie into the surrounding existing topography. Approximately 110,000 cubic yards of additional common fill soils may be required. This does not include additional soil demands for daily cover soils, intermediate cover, and closure rooting zone layers. Common fill soils may have to be imported from off-site sources as part of this Expansion.

10.2.2 Aquatic Resources

10.2.2.1 Wetlands

Per the WDNR Surface Water Data Viewer, the nearest wetlands are mapped approximately 1,500-feet north of the Expansion along Seas Branch.

10.2.2.2 Groundwater

The perched water table elevation in the monitoring wells located within 300 feet of the design limits of the proposed Expansion area ranged from approximately 1115 feet to 1145 feet NAVD during the May 2023 event. Based on static water elevations collected during 2022 and 2023, groundwater flow within the perched water table is generally towards the south-southeast, while the groundwater flow within the regional water table is generally towards the north to northeast.

The horizontal gradient of the perched water table across the site is approximately 0.062 to the south-southeast with the hydraulic gradient within the perched water table across the proposed landfill Expansion area at approximately 0.066 toward the south-southeast.

The horizontal gradient of the regional water table across the site is approximately 0.020 to the north-northeast with the hydraulic gradient within the regional water table across the proposed landfill Expansion area at approximately 0.026 toward the north-northeast.

The proposed Expansion will cause a net decrease in site infiltration quantities.

10.2.2.3 Surface Water

Development and operation of the proposed Expansion is not expected to have a significant adverse impact on surface water in accordance with NR 504.04(4)(c). The nearest surface water feature to the site is located more than 1,500 feet from the waste filling limits. The proposed Expansion will be designed to include a sedimentation/infiltration basin that will limit the release of sediment in accordance with applicable soil erosion and stormwater runoff regulations. There are no direct discharge points to nearby wetlands from the surface water control system.

10.2.2.4 Stormwater

Stormwater flow patterns have been previously established for the facility and the proposed Expansion will have minimal impact on existing stormwater patterns. Diversion berms will be designed above the final cover system to collect and convey storm water runoff to downslope channels that into receiving perimeter ditches. Diversion berms concentrate and control flow, and discharge runoff from the landfill quickly. The downslope channels will collect and convey surface water from diversion berms to the perimeter ditches and ultimately to the sedimentation basins. Ditches designed around the perimeter of the landfill will also route stormwater to sedimentation basins. A proposed stormwater sedimentation basin to the southeast of the existing landfill collects stormwater from the perimeter ditch along the landfill and Expansion. As discussed in section 8.16.4 and **Appendix U**, the sedimentation basin is designed to the standards of Wis. Adm. NR 504.09 to meet the volumetric and treatment requirements of the increased drainage area associated with the expansion. Ditches are designed around the perimeter of the landfill and up to respective sedimentation and infiltration basins. Flow will be directed off the final cover slopes to ditching taking flow to the sedimentation basin as shown on **Plan Sheet 28** and Section 8.16.

10.2.3 Buildings, Roads, and Other Structures

No new buildings or structures intended for human occupation are planned as part of the proposed Expansion. The proposed Expansion will include service roads, leachate collection system infrastructure, landfill gas system infrastructure, and sedimentation basins. Additional service roads are proposed along the perimeter of the proposed Expansion to provide access for waste hauling, monitoring, and maintenance of the additional phases.

10.2.4 Emissions and Discharges

Emissions from the site improvements will be from construction and ongoing operations. Due to implementation of best management practices, the design of the proposed Expansion, and the proven commitment by the County to mitigate their impact, the proposed Expansion is not expected to have significant impacts to humans or the environment. The landfill emissions and discharges expected from the proposed Expansion include the following:

Engine Exhaust – Engine exhaust from diesel and gasoline-powered vehicles and equipment will be discharged to the atmosphere. The discharge volume will vary depending on the number of vehicles or equipment pieces in operation at a given time. Vehicle exhaust will be kept to a minimum by maintaining vehicles in good operating condition and minimizing idling time when vehicles or equipment are not in immediate activity. No significant increase in vehicular traffic is expected during landfill operation over that which currently occurs at the existing facility.

Dust – Dust may be generated from the gravel access or haul roads, earthwork activities, and wind blowing across exposed areas. Dust quantity will vary depending on the number of vehicles or equipment in operation, weather conditions, and amount of exposed area. Dust will be controlled by establishment of permanent paved roads and sweeping activities, applying water or commercial dust suppressants to gravel access and haul roads during dry weather conditions, and establishing vegetation on completed, disturbed areas. A Dust Control Plan has been developed for the existing landfill and will be updated for the proposed Expansion, during the Plan of Operation.

Noise – Noise impacts associated with the proposed Expansion will occur from bulldozers, scrapers, and other earth moving equipment during liner and final cover construction. During operation, noise will be generated by waste hauling trucks and landfill equipment. These will occur during the hours of operation and are not expected to increase over existing noise levels in the vicinity of the site. Hours of operation are determined in the host agreement, but presumably will remain unchanged.

Leachate – The proposed Expansion will utilize and expand upon the existing leachate collection system for the active landfill. Leachate produced from precipitation that infiltrates through the waste and impinges through a highly permeable drainage blanket will be collected and conveyed via collection lines which will transmit the flow to a sump at the lowest base elevation of Phase VII. From the sump, the leachate will be pumped via a sideslope riser into a force main to an on-site leachate storage tank. Leachate is then transported to the City of Viroqua wastewater treatment plant or another approved treatment plant. The quality and characteristics of the leachate are expected to remain similar to those of the leachate that is currently being collected and treated. Leachate generation is discussed in Section 6.3 of this FR and existing leachate characteristics are provided in **Table 6-2**.

Landfill Gas – LFG from the decomposition of waste will be generated as part of the proposed Expansion and with current waste filling operations. The chemical characteristics of the LFG are not expected to change. The proposed Expansion includes a final cover system with a gas extraction system. These controls will prevent significant subsurface gas migration. A network of gas monitoring probes has already been installed around portions of the existing landfill to monitor for gas migration, and an additional gas probe is proposed to be installed east of the Expansion footprint to have a complete gas monitoring probe system. The gas collection and control systems will be permitted in accordance with the Title V construction and operating permit requirements.

Odors – The control of odors will be achieved by cover soil placement and by the installation of the above-noted gas collection and control system. Highly putrescible waste will be covered immediately upon placement. An Odor Control Plan is currently in place for the existing landfill and will be updated in the Plan of Operation for the proposed Expansion.

Surface Water Runoff – The proposed Expansion has been designed to maintain a close surface water balance between the existing and post-development conditions. Maximum stormwater discharge will occur under final cover conditions after the landfill has ceased operations. Section 8.16 provides a further discussion on surface water management.

Groundwater – The risk of groundwater contamination will not increase as a result of the proposed Expansion. The potential for contamination from the landfill will be minimized by following NR 500 regulations and design requirement that include the use of a composite liner and cover system, and a leachate collection and management system, and operational best management practices.

10.2.5 Maps and Descriptive Materials

Maps, plans and other descriptive materials that may help clarify the proposed Expansion are presented in the plan set, figures, and appendices listed in the table of contents for this report.

10.3 Existing Environment

10.3.1 Physical Environment

10.3.1.1 Topography

The proposed landfill Expansion is located in an unglaciated portion of Wisconsin known as the “Driftless” region. Topography within this area is typified by systems of bedrock ridges cut by stream and river valleys. The ridge and valley system is present in the immediate vicinity of the site, with elevations ranging from approximately 1040 MSL to 1260 MSL within the site boundaries (USGS Avalanche Quadrangle, 2018). Generally, the lower elevations are present to the north along the Seas Branch Drainage, and to the southeast along an unnamed discontinuous drainage. A system of bluffs forms the higher elevations generally through the central portion of the site. The proposed horizontal expansion area is along the top of this bluff system. Surface water from the site generally flows either to the north toward Seas Branch (recently improved trout stream) or to the southeast (toward the unnamed discontinuous drainage way) and then northeast along this drainage way, which flows into the nearby Seas Branch 5 Reservoir.

Site topographic features will be affected by the proposed Expansion. The Expansion grading plan will occupy a part of a wooded area east of the existing landfill. This area is sloped to the southeast ranging in elevation from 1250-ft NAVD 88 on the north side of the Expansion area to 1150 ft NAVD 88 to the east side of the Expansion area. This area will be cleared and backfilled to the landfill subbase grades. The uncleared wooded area will be left as-is to provide separation between the landfill and adjacent properties.

10.3.1.2 Regional Geology

Based on review of the Web Soil Survey for Vernon County (USDA, accessed July 2023), a large portion of the existing landfill is designated “2050” for “landfill”, indicative of disturbed or developed areas. A soil survey for the landfill property is provided in **Appendix F**. The remaining soil cover within the landfill Expansion area include the following soil types:

- Seaton Silt Loam (115D2), driftless ridge, 12 to 20 percent slopes, moderately eroded.
- Basco Silt Loam (234D2), 12 to 20 percent slopes, moderately eroded.
- Pepin Silt Loam (125D2), 12 to 20 percent slopes, moderately eroded.
- Valton Silt Loam (133C2), 6 to 12 percent slopes, moderately eroded.
- Mt. Carroll Silt Loam (114B2), 2 to 6 percent slopes, moderately eroded.

Unconsolidated deposits in the vicinity of the site generally consist of alluvium in the river and stream channels and terraces deposited during Holocene time. These soils are typically fine grained and range from clays to medium sands (Young, 1973). The project area is situated in the unglaciated driftless zone of southwestern Wisconsin. As a result, unconsolidated materials away from stream channels are generally associated with windblown deposition or mass wasting that occurred during the Late Pleistocene.

Evans (2003) also describes rolling topography along the lower slopes of the Paleozoic bedrock ridges as evidence of the downslope movement of the primarily sandstone and dolostone bedrock due to mass-wasting processes. Colluvium deposits are generated from the weathering and subsequent re-deposition of materials comprising the sandstone and dolostone bluffs in the region. A thin layer of loess (silt) is often found on the surface or buried below colluvium across the region. Residuum deposits are generated from in-place weathering of the sandstone and dolostone bedrock. Thickness of unconsolidated deposits in the vicinity of the site ranges from 0 to 50 feet in upland areas, to over 200 feet in stream valleys (Young, 1973).

The bedrock geology generally consists of Paleozoic sedimentary beds overlying pre-Cambrian basement rock. The Paleozoic rock units generally have a regional dip to the southwest at a rate of approximately 10 feet per mile, which largely parallels the Precambrian surface (Evans, 2003).

The uppermost sedimentary bedrock units in Vernon County within the vicinity of the site consist of Ordovician aged dolostone, sandy dolostone, and dolomitic sandstone of the Oneota and Shakopee Formations (Prairie du Chien Group). The Prairie du Chien Group is underlain by the Cambrian aged sandstone and dolomitic siltstone of the Jordan Formation and St. Lawrence Formation (of the Trempealeau Group), the glauconitic sandstone of the Lone Rock Formation (of the Tunnel City Group), and the quartz sandstone of the Wonewoc Formation (of the Elk Mound Group) (Ostrom, 1981).

Based on regional publications by Young (1992), Hindall and Borman (1974), Young and Borman (1973), the bedrock encountered at Vernon County Landfill is the Prairie du Chien Group. It appears that all on-site borings terminate within the lower part of the Prairie du Chien Group.

Based on boring logs from the City of Viroqua municipal wells, the Jordan Sandstone should occur approximately 250 feet below ground surface on-site.

The Prairie du Chien Group consists of the upper Shakopee Formation and the lower Oneota Formation. The Shakopee Formation is further divided into the Willow River and New Richmond members. The Oneota Formation is further divided into the Hager City and Stockton Hill members. The Stockton Hill Member is the basal member of the Prairie du Chien Group and is characterized by silty to sandy dolostone and dolomitic sandstone. The Hager City Member is characterized by thin to medium beds of laminated and stromatolitic dolostone with little to no silt or sand. The New Richmond Member is characterized by fine-grained, feldspathic quartz sandstone. The Willow River Member is the upper-most member of the Prairie du Chien Group and is characterized by stromatolitic and wavy laminated sandy dolostone.

The Jordan Formation has not been encountered during on-site drilling but underlays the Prairie du Chien Group. The Jordan Formation is characterized by a quartz-rich sandstone with medium to large-scale sets of cross-stratification. The St. Lawrence Formation underlies the Jordan Formation and is characterized by thin-bedded sandy dolomite, dolomitic sandstone, and dolomitic siltstone. The Lone Rock Formation underlays the St. Lawrence Formation and is characterized by thin to medium-bedded, cross-stratified, very fine to fine grained sandstone that is brown to greenish brown in color due to the presence of the green-black mineral, glauconite. The Wonewoc Formation underlies the Lone Rock Formation and is generally comprised of buff to white, fine to medium grained sandstones. The very fine to fine grained quartz sandstones, sandy siltstones, and shales of the Eau Claire Formation underlie the Wonewoc Formation in Vernon County. The Mount Simon Formation is the bottom most Cambrian unit in Vernon County. The formation is largely comprised of medium to coarse grained sandstone containing abundant well-rounded quartz grains (Evans, 2003).

Precambrian igneous and metamorphic basement rock is present below the Paleozoic deposits in Vernon County. These rocks consist of Archean Gneiss and early Proterozoic granite and rhyolite. These rocks originated from Precambrian intrusions and volcanic events, or subsequent metamorphism of these rocks.

10.3.1.3 Site Geology

The unconsolidated deposits at the Vernon County Landfill consist of loess and residuum deposits overlying dolostone bedrock. In some areas, a saprolite or weathered dolostone separates the unconsolidated deposits from the dolostone bedrock below. Generally, the more competent dolostone bedrock is distinguished by refusal during standard penetration testing.

The total thickness of unconsolidated sediments identified within borings completed within 300-feet of the proposed landfill Expansion ranges from approximately 14.0 feet (MW-3/MW-4P/MW-6) to 79.5 feet (MW-10/MW-11/MW-12). The variability in unconsolidated soil thickness is a result of the land surface topography and the topography of the upper bedrock surface. The distribution of loess and residuum deposits is presented on the site cross-sections (**Plan Sheet 11** through **Plan Sheet 22**).

Loess soils at the Vernon County Landfill vicinity consists of windblown fine-grained sediment deposited during the Late Pleistocene. These deposits are discontinuous at the site. Where present, loess deposits can be generally described as light brown to brown to gray, clayey silt to silty clay to clay with silt (ML to CL). Thickness of loess soils in the vicinity of the proposed landfill Expansion area range from 0 to 10 feet.

Residuum deposits on the landfill site were generated from the weathering of the underlying dolostone bedrock. Although residuum originates from bedrock, the extent of weathering has removed all bedrock structure and it is therefore considered an unconsolidated deposit. The residuum can be generally described as brown to red brown to red, clay (CL) with to trace sand and gravel to clayey sand (SC) with to trace gravel. The thickness of the residuum deposits identified in historic borings performed in the vicinity of the proposed landfill Expansion area ranges from approximately 14.0 to 79.5 feet.

Saprolite on the landfill site was generated from the weathering of the underlying dolostone bedrock. Unlike residuum, the saprolite unit still holds the original bedrock structure and is therefore similar to a weathered bedrock. The saprolite can be generally described as weathered dolostone to weathered dolostone with silty sand to weathered dolostone with clay.

The uppermost bedrock formation in the proximity of the proposed landfill Expansion area has been designated as the Ordovician-aged Hager City Member of the Prairie du Chien Group. The Hager City Member is characterized by thin to medium beds of laminated and stromatolitic dolostone with little to no silt or sand (Evans, 2003). The Stockton Hill Member, which is the basal member of the Prairie du Chien Group and is characterized by silty to sandy dolostone and dolomitic sandstone and appears to be encountered on-site as well.

The saprolite and dolostone bedrock surface elevation encountered within the footprint of the proposed landfill Expansion area had elevations ranging from approximately 1221.0 (B-18) to 1195.0 (B-20) feet NAVD. The top of the saprolite and dolostone bedrock is currently approximately 17 feet below (B-18) to 23 feet below (B-20) the proposed subbase elevations. A bedrock surface map, including saprolite, for the entire landfill property is provided on

Plan Sheet 10.

10.3.1.4 Surface Water

The site is located within the West Fork Kickapoo River Watershed with regional surface water draining to the Kickapoo River Watershed. Surface water from the northern portion of the site drains to the north to Seas Branch Creek which then flows east towards the west fork of the Kickapoo River. Surface water from the southern portion of the site drains to the to an unnamed tributary which then flows northeast to Seas Branch Creek and then east to the west fork of the Kickapoo River. More regionally surface water drainage is to the southeast towards the Kickapoo River. The West Fork Kickapoo River Watershed is bound to the north by the Coon Creek Watershed and the Middle La Crosse River Watershed, the east by the Bear Creek-Kickapoo River Watershed, the south by the Tainter Creek-Kickapoo River Watershed, and the west by the Bad Axe River Watershed.

Significant surface water bodies or drainage in the vicinity of the site include Seas Branch Creek (approximately 1,500 feet north of the proposed expansion), an unnamed intermittent creek (approximately 750 feet south and southeast of the proposed expansion), and Seas Branch Reservoir (Reservoir 5) (approximately 0.90 miles to the northeast) that is formed due to a wet flood control structure or dam.

The chemical quality of surface water in the Lower Wisconsin River Basin is generally good. The water is generally calcium magnesium bicarbonate type, similar to groundwater. The primary water quality concerns are caused from nonpoint sources of pollution, particularly from agricultural operations, excessive populations of rough fish, and hydrologic modifications of the streams such as damming, straightening, and the ditching, draining, or other alternation of

wetlands. The potential for surface water contamination within the West Fork Kickapoo River Watershed is considered high due to over 50% of the land is used for agriculture (WDNR, 2002)

10.3.1.5 Regional Hydrogeology and Groundwater

Regional hydrogeologic reports recognize six hydrogeologic units in Vernon County within the vicinity of the site: 1) St. Peter-Prairie du Chien-Jordan aquifer, 2) St. Lawrence-Lone Rock confining unit, 3) Wonewoc aquifer, 4) Eau Claire confining unit, 5) Mt. Simon aquifer, and 6) Precambrian confining unit (Young, 1992; Mandle and Kontis, 1992; Olcott, 1992).

The deepest on-site borings terminate within the basal member of the Prairie du Chien Group, meaning that the St. Peter-Prairie du Chien-Jordan aquifer is the only hydrogeologic unit being monitored on-site.

Within Vernon County, the St. Peter-Prairie du Chien-Jordan aquifer is typically the uppermost aquifer but has a limited potential. According to Hindall and Borman (1974), well yields from this formation average less than 15 gallons per minute (gpm). Therefore, this aquifer typically provides sufficient yield for individual domestic wells but not public supply wells. Domestic well logs within the vicinity of the site confirm this with maximum construction depths of 300 feet, which places them within the St. Peter-Prairie du Chien-Jordan aquifer.

The deeper aquifers of the Wonewoc Formation and the Mt. Simon Formation can yield more than 500 gpm and therefore these aquifers are typically used for public supply wells. The closest municipal well (Viroqua's Well No. 5) is located approximately 2.7 miles southwest of the site and draws its water from both the Wonewoc and Mt. Simon aquifers.

In the vicinity of the site, the St. Peter-Prairie du Chien-Jordan aquifer system is typically hydraulically connected to streams because of steep topography within the region. The degree of this connection, however, is affected by the permeability of the deposits comprising the aquifer. The most permeable deposits have the greatest connection to streams, but the connection decreases with decreasing permeability.

Groundwater in the aquifer system moves from recharge areas at or near the outcrop of the aquifer to discharge areas, which is regionally the Kickapoo River and its tributaries. In the vicinity of the Vernon County Landfill and the proposed Expansion, the main discharge area is north of the site at Seas Branch Creek. Regional groundwater in the vicinity of the site flows primarily to the north to northeast, towards Seas Branch Creek.

The majority of the regional groundwater flow within the Cambrian aquifer system occurs within the Mt. Simon aquifer which is generally under a leaky artesian (confined) system and moves toward the Mississippi River, the regional discharge area. Although individual aquifers in the system are separated by confining units that may be much less permeable than the aquifers, some water moves vertically through these confining units. Hydraulic heads in the individual aquifers of the Cambrian aquifer system generally are at successively lower altitudes, which indicated that water moves vertically downward into the aquifer system in most areas (Olcott, 1992).

Depth to the water table in the vicinity of the site depends largely on topography and ranges from 0 to almost 200 ft bgs. The extreme depths occur in regions where the water table is near the surface in valleys and is deep below ridges (Young and Borman, 1973)

10.3.1.6 Site Hydrogeology

The deepest on-site borings terminate within the basal member of the Prairie du Chien Group, meaning that the St. Peter-Prairie du Chien-Jordan aquifer is the only hydrogeologic unit being monitored on-site. Shallow groundwater will generally be assessed in reference to water table conditions, and it has been determined that a perched water table and a regional water table exist on-site.

With the exception of four Public Health/Public Welfare parameters (iron, fluoride, manganese, nitrate+nitrite), the groundwater quality at Vernon County generally complies with all preventative action limits (PALs) and enforcement standards (ES) set forth in NR 140 Wis. Adm. Code. There is currently no evidence that the active MSW Landfill (WDNR License No. 3268) has caused groundwater contamination at the facility.

The on-site private water supply well (P-1) for the current balefill facility is located greater than 1,200 feet from the proposed expansion area. One private well (P-2) is also located south of the landfill property and is also greater than 1,200 feet of the proposed expansion area. Both private water supply wells are sampled semi-annually as described within the Environmental Monitoring and Maintenance Plan (**Appendix R**). No landfill-related impacts have been found within either private well.

10.3.1.7 Air Quality

The proposed Expansion will create air emissions similar to the emissions presently being released during landfill operations at the landfill. The proposed Expansion is not anticipated to have significant impacts on air quality.

LFG constituents from the existing landfill and operations potentially being emitted to the atmosphere include methane, carbon dioxide and monoxide, sulfur dioxide, nitrogen dioxide, and nonmethane organic compounds (NMOCs). Since the proposed Expansion will permit additional airspace, the landfill will be open approximately until 2039, assuming the proposed landfill expansion occurs in 2024, and more LFG producing waste will be placed. While the total amount of LFG generated will increase, the daily or annual emissions are not anticipated to increase substantially from current emissions since the daily and annual waste placement tonnage is not anticipated to increase significantly during operation. The Organic Stability Plan will be revised for the proposed Expansion during the Plan of Operation to ensure that the facility achieves the objectives of organic stability according to NR 514.07(9)(c) Wis. Adm. Code.

Proper waste placement, compaction and daily covering of solid waste, and efficient operation of the LFG collection system will minimize odors. In the event of an odor complaint, the complaint is logged along with the immediate corrective action taken. An Odor Control Plan is in place at the facility.

Construction activities will create emissions similar to those in the construction industry including highway/municipal construction, gravel pit operations and commercial construction. Dust control methods, and other best management practices outlined in the Dust Control Plan, will be performed as needed.

10.3.1.8 Wetlands

No wetlands are present at the landfill property in the area of the proposed Expansion. All site surface water will be diverted to the proposed stormwater sedimentation basin, and therefore no site surface water will discharge directly into a wetland.

10.3.1.9 Soil Borrow Sources

The soil materials needed to construct the proposed liner and final cover systems will be obtained from both on-site and off-site sources. Clay will be obtained from existing on-site clay borrow sources as described in Section 9. Topsoil will be obtained from scarification of the proposed expansion area and on-site borrow sources. Common fill will partially be obtained from on-site borrow sources but will most likely will require off-site soil sources to reach subbase grades of the proposed Expansion. Granular materials for the leachate drainage system will be obtained from off-site quarries.

10.3.2 Biological Environment

Prior to the arrival of white settlers in the mid-1800s, the dominant vegetation in central Vernon County consisted of oak savanna (bur and white oaks) and prairie (Slota, 1969; Cottam et al., 1965). However, during the late 1800's and early 1900's much of the land near Viroqua was logged for timber or converted to agricultural fields. Although farming has been on the decline in recent years, agricultural fields continue to dominate the landscape near the proposed site. Woodland areas (land reverted from agriculture or never used for that purpose) contain mostly oak trees, although shrubs and transitional growth exist in areas immediately adjacent to fields.

10.3.3 Land Use and Zoning

The Vernon County Landfill property is located within the Town of Viroqua jurisdictional boundary. According to the Town of Viroqua Clerk, the township has adopted a zoning ordinance which is available on their website. Pursuant to Wisconsin Statute s. 289.22 (Local Approval), the Vernon County Solid Waste Department will be issuing a certified letter to the Town of Viroqua requesting they specify all applicable local approvals that are required.

Based on review of the draft ordinance and zoning map, the Vernon County Landfill property is located in a "Special Purpose District". Permitted uses in the special purpose district include the following uses, so long as such sites are secured in a sufficient manner to insure public and environmental safety, including meeting all applicable State or Federal standards and laws: Landfills and former Landfills; Junk Yards; and, chemical, biological, and/or hazardous material production or handling.

Based on review of the Town of Viroqua's zoning ordinance, current zoning will not require special applications or variances to facilitate the landfill Expansion. Since the entire proposed Expansion footprint is located on Vernon County property, and does not require a purchase of agricultural property, an Agricultural Impact Statement will not be required.

As indicated in the WDNR's opinion to the ISI, the proposed Expansion is not located in a floodplain, conservancy, or shore land. As such, zoning ordinances relating to these instances are not applicable.

10.3.4 Socioeconomic Conditions

Vernon County owns approximately 250-acres which fully encompasses the existing landfill and proposed Expansion. No residents will be displaced. Since the current landfill was permitted in 1992, the area in the vicinity of the landfill has seen little development in the surrounding area with a majority of the land remaining for agricultural use.

There are no unique social or economic conditions near the proposed site. As described in the preceding section, land use in this area includes mostly farms and low-density residential development. Consequently, no particular ethnic, cultural, or socio-economic groups exist other than farmers and rural residents, which are not unique to this part of Vernon County.

It is Vernon County's objective to provide cost effective and environmentally sound waste disposal services locally to its residents. In addition to meeting disposal needs of the County, the continued operation of the landfill via Expansion will provide employment opportunities for local residents, contractors, and support local businesses through the purchase of required goods and services.

10.3.5 Other Special Resources

No special resources, including archaeological or historical areas, or prime agricultural land will be impacted by the proposed Expansion. On August 31, 2021 Laura Spears, WDNR Wastewater Specialist, issued a letter summarizing the findings of an endangered resources (ER) and cultural/historic review for the proposed Expansion as part of the ISI request. A copy of the above letter is included in the ISR and provided in **Appendix B** and indicates there are not cultural or historic concerns for this parcel.

10.4 Environmental Consequences

10.4.1 Physical Impacts

Th physical impacts which are summarized in **Table 10-2** include potential impacts associated with expansion of the existing landfill.

10.4.2 Biological Impacts

As referenced in Section 10.3.2, it appears unlikely that the proposed Expansion would result in any significant adverse impact on critical habitat areas or endangered or threatened species. The biological impacts which are summarized in **Table 10-3** include potential impacts associated with Expansion of the existing landfill.

10.4.3 Land Use Impacts

The proposed Expansion footprint is a continuation of an existing landfill operation and is not expected to have an effect on surrounding land use in the immediate vicinity. Most of the surrounding land is used for agricultural or low-density residential development, much as it was before the existing landfill opened, and therefore there is no reason to expect that this would change if the horizontal and vertical expansion was built. Additionally, the property is currently zoned for landfill use within the Town of Viroqua zoning ordinance.

10.4.4 Socioeconomic Impacts

There are no unique ethnic, cultural, or socioeconomic groups in this area that would be affected by the proposed horizontal and vertical expansion. The primary effects of using the proposed site for solid waste disposal would be the loss of land from the local tax base and the increase in noise at the site; however, all of these changes would have already occurred in the construction of the existing landfill and construction/demolition waste landfill.

The Expansion will have a positive impact on the economic base of the surrounding community through employment opportunities for local residents and contractors and increase or maintain local business through the purchase of required goods and services. If the landfill Expansion were to not occur, these economic impacts would likely shift to a different municipality or region.

Vernon County will continue to operate the Expansion under the philosophy of managing waste locally and providing services to, first and foremost, its residents and local businesses. At this time, Vernon County does not intend to operate the Expansion as a regional facility that would accept significant amounts of waste from out of county. The service area proposed to utilize the landfill is proposed to be localized to Vernon County as it has operated historically. Refer to Section 11 for further discussion on service area.

Traffic impacts and patterns for users of the facility are anticipated to remain similar to the present throughout the operational life of the Expansion. The Expansion is proposed to service Vernon County and essentially will be an extension of the site's operating life. Therefore, traffic to local roads from hauling vehicles and recycling trucks are anticipated to remain similar to the level currently experienced and will be extended over the course of operation.

10.4.5 Other Special Resources

As discussed in Section 10.3.5, no special resources, including archaeological or historical areas, or prime agricultural land will be impacted by the proposed Expansion.

10.4.6 Probable Adverse Impacts that Cannot Be Avoided

Certain environmental impacts from the proposed Expansion cannot be avoided. To the extent practicable, the impacts will be minimized through engineering design and best management and operational practices. Probable adverse impacts that cannot be avoided include:

Land Use Impacts – During operation and after the landfill is closed there will be limitation on how the site is used. Construction of buildings or other structures may be limited or restricted.

Topographic Impacts – The topography and appearance of the site will be altered during construction and operation and following closure of the landfill.

Wildlife/Habitat Impacts – Localized plant and animal populations may be disturbed during construction and site operation. However, there are areas adjacent to the Expansion that will not be disturbed and are very similar to the area being removed for the Expansion.

Traffic Impacts – Traffic impacts are not anticipated to increase compared to existing conditions, but they will be extended due to an Expansion.

Odor/Emission Impacts – Odor and emission impacts are not anticipated to increase compared to existing conditions, but they will be extended due to an expansion. These impacts will continue to be minimized by good operating practices and optimization of the LFG collection system.

10.5 Alternatives

The following section provides a discussion on alternatives to the proposed Eastern Expansion and focuses on avoidance of environmental impacts, while considering the associated economic impacts. In accordance with s. NR 512.16(5) Wis. Adm. Code, the alternatives evaluated include:

- Taking No Action
- Enlargement, Reduction, or Modification of the Project
- Other Landfills or Locations
- Alternative Methods for Disposal (Waste Reduction/Recycling/Reuse/Incineration)

10.5.1 No Action Alternative

Since adopting a solid waste management plan and creating a solid waste management committee in 1986, the County has taken the lead role in managing solid waste for residents of the county. The “no action alternative” assumes that the proposed Expansion would not be developed. The existing landfill is expected to reach capacity in 2024 (**Table 11-5**). The proposed Expansion is necessary to continue to provide solid waste management services to the service area as it would be unlikely that individual communities would manage their solid and hazardous wastes as economically as the County does now.

If the proposed Expansion is not constructed, over 17,000 tons per year of waste currently received will have to be disposed of at other landfills or solid waste facilities. This would shorten the life of the other landfills and increase the need for additional waste disposal facilities in the area. There would be additional cost for transportation to the other facilities as it is likely that waste would have to be transported to a larger existing private landfill, which are located more than 100 miles away. Also, there is no guarantee that the disposal capacity replacement required under the no action alternative could be approved of at a site where potential impacts can be minimized to the same extent that they are by the proposed Expansion.

If the proposed Expansion did not proceed, this would avoid the environmental impact associated with this portion of the landfill property, however, this would not result in any avoidance of existing environmental impact associated with the existing landfill. The proposed Expansion utilizes land already dedicated to landfilling activities, has environmental controls already in place, and has been accepted by the local communities.

There would be several negative impacts to socioeconomic factors discussed in Section 10.4.4. The no action alternative will result in limited environmental benefit but would have significant negative consequences. Therefore, the no action alternative is not feasible.

10.5.2 Enlargement, Reduction, or Modification

The proposed Expansion has been designed to optimize disposal volume within the constraints of site conditions, regulatory requirements, and economic considerations. Enlarging the proposed Expansion area is not feasible due to the physical constraints of the site and regulatory limits not permitting landfill expansion life to exceed 15 years. The area west of the existing landfill is limited by shallower bedrock and an existing high pressure natural gas line. The area south of the

current landfill is constrained by the leachate collection system and other existing landfill related infrastructure and an overhead power line. The area to the north and west of the existing landfill is constrained by shallow bedrock.

Reducing the size of the proposed Expansion would likely result in under-utilization of the existing landfill property and result in loss of air space for the service area. Due to the constraints above, the area of potential contiguous expansion will reach its feasible limits with this Expansion. If the size of the site is reduced, that would require the County to pursue another expansion in the future or permit a new green site sooner and not capitalize on the efficiencies of a contiguous expansion (use of LFG management systems, leachate management systems, roads, scales, etc.). Or it would require another landfill to pursue an expansion or development sooner to account for the waste currently being managed in the Vernon County system.

The design of the proposed Expansion has taken into consideration the above physical constraints and environmental impacts, along with economic considerations. The County actively seeks for opportunities to divert and recycle/re-use waste from the landfill and therefore fully understands the benefit to be gained in reducing air space consumption and will continue to do so. Therefore, at this time, modifying the proposed Expansion would not have a significant impact on mitigating environment impacts.

10.5.3 Alternative Landfills

Vernon County currently has agreements in place with 21 of the 33 municipalities in Vernon County to deliver waste to the Vernon County Landfill. The system supports Wisconsin's Solid Waste Reduction, Reuse, Recycling, Composting, and Resource Recovery Policy (WI Stat § 287.05), which states "that maximum solid waste reduction, reuse, recycling, composting and resource recovery is in the best interest of the state in order to protect public health, to protect the quality of the natural environment and to conserve resources and energy." Potential alternative landfills to manage waste generated within the Vernon County Landfill service area are listed below.

MSW Landfill	License No. / Permit No.	County, State	Distance (Miles)
La Crosse County Solid Waste Landfill	3253	La Crosse, WI	40
Monroe County Ridgeville II Sanitary Landfill	3660	Monroe, WI	35
GFL – Seven Mile Creek Landfill	3097	Eau Claire, WI	112
WM – Cranberry Creek Landfill	2967	Wisconsin Rapids, WI	102

For Wisconsin Landfills, remaining capacities and site life are provided below from the 2022 WDNR Landfill Tonnage Report.

WDNR Tonnage Report (2022):

- La Crosse County Landfill has an estimated 11 years of remaining site life.
- Monroe County Landfill has an estimated 3 years of remaining site life.
- GFL – Seven Mile Creek Landfill has an estimated 8 years of remaining site life.
- WM – Cranberry Creek Landfill has an estimated 6 years of remaining site life.

La Crosse County Landfill:

La Crosse County Landfill recently received approval for expansion, which will increase airspace capacity by approximately 3,085,865 cubic yards and increase the remaining site life by as much as 13 years. Per La Crosse County Landfill feasibility report, the current landfill without expansion will reach capacity in 2030, however with expansion its site life has been extended to approximately 2037 or 2043 depending on Xcel Energy's participation in the solid waste management system. With expansion, this results in remaining site life of approximately 14 to 20 years inclusive of expansion and existing capacity. The landfill is located 40 miles from the Vernon County Landfill. La Crosse County Landfill currently has a service area that broadly encompasses Buffalo, Trempealeau and La Crosse Counties in Wisconsin, and Houston and Wabasha Counties in Minnesota.

Monroe County Landfill:

Monroe County Landfill received positive feedback on the feasibility determination to expand, which would increase airspace capacity by approximately 810,000 cubic yards. Per Monroe County Landfill feasibility report for their Northern Expansion, Monroe County does take out of county waste. However, its primary service area is Monroe County as the landfill is relatively small and has the intent of providing service primarily to County residents. It is anticipated that Monroe County Landfill would not be willing to accept all waste from Vernon County service area, thereby depleting valuable air space intended for Monroe residents.

Seven Mile Creek Landfill (GFL):

Seven Mile Creek Landfill – GFL recently received positive feasibility determination to expand, which will increase air space capacity by approximately 4.13 million cubic yards. However, it was indicated that this would only increase the remaining site life by approximately 9 years, which would increase the remaining site life to be approximately 17 years (inclusive of existing permitted airspace).

Cranberry Creek Landfill (WM):

Per correspondence with Tony Peterson (WDNR), Cranberry Creek Landfill is in progress with a feasibility study for a proposed expansion. The preliminary volume indicated in their ISR is approximately 4.05 million CY.

Although feasible to use alternate facilities, diversion of Vernon County service area tonnage would reduce the remaining capacity and site life of these facilities, which will cause these facilities to either expand sooner than expected or permit for a new landfill. Although municipally owned facilities are located within reasonable distances (i.e., La Crosse and Monroe County being the closest), there is no guarantee these facilities would accept all or a portion of Vernon County waste. Therefore, it would be reasonable to expect Vernon County waste would be transported to a privately owned facility over 100 miles away which could be a likely outcome without expansion considering the local transfer station in Vernon County is privately owned. This could potentially result in transporting Vernon County waste distances as much as 100 miles or more (single-trip, one way) and would increase wear and tear on roads, increase GHG emissions due to the haul distance, and would likely result in increased tipping fees to Vernon County residents. The negative environmental consequences of these scenarios could be significant.

Utilization of alternative landfills will result in little environmental benefit to Vernon County, increase the environmental impact at the alternative facilities and could have significant negative consequences, compared to the proposed Expansion.

10.5.4 Alternative Locations

There are few suitable landfill locations in Vernon County due to the unique topography, geology, and hydrology in the region, which restricts potential landfill sites to either ridge tops or valleys which may not meet bedrock separation distances or surface water locational criteria in NR 504.06(2)(c) and NR 504.04(3)(a), respectively. Suitable nearby clay borrow sources for liner material can also be difficult to find. For these reasons, and many others such as finding suitable locations with respect to population centers, highways and airports make it exceedingly difficult to site a new landfill location within the County.

The proposed Expansion utilizes land already dedicated to landfilling activities, has environmental controls already in place, and has been accepted by the local communities. Also, creating the same amount of landfill capacity in an undeveloped location would not take advantage of the efficiencies of a contiguous expansion including the utilization of existing infrastructure such as leachate management systems, environmental monitoring network, roads, scales, and operations support infrastructure.

10.5.5 Alternative Methods for Disposal

In efforts to conserve air space and maximize the value of discarded resources, the County provides opportunities for system users to divert reusable resources from the landfill and works with stakeholders to find uses for the diverted waste streams. Vernon County offers a recycling and HHM collection program. Residents can bring recyclables and HHM to the Vernon County Recycling Center located on the same property of the existing landfill.

Vernon County is the RU for collection of household recyclable materials such as paper, glass, plastic, and metal cans for all municipalities in Vernon County except the Town of Liberty. Individual municipalities contract with local haulers for curbside collection of recyclable items. Drop off facilities are also common in the County for collection of recyclable materials, particularly in rural areas or where there is a convenience need. Vernon County also provides two “Clean Sweep” events per year taking in HHM from residents to be recycled. Vernon County regularly accepts at their recycling facility located at the landfill other items such as e-waste, mattresses, tires, batteries, and bulbs for a fee throughout the year. Additionally, Vernon County accepts automotive fluids such as oil, antifreeze, gasoline, diesel, brake fluid, and oil filters at no charge for recycling. Vernon County intends to continue these programs during operation of the Expansion and may expand collection efforts where opportunities arise.

Activities like waste diversion and recycling have been effective at reducing the quantity of waste entering the waste stream. However, not all waste is suitable for reuse or recycling, and waste reduction and recycling technologies still have residual waste which currently requires the need for landfilling. Recent reductions in the acceptance of United States recyclables by China (China Sword Policy) has resulted in recycled materials stacking up with little market value. Much of this material had to be landfilled while the recycling industry addressed recycling contamination issues and moved to identify alternative markets. Market value for recyclable materials have historically been volatile, and major market disruptions such as the China Sword Policy have significant short and long-term effects on the viability of recycling programs. Elimination of landfills, or not providing sufficient air space within landfills, will likely result in improper management of waste and create much larger environmental impacts than a properly designed and operated landfill.

11 Need and Design Capacity {NR 512.17}

11.1 Introduction

This section presents an evaluation of need for the proposed Eastern Expansion. The Expansion design will add an estimated net (including waste and daily and intermediate cover) 430,000 CY of airspace to the landfill's current capacity which will create approximately 15 years of additional site life. Per Wisconsin Statute, s. 289.29(1)(d), the maximum site life for a solid waste disposal facility is limited to 15 years.

To receive approval for landfill expansion, an evaluation of need and design capacity must be made in accordance with NR 512.17 and Wisconsin Statute, s. 289.28. WDNR will also consider the effect of planned and existing waste reduction and recycling activities and other existing or proposed competing solid waste facilities, regardless of whether the other facilities are located within the service area of the proposed landfill.

In assessing the need for the proposed Expansion, the WDNR will consider the following issues:

1. The approximate service area for the facility which takes into account the economics of waste collection, transportation, and disposal;
1. The volume of waste suitable for disposal at the facility and generated within the anticipated service area;
2. The design capacity of the following facilities located within the anticipated service area of the facility:
 - a. Approved facilities, as defined under Wisconsin Statute, 289.01, including the potential for the expansion of those facilities on contiguous properties already owned or controlled by the applicant;
 - b. Non-approved facilities, as defined under Wisconsin Statute, s. 289.01, which are environmentally sound—the assumption being that a non-approved facility is not environmentally sound unless evidence to the contrary is produced;
 - c. Other facilities for which FRs have been submitted and determined to be complete by the WDNR;
 - d. Facilities for the recycling of solid waste or for the recovery of resources from solid waste that have been licensed by the WDNR;
 - e. Proposed facilities for the recycling of solid waste or for the recovery of resources from solid waste for which plans of operation have been approved by the WDNR;
 - f. Solid waste incinerators licensed by the WDNR; and
 - g. Proposed solid waste incinerators which have plans of operation that have been approved by the WDNR.

The following sections are intended to address the above issues and provide information to demonstrate the need for the proposed Vernon County Landfill Eastern Expansion. The discussion in the following sections assesses the need for the Expansion based on the solid waste volumes in the service area while considering effects of waste reduction and recycling initiatives.

11.2 Service Area

To demonstrate the need for the proposed Expansion, it's necessary to define the service area that has a reasonable expectation to utilize the air space permitted. Generally, service areas are referred to on a county-wide basis, but in some circumstances not all municipalities within certain counties dispose of waste in the same location. Generally, it is not uncommon for nearby municipalities within a reasonable hauling distance to dispose of waste at competing haulers and disposal locations that offer varied pricing. Particularly if a municipality is in the outskirts of the jurisdictional limits of the county. As a result, there can be overlapping service areas between competing disposal locations and service areas which are continually changing.

The proposed Expansion will continue to be owned and operated as a municipally owned solid waste disposal facility. The Vernon County landfill service area is shown on Figure 1 in **Appendix F**. Vernon County currently has agreements in place with 21 of the 33 municipalities in Vernon County to deliver waste to its landfill and it is anticipated that additional municipalities will participate.

Vernon County is unique as its service area is localized to the municipalities within Vernon County. Service areas for municipally owned and operated landfills are typically established, through local ordinance, to secure waste from within their boundaries, but also may accept waste from surrounding areas. Chapter 54 of Vernon County Municipal Ordinance contains a solid waste flow control ordinance requiring persons who may be subject to the ordinance to dispose of solid waste at the Vernon County Landfill. Generally, Vernon County's approach to solid waste management has always been, and continues to be, to manage waste locally and provide disposal services, first and foremost, to its residents. Although Vernon County can accept waste from out of county, it is not currently a significant source of incoming waste tonnage. Vernon County does not currently nor is anticipated in the future to actively pursue waste generated outside of Vernon County to establish itself as a regional facility and/or for creating additional revenue streams. Therefore, for the purpose of this analysis the service area is defined as Vernon County only.

11.2.1 Economics of Disposal

An important part of determining the service area of a facility is analyzing the economics of waste collection, transportation, and disposal. As of 2019, tipping fees for Wisconsin landfill facilities that are located in the vicinity of the service area, range from \$49 to \$72 per ton. Vernon County Landfill's tipping fee is currently \$65 per ton.

Like many public landfills, Vernon County does not provide waste hauling services within the service area as they encourage public/private partnerships. Inconsistent, or consistently changing tipping fees within a service area, can result in haulers seeking alternative disposal facilities. The Vernon County Landfill has only implemented minimal increases in tipping fees (\$50 in 1993 to current \$60) in the past several decades and has engaged the system haulers well in advance for their input and preparation. Additionally, the current agreements in place with participating municipalities offer a flat rate tipping fee with the option to participate in a rebate program depending on their level of commitment to the system.

Given the location of the landfill, with respect to the service area population, most of the waste received at the facility is direct hauled to the facility in collection trucks. A single privately operated transfer station is also located within Vernon County near Viroqua. Transfer stations

provide a temporary collection point where waste can be consolidated and hauled, usually in larger quantities, to final disposal or processing locations.

Vernon County has formal agreements in place with most of the municipalities and their haulers within the service area, and it is anticipated more municipalities will participate in the formal agreement. These agreements are indicative that waste generated within Vernon County is committed for disposal to the existing site. Vernon County is not actively pursuing waste outside its current service area footprint.

11.2.2 Service Area Overlap

Vernon County Landfill services the needs of the County and currently is not competing for waste with other regional facilities. Vernon County desires to preserve its airspace for use by Vernon County residents, business, and institutions. Typically, a needs analysis includes an inquiry into the service areas of competing landfills to determine if any overlap exists and how that might impact incoming waste quantities. However, with the service area only consisting of Vernon County, an overlap analysis is not applicable. Although other facilities within the region such as Waste Management's Cranberry Creek Landfill in Wood County and Monroe County Landfill have listed Vernon County as part of their service areas in their respective feasibility reports, it is not anticipated these facilities routinely receive significant amounts of MSW generated within Vernon County. Most likely these facilities have indicated Vernon County as part of their service area to acknowledge occasional waste is or has been received during their respective operating history and therefore taking this occasional waste into consideration as part of their site life analysis.

Additionally, as the ability of MSW landfills to accept additional non-MSW waste types has expanded since establishment of Subtitle D regulations including industrial and special wastes, it is likely these nearby facilities have received non-MSW waste types generated from Vernon County to which they may have the current regulatory approvals and capacity to accept such waste. Whereas disposal of such waste at Vernon County would deplete airspace much sooner, thus shortening disposal capacity that is primarily dedicated to MSW and C&D waste generated by local residents and businesses. It's reasonable to expect that the services of a larger landfill outside the County may be needed on occasion to manage non-MSW waste types that may require special infrastructure, manpower/equipment, etc. for which a larger facility may be better equipped. Therefore, the inclusion of Vernon County as part of the service area for these nearby facilities is not likely a reflection that Vernon County is a considerable contributor of MSW to these facilities. Vernon County has the ability and capacity (with the Expansion) to manage the vast majority of waste generated in Vernon County.

Table 11-1 includes a summary of the remaining site capacity and service area population characteristics for the Vernon County Landfill. The remaining site capacity listed in **Table 11-1** is as reported on the 2022 Annual Tonnage reports provided on the WDNR website. Population data for Vernon County was obtained through the Wisconsin Department of Administration online Demographic Services Center. Historical waste acceptance at Vernon County Landfill dating back to 2007 is summarized on **Table 11-2**.

11.3 Waste Quantities and Disposal Rates

11.3.1 Average Statewide Disposal Rates

Solid waste disposal rates can be averaged on a per-capita basis for Wisconsin residents. The estimated population growth rate for Wisconsin between 2010 and 2022 is estimated to be 0.38%. The disposal rates, identified in **Table 11-3** are based on statewide averages and are assumed to be representative of the service area.

The total amount of waste disposed of in Wisconsin MSW and industrial landfills in 2022 was approximately 8,450,322 tons which includes all waste types and waste originating from out-of-state. This total was then divided by the estimated population of Wisconsin in 2022 (5,949,155) to determine the per capita annual waste disposal of Wisconsin residents in 2022 (1.42 tons/per capita, per year). Between 2018 and 2022, the average per capita annual waste disposal rate was 1.43 tons, or 7.84 lbs per person per day (**Table 11-3**). The solid waste disposal tonnage for Wisconsin was converted to volume utilizing the suggested waste density for landfill waste of 1,500 lbs/CY. The corresponding total 2022 estimated landfill air space consumption rate for Wisconsin is approximately 11,267,096 CY.

In recent decades, recycling efforts have seemingly reduced waste disposal rates in Wisconsin landfills. However, waste disposal rates have seemingly plateaued in the past 10 years (**Table 11-3**). Wisconsin Act 335 established prohibitions on disposal of certain types of waste in landfills. Prohibitions became effective in the early 1990's. The prohibitions included white goods, car batteries, waste oil, and yard waste. Act 335 was followed by NR 544 Wis. Adm. Code, which provides guidance to help implement and maintain effective recycling programs. In 1995, cardboard containers and packages, magazines, glass, plastics (#1 and #2), steel and aluminum containers, newspaper, office paper, and tires were prohibited. State-wide, mandatory recycling of electronic devices was made effective in 2010. Local ordinances may impose additional prohibitions.

Though these recycling laws have been effective for decades and their impacts have been observed, resource recovery and recycling efforts may be further expanded or modified again in the future. Fluctuation in prices paid for recovered materials as well as use of products comprised of prohibited materials may further influence trends in recycling.

11.3.2 Service Area Waste Disposal Rate (per Capita)

To estimate per capita disposal rates for the Vernon County Landfill's service area, the state-wide average disposal rate of 1.43 tons/person/year (or 7.84 lbs/person/day) from 2018-2022 was used (WDNR, 2022). It's likely that the state-wide waste generation and disposal rates are greater than those at the local level, particularly due to inclusion of industrial waste landfills which may not be reflective of the rural setting of Vernon County. However, the higher state-level estimate helps compensate for the fact that local per capita generation rates are more variable, and it's difficult to discern a true boundary for the service areas of respective landfills. Service area boundaries can change and overlap frequently and on a temporary basis, making it not only difficult to identify the point-source origin of waste, but also how much waste is from where and from who. Even though Vernon County has an idea of the origins of the waste it receives as it strives to maintain waste locally, other landfills may occasionally receive varying quantities of waste from outlying areas of Vernon County, and vice versa. Using the state-wide consumption rate helps to estimate a potential maximum of waste that could be disposed at Vernon County

Landfill as well as to gauge how much waste generated within Vernon County may potentially be disposed of elsewhere.

The estimated tonnage per capita rate of waste disposed within the Vernon County service area is shown in **Table 11-4**. The table uses a landfill in-place density of 1,500 lbs/CY to convert to volume. **Table 11-4** suggests that disposal demand for Vernon County's service area may be as high as 44,250 tons/year (59,000 CY/year). Disposal rate projections for the service area were calculated using the statewide per capita disposal rate (calculated in **Table 11-3**) and applied back to the specific service area using population data (provided in **Table 11-1**). As the population increases in the service area, the volume of solid waste generated and disposed is expected to also increase. Based on the 2020 Census, the Wisconsin Department of Administration population estimates, and recycling efforts, waste disposal rates are expected to increase commensurate with population growth of approximately 0.22 percent per year for Vernon County. This compares to a 0.38 percent per year increase statewide.

11.3.3 Vernon County Landfill Waste Disposal Rate

According to the WDNR tonnage reports, and as summarized in **Table 11-2**, the average tonnage of waste accepted at the Vernon County Landfill between 2018 and 2022 was 18,926 tons. Utilizing the suggested waste density for landfill waste of 1,500 lbs/CY, the average airspace consumed during the past five years was approximately 25,234 CY/year. Generally, the Vernon County Landfill has experienced an increasing trend in waste disposal quantity since initial operation of the landfill. Since 2007, waste disposal has increased by an average annual rate of approximately 1.56%. In the previous five years (2018-2022), that rate equates to approximately 2.10%. The compound annual growth rate, which calculates the constant rate of increase over this same five-year period is 1.62%. The median growth rate since 2007 is approximately 2.39%. To be conservative, the lowest calculated waste demand growth rate (i.e., annual average) of 1.56% was utilized to project future waste disposal rates to determine when the Expansion and current remaining permitted airspace will be consumed.

11.3.4 Existing Waste Reduction Activities

Recycling and waste reduction activities have been implemented at the Vernon County Landfill over the past several decades. These efforts have had significant positive impacts establishing better uses for the materials, as well as preserving valuable land and disposal air space. Although these efforts have been successful at diverting waste from the landfill, the tonnage values presented in this analysis represent an increase in the amount of landfilled waste after waste reduction initiatives. The following is a summary of the existing waste reduction efforts being implemented at the Vernon County Landfill.

11.3.4.1 Recycling Program

Beginning in 1991, the Vernon County Solid Waste and Recycling program has served as the Responsible Unit for the municipalities located within Vernon County except the Town of Liberty. The recycling program provides roll-off containers and curbside delivery and pick up to each participating municipality. The source separated recycled materials are delivered to the recycling building, located at the landfill property, where they are further processed, sorted, and bailed for subsequent sale. The Vernon County recycling program was recognized with the WDNR Wisconsin Recycling Excellence Overall System Award during 2020.

11.3.4.2 Citizens Drop-off Area

Vernon County provides a public drop-off site to homeowners, renters, and businesses located within Vernon County. In 2019, the citizens drop-off area was expanded to include bins for source separated recyclables and provides a valued convenience to the system users and is much safer than allowing the public access to the active landfill and recyclable material processing areas with equipment operators and haulers. Drop off items include:

- Source separated recyclables (plastic, glass, tin, paper, metal)
- Tires
- Large items: Furniture and furnishings including upholstered items.
- General household waste, toys, bikes, grills, lawnmowers (without gas and oil), mattresses, appliances, and other items.
- Demolition/Construction Debris: Wood, drywall, doors, windows, sinks, toilets, tubs, roofing, bricks, carpets, tile, and flooring.
- Garbage: Normal household waste like bagged waste, paper, and food waste
- Other: Yard waste/grass clippings, shingles, brush, and animal carcasses
- Refrigerators, dehumidifiers, air conditioners

11.4 Design Capacities within Service Area

The design capacities of facilities located near the Vernon County Landfill service area are discussed in the following subsections. Facilities discussed include other approved, non-approved, and proposed disposal, recycling and recovery facilities, and solid waste incinerators.

11.4.1 Approved Solid Waste Facilities

As defined under Wisconsin Statute, s. 289.01, an “approved facility” is “a solid or hazardous waste disposal facility with an approved Plan of Operation (POO) under Wisconsin Statute, s. 289.30, or a solid waste disposal facility initially licensed within three years prior to May 21, 1978, the owner of which successfully applies within two years after May 21, 1978, for a determination by WDNR that the facility’s design and Plan of Operation comply substantially with the requirements necessary for plan approval under Wisconsin Statute, s. 289.30.” This subsection describes approved facilities providing disposal capacity near the Vernon County Landfill service area, including the Vernon County Landfill. Section 11.2.2 discussed other approved facilities near the Vernon County service area that could or on occasion provide disposal capacity to Vernon County.

The Monroe County Landfill, located in Norwalk, Wisconsin, and La Crosse County Landfill, located in La Crosse and Onalaska, Wisconsin, are located in relatively close proximity to the Vernon County Landfill, but are publicly owned and are not competing within the Vernon County Landfill service area. La Crosse County and Monroe County prioritize waste from within their own respective service areas and would likely not be in favor of receiving excess waste from the Vernon County service area if its airspace capacity were to be depleted.

Waste Management’s Cranberry Creek Landfill located in Wisconsin Rapids is the closest privately operated facility to Vernon County. Cranberry Creek could potentially compete with Vernon County; however, this would result in Vernon County generated waste being hauled much greater distances compared to the Vernon County Landfill.

11.4.2 Non-Approved Facilities

Non-approved facilities are defined as “a licensed solid or hazardous waste disposal facility that is not an approved facility” by Wisconsin Statute, s. 289.01(24). No unapproved facilities are operating in the service area. No unapproved facilities are anticipated to be in operation during the life of Vernon County Landfill’s expansion. There is no indication that any other facilities are in operation or proposed for operation within the service area.

11.4.3 Other Proposed Facilities with Submitted Feasibility Reports

Although Vernon County does not compete with other landfills, other facilities who service the region which have recently submitted feasibility reports to the WDNR for proposed expansion include La Crosse County Landfill, Monroe County Landfill, and Seven Mile Creek Landfill in Eau Claire County. Cranberry Creek Landfill in Wood County has submitted an ISR and is currently in progress with their feasibility report. It is anticipated the Cranberry Creek Landfill expansion would be approximately 4.05 million CY. La Crosse County Landfill, Monroe County Landfill and Seven Mile Creek Landfill recently had their respective feasibility studies approved for expansion. La Crosse County was granted an additional 3.09 million CY of airspace. Monroe County Landfill was granted an additional 810,000 CY of airspace. Seven Mile Creek Landfill was granted an expansion of 4.13 million CY.

11.4.4 Existing Licensed Solid Waste Recycling and Resource Recovery Facilities

Wisconsin Act 335 established prohibitions on disposal of certain types of waste in landfills. Prohibitions became effective in the early 1990’s. The prohibitions included white goods, car batteries, waste oil, and yard waste. Act 335 was followed by NR 544, which provides guidance to help implement and maintain effective recycling programs. In 1995, cardboard containers and packages, magazines, glass, plastics (#1 and #2), steel and aluminum containers, newspaper, office paper, and tires were prohibited. State-wide, mandatory recycling of electronic devices was made effective in 2010. Local ordinances may impose additional prohibitions.

Though these recycling laws have been effective for decades and their impacts have been observed, resource recovery and recycling efforts may be further expanded or modified in the future. Changes in recycling rates have been recently observed due to recent changes in China and other foreign countries rejecting contaminated recycled materials exported from the United States. Recent trends indicate this will increase landfill waste disposal rates in the United States.

A local unit of government identified as the “responsible unit” generally oversees recycling efforts in Wisconsin. In many cases, the responsible unit (RU) is the county; however, smaller units of local government often maintain RU status for their own community within the county. Vernon County is the RU for most of the County except the Town of Liberty. RU’s are required to report annually to the WDNR specific household recyclable materials such as newspapers, cardboard, aluminum containers, glass, plastics, etc. RU’s may also report optional items that have been recycled such as yard waste, waste tires, etc. Per the 2021 WDNR annual reports from RU’s and material recovery facilities, a total of 410,011 tons of mandatory reportable materials were collected by RU’s and a total of 638,756 tons including all optional items were collected by RU’s. This equates to approximately 138 lbs. per capita of mandatory reported recyclables and 215 lbs per capita including optional reported materials.

Although a significant amount of waste materials is diverted to recycling and reuse facilities, the landfill disposal tonnages presented in this FR already exclude these materials. Thus, further supporting the need for landfilling as well as expanded waste reduction initiatives on a global scale.

11.4.5 Proposed Solid Waste Recycling and Resource Recovery Facilities

There's no indication that any new recycling and resource recovery facilities are proposed for operation within the service area.

11.4.6 Licensed Solid Waste Incinerators

There are currently only two licensed MSW incinerators operating in Wisconsin; the Barron County Waste to Energy and Recycling Facility located in Almota, WI, and the Xcel Energy French Island Refuse Derived Fuel (RDF) Facility located in La Crosse, WI. Both facilities are outside the Vernon County service area with the closest facility being the Xcel RDF Facility. Xcel and La Crosse County Landfill have established an agreement for regional solid waste disposal for which La Crosse County provides up to 75,000 tons of MSW annually to Xcel. Incinerated waste from both these facilities was not included in the per capita waste disposal rate calculation of **Table 11-3**, therefore no adjustments for per capita disposal rates are needed.

11.4.7 Proposed Solid Waste Incinerators

Currently, there's no indication that any additional solid waste incinerators are proposed for operation within the service area.

11.5 Existing Design Capacity of the Vernon County Landfill

11.5.1 Service Area Capacity (Per Capita Method)

Table 11-1 summarizes the remaining disposal capacity available to Vernon County. As of January 2023, 33,769 CY of airspace remain at the landfill. Utilizing per capita disposal rates calculated using statewide waste disposal data and applying it to the Vernon County service area, suggests a Vernon County per capita disposal rate of 59,000 CY/year. Utilizing this method, without the Expansion, the estimated site life and disposal capacity of the existing landfill will be consumed in 2023. With the Expansion, per capita disposal rates commensurate with population growth rates would provide disposal capacity to approximately 2030 assuming a favorable feasibility determination and Plan of Operation approval in 2024. Both these scenarios with and without the Expansion are summarized in **Table 11-6** and **Table 11-7**.

11.5.2 Remaining Capacity and Site Life of Vernon County Landfill (Historic Data Method)

Based on the 5-year average for airspace consumption presented in **Table 11-2**, Vernon County Landfill has less than 2 years of site life remaining as of January 2023. According to the WDNR tonnage reports, and as summarized in **Table 11-2**, the average tonnage of waste accepted at the Vernon County Landfill between 2018 and 2022 was 18,926 tons. Utilizing the suggested waste density for landfill waste of 1,500 lbs/CY, the average air space consumed during the past five years was approximately 25,234 CY/year. The WDNR's 2022 tonnage report estimates that 17,327 tons of municipal and non-municipal waste were disposed of at the Vernon County Landfill in 2022 (WDNR, 2020), suggesting an increasing trend over the past several years.

Several waste growth rates were calculated utilizing historical tonnage data dating back to 2007 and using the most recent data within the previous 5 years. For purposes of analyzing the additional site life the Expansion will add to the existing landfill, the most conservative (lowest) calculated growth rate was used to project future waste disposal rates. This equates to an average annual growth rate of 1.56% as shown in **Table 11-2**. Utilizing this growth rate and the previous 5-year average airspace consumption rate of 25,234 CY, the proposed Expansion volume of approximately 430,000 CY will be consumed within 15 years. This results in the total airspace (i.e., current remaining capacity and proposed Expansion capacity) being consumed by early 2039 assuming the Expansion airspace is approved for use in early 2024. The estimated site life for the Expansion utilizing projected future waste quantities and based on historical tonnage data is presented in **Table 11-5**.

11.6 Proposed Expansion Capacity

The design capacity for the proposed Vernon County Eastern Expansion was based on historical waste acceptance rates with consideration of service area demand. The proposed design capacity is approximately 430,000 CY.

The need for the proposed Expansion must consider future service area demands based on several waste loading scenarios. The proposed design capacity maximizes the available airspace within the remaining property at the Vernon County Landfill that is feasible to utilize, while balancing environmental and social impacts.

11.7 Need and Design Capacity Conclusion

To determine the need for expansion, the waste disposal rates for the service area were calculated based on a per capita method using statewide waste disposal data and applying it to the service area and based on historical tonnage data recorded at the existing landfill. As presented in **Table 11-6**, without the proposed Expansion, the estimated site life and disposal capacity within the service area will be consumed this year (2023) based on per capita disposal rates. Utilizing airspace consumption rates based on historic tonnage data, the existing landfill will reach capacity in 2024, which is likely the more realistic timeframe. Additionally, these disposal rates already reflect the impact of waste reduction and recycling initiatives as they exclude recyclable materials.

While it is likely that other landfills in the region could take Vernon County waste beyond 2024, it would likely result in impacts to those facility's site life assumptions and add additional costs to the service area residents (i.e., Vernon County) due to significant increases in waste hauling distances. As presented on **Table 11-5** and **Table 11-7**, with an approved expansion, the available disposal capacity to the service area will be extended to 2039 when utilizing historic waste disposal rates tracked at the facility or 2030 when utilizing per capita waste disposal rates. In either approach, the additional site life from the proposed Expansion would be less than the 15-year site life limit noted in state statute section 289.29(1)(d).

As shown in **Table 11-8**, the statewide disposal capacity is projected to last approximately 10 years beginning in 2024. With current disposal rates and current available disposal capacity, not including pending landfill expansions, landfill disposal capacity will be reached in Wisconsin during 2034. This indicates not only the need for the proposed Expansion of the Vernon County Landfill but also the need for other landfills to be developed or expanded in Wisconsin.

It is expected that the waste disposal rate at Vernon County Landfill will increase during the next 15 years. As a result, consumption of air space will increase over time as demonstrated by historic tonnage data since inception of the landfill. The factors that have caused most landfills in Wisconsin to reach capacity sooner than projected during the permitting process are challenging to define. Factors that can increase waste disposal rates include economic trends and local/global population increases. Changes in global recycling markets may cause increased waste disposal rates in the future. Natural or anthropogenic disasters can also significantly increase disposal rates for short periods. In 2018, flooding events contributed to an additional 1,784 tons of non-MSW waste being landfilled than the previous year.

The anticipated site life of the proposed Expansion is calculated by dividing the net landfill air space (430,000 CY) by the annual service area demand, with consideration of service area demand increases. Future service area demand projections are calculated using the average airspace consumption rate observed at the landfill between 2018 and 2022, plus the average annual waste growth rate between 2007 and 2022 of 1.56% (**Table 11-2**). Under this scenario, the proposed Expansion volume and currently existing landfill capacity as of January 1, 2023 is projected to be consumed in early 2039.

The need for the Vernon County Landfill Eastern Expansion is justified based on the projected site life for the Vernon County Landfill, and that landfills in Wisconsin have a limited capacity that will be reached in 2034 should no new landfills be sited, or Expansions permitted. The publicly owned Vernon County Landfill will continue to provide competition to other private municipal solid waste landfills in Wisconsin. Competition ensures Wisconsin residents can access reasonably priced waste disposal. If public landfills are not allowed to expand, their capacity will eventually be depleted. Reduced competition will allow private landfills to substantially increase their fees for disposal. Competition in a marketplace that has seen numerous mergers is needed to provide efficient, cost-effective, waste disposal. The proposed Expansion will ensure that the landfill continues to provide cost-effective and environmentally conscious waste management services for residents within the service area.

12 Evaluation of Alternatives to Land Disposal

This section provides an evaluation of alternatives to land disposal as required by NR 512.18. This section summarizes the state requirements in regard to alternatives, presents the alternatives, and evaluates their feasibility or current status of implementation and operation. This section also discusses the waste reduction and recycling activities for the proposed Expansion.

Many technologies exist for processing solid waste and reducing solid waste disposal quantities. The following discussion is a brief overview of the practical means available, or being actively practice, in the service area for reducing the amount of waste to be landfilled. These means include waste reduction, reuse, recycling, composting, co-composting, and incineration/energy recovery. Since the preparation of the FR for the existing landfill, Wisconsin has implemented several code and rule changes that have impacted waste going to landfills. These include mandatory recycling rules implemented at the local level and changes in fees that landfills pay. Each of these changes have been in place for a sufficiently long period of time that the impacts to the waste types and quantities received at Wisconsin landfills reflect those changes.

12.1 Description of Alternatives to Land Disposal

While landfilling is an important component of integrated solid waste disposal, it is only one of several waste management options. Solid waste disposal alternatives include waste reduction, reuse, recycling, composting, incineration, and processing. The feasibility of each of these options is based on factors such as cost/market economy, quantity, economies of scale, public acceptance, environmental protection, location, hauling and transportation systems, and long-term sustainability.

12.1.1 Waste Reduction

One key concept of waste reduction is the reduction of the quantity of materials used to produce and package consumer goods, thereby reducing the volume of waste requiring disposal. This practice eliminates waste from being created in the first place and is the most preferable method of managing waste. This type of resource management includes redesigning products to use fewer materials and choosing to use products that have minimal disposal requirements or that meet recycling standards.

Another key concept of this reduction method is the development of products with longer useful lives. This reduces the need to frequently replace items and results in a reduction of the amount of waste requiring disposal. This type of solid waste management is generally environmentally, socially, and economically acceptable as compared to many other potential management techniques.

Waste reduction can be implemented at all stages for production of goods, transportation methods and at the point of sale for many items. No matter at what stage waste reduction is implemented, it can reduce the costs of waste collection, transportation, processing, and disposal at the point of product use since lesser quantities of waste are involved.

Implementing waste reduction requires a change in product design and manufacturing practices and procedures. Industry could be a leader for implementing waste reduction efforts. However, industry typically responds to consumer demands and marketplace response to products. As such, consumers can influence industry practices through purchasing decisions. Local municipalities, through their effective recycling programs, can educate people on the need to closely consider the use of products with excess packaging and short useful lives.

During recent years there has been an increased emphasis on producer responsibility, particularly for products such as paint, computers and electronics, compact fluorescent light bulbs, and other materials that can contain hazardous or toxic materials. Several different models have been implemented in several states for the management of these types of products. In addition, several large communities and corporations are embracing the concept of zero waste as a mechanism to achieve sustainability. The emphasis of zero waste is to move materials up the waste management hierarchy.

Disposal costs or disposal costs savings for waste reduction are very difficult to estimate. Unless industry or large retailers force change through their sustainability programs, it would likely be up to governmental entities and consumers to be the primary driving force behind encouraging waste reduction at the manufacturing level. For waste reduction efforts to have a long-term impact, consumers would need to support manufacturers, and their distributors, that embrace waste reduction with their purchasing decisions. The cost-benefit of the public education process

and the corresponding reduction in waste quantity produced includes multiple variables and is very difficult to quantify.

12.1.2 Waste Reuse

The reuse of waste items reduces landfill needs, conserves resources, and in some cases, reduces the environmental impact of landfilling. Reuse applications include the use of multiple-use products as well as the sharing, repairing, and rebuilding of other items for reuse.

Industrial implementation of this solid waste management technique could possibly include the reuse of machinery, spare and extra parts, by-products, liquids, barrels, drums, pallets, and scraps. With the limited supply and increasing costs of natural resources, the high costs for raw materials and waste disposal will serve as an incentive for implementing waste reuse. Zero waste initiatives, or waste disposal reduction initiatives can also be an important driver in identifying reuse applications.

At the municipal level, mandatory reuse of products could be difficult to enforce so education and information on programs available to consumers for reuse of household items may be appropriate. Many domestic household items can be refurbished and reused, provided the proper resources and tools. Items such as clothing, appliances, and furniture are often donated to charitable organizations and local community groups. Increased reuse of waste items can be encouraged by working with organizations and providing publicity and assistance in promoting collection drives.

12.1.3 Waste Recycling

Recycling is the manual or mechanical separation of solid waste materials into constituents that can be physically and/or chemically changed into new or different products. Typical examples of recyclable materials include paper, cardboard, aluminum cans, glass, plastics, and scrap metals. Any of which can be used to produce new materials given that certain steps are taken during collection and storage.

Recycling programs often have an advantage over other methods of solid waste reduction techniques in that they are generally low technology. In addition, they can often be implemented rather quickly and are adaptable and flexible to program location and the market demands. The types of recycling programs most often implemented are classified by collection method, and include curbside collection, drop-off centers, and buy-back centers.

Curbside collection is the periodic pickup of recyclables at the curbside or at the point of generation. Dropoff centers are facilities where people can bring recyclables but are not compensated for their return. Buy-back centers are facilities where people can bring recyclables and be compensated for them.

Recycling programs and recycling centers can be managed by local municipalities, community organizations, or private businesses. Programs have been implemented by statutory and local requirements or can be completely voluntary. Vernon County is the RU for collection of household materials such as paper, glass, plastic, and metal cans for all municipalities in Vernon County except the Town of Liberty. Individual municipalities contract with local haulers for curbside collection of recyclable items. Drop off facilities are also common in the County for collection of recyclable materials, particularly in rural areas or where there is a convenience need. Vernon County also provides two "Clean Sweep" events twice per year taking in household hazardous materials (HHM) from residents to be recycled. Vernon County regularly accepts at

their recycling facility located at the landfill other items such as e-waste, mattresses, tires, batteries, and bulbs for a fee throughout the year. Additionally, Vernon County accepts automotive fluids such as oil, antifreeze, gasoline, diesel, brake fluid, and oil filters at no charge for recycling. Vernon County intends to continue these programs during operation of the Expansion and may expand collection efforts where opportunities arise.

Activities like waste diversion and recycling have been effective at reducing the quantity of waste entering the waste stream. However, not all materials are suitable for reuse or recycling, and waste reduction and recycling technologies still have residual waste which currently requires the need for landfilling. Recent reductions in the acceptance of United States recyclables by China (China Sword Policy) has resulted in recycled materials stacking up with little market value. Much of this material had to be landfilled while the recycling industry addressed recycling contamination issues and moved to identify alternative markets. Market value for recyclable materials have historically been volatile, and major market disruptions such as the China Sword Policy have significant short and long-term effects on the viability of recycling programs.

The general public is familiar with recycling and understands that there is a value to preserving landfill space. Based on the WDNR's "Status of Recycling Report" (WDNR, July 2003), Wisconsin is diverting approximately 40.4 percent of MSW. In addition, an EPA sponsored study (U.S. Recycling Economic Information Study, Prepared for The National Recycling Coalition, by R. W. Beck, Inc., July 2001) concluded that recycling and reuse directly contributes approximately \$12.9 billion to government revenues, and contributes approximately \$45.8 billion in total revenues, including indirect revenues.

12.1.3.1.1 Curbside Collection

This method involves the routine collection of recyclable household goods, such as paper, cardboard, aluminum, metals, glass, and plastics. Industrial and commercial collection is also possible if it proves to be economically feasible. Collection services are generally provided by municipal or private collection agencies. Collections may be single stream or source separated methods depending on the service provider.

This type of program is most convenient for the generator as it does not require the transport of materials. However, unless the program is locally mandatory, participation rates for household generators can be low. Well publicized programs that are a combination of both voluntary and mandatory efforts can be very successful.

State rules require that municipalities with populations of 5,000 or more and with an aggregate population density of at least 70 persons per square mile provide curbside collection of newspaper, glass, aluminum, and steel containers, #1 and #2 plastic containers, corrugated cardboard, and magazines at least once a month from single family and two to four-unit residences. They must also provide drop-off collection for materials that are not collected at curbside. Municipalities with populations less than 5,000 or an aggregate population density of less than 70 persons per square mile must provide either curbside or drop-off collection for single family and two-to-four-unit residences.

12.1.3.2 Drop-Off Centers

Drop-off centers are intended to provide easy disposition of mixed or separated recyclable materials. The types of facilities can range from unstaffed centers with separate large containers for individual recyclables, to full-scale fully staffed facilities, which provide disposition, processing,

storage, and transport of recyclables. In all cases, the generator must transport recyclable materials to the drop-off center at their expense.

This type of program can be voluntary or mandatory. Statutory requirements for Wisconsin require all communities with a population of 10,000 or more and all disposal facilities with an annual solid waste intake of less than 50,000 tons to provide waste separation and collection facilities. In addition, communities of 3,500 persons or more with stores that sell motor oil must provide waste oil collection facilities or provide information regarding where the nearest collection facility is located.

Participation rates for this method of collection are estimated to range from 10 percent for voluntary programs to almost 100 percent for mandatory programs. Well publicized programs typically achieve higher and more consistent participation rates.

12.1.3.3 Buy-Back Centers

This method of collection is similar to a drop-off center. Generators transport recyclables to the buy-back center and are financially compensated for the materials. Participation rates tend to be higher and more consistent due to the financial compensation. Many buy-back centers handle primarily industrial and commercial recyclable materials. Compensation for house-hold recyclables such as paper, cardboard, glass, and aluminum, may be provided.

12.1.4 Waste Composting and Digestion

Composting is the biodegradation of the organic portion of solid waste materials (food, wood, leaves, grass clippings, etc.). Since it is rich in humus (partially or wholly decayed vegetable matter), compost is generally used as a soil conditioner or mulch. Many different composting processes exist, ranging from simple backyard composting to automated composting in digesters to large scale operations with composting windrows.

Small-scale composting can be accomplished effectively by private residences, with little investment, and with end products immediately available for their personal use. Exemptions from regulation are granted in these instances, provided the composting is maintained in a nuisance-free manner and contains less than 50 cubic yards of material.

On a larger scale, materials are collected and prepared for composting by sorting out the materials that cannot be composted, then shredding and grinding the compostable portion, with the possible addition of sludges or water. Materials are then digested in open or closed digester systems and finished by regrinding and rescreening the compost to ensure uniform size, consistency, the lack of contaminants, and the proper water content. Generally, only a few bulk commercial and specialty markets exist for the sale of composted material and that limits the implementation of larger programs.

Organic waste collection and delivery to a small or medium size digester system has been implemented on a limited scale in Wisconsin in recent years. The digesters predominantly are available to process high organic waste streams such as food wastes from cafeterias, restaurants, schools/universities, or other locations where food or meals are processed. Supplementation of other organic materials, such as yard waste or manure may be used if the food waste stream is variable.

The State of Wisconsin through Statute 287.07 banned yard waste from landfills in an effort to reduce the volume of waste disposed of at landfills. As discussed above, yard wastes make up

the majority of material that is available as good composting material. Because yard waste is already banned from landfill disposal, composting yard waste will not save additional landfill space and is not an alternative to land disposal.

12.1.5 Co-Composting

Co-composting is basically the same as previously discussed for composting. Co-composting mixes various organic waste types together for composting. Municipal waste and sludge from wastewater treatment facilities are typically composted together. If co-composting is done in conjunction with an effective recycling program, little or no sorting of the municipal waste may be needed.

Recent experience indicates that much of the co-compost must be rejected during the final screening process in order to obtain a product that can be sold. This is due to the presence of small pieces of nondegradable waste that were not initially removed creating a compost that is not visually appealing to most residential applications. These limitations often result in a co-compost product that is not economically viable.

12.1.6 Waste Incineration and Energy Recovery

Incineration is the controlled burning of solid waste materials to reduce the volume of materials requiring landfill disposal. Energy recovery is the process whereby usable energy is recovered during the waste incineration process. Incineration can reduce the volume of burnable solid waste by 80 to 90 percent or of total solid waste by 50 to 60 percent. This can extend the useful life of a solid waste disposal facility. Incineration can also alter the weight and volume of the refuse through the drying effect caused by complete or partial incineration.

Incineration and energy recovery systems are mass-burn or RDF systems. In a mass-burn system, solid waste materials are placed directly into an incineration chamber with little or no preparation or processing. In an RDF system, solid waste materials are processed into intermediate fuels referred to as pellets and are incinerated in commercial size boilers.

In many respects, mass-burn and RDF incineration processes are the same. Storage area for the fuel (refuse) must be available. Usually up to 3 days of storage are common to allow for continuous use of the facilities. Ash residue is collected in bottom quench tanks, which eventually convey the ash to a storage area. Electrostatic precipitators or scrubbers are used to collect particulates in the exhaust, commonly referred to as fly ash.

The French Island RDF facility is the only operating RDF plant in Wisconsin. The RDF facility blends wood waste and RDF, currently at approximately a 50/50 ratio, to create fuel for a fluidized bed boiler, which produces steam and electricity.

Barron County maintains the only other waste to energy facility in the State. Barron County is a mass-burn facility that produces steam which is sold to a nearby cheese production facility. Excess steam is also used to generate electricity.

12.2 Evaluation of Implementing Alternatives to Land Disposal

In efforts to conserve airspace and maximize the value of discarded resources, Vernon County provides opportunities for system users to divert reusable/recyclable resources from the landfill and works with stakeholders to find uses for the diverted waste streams. Vernon County will

continue to provide recycling services for typical household recyclables as well as HHM collection either through their fee-based program or semi-annual clean sweep events.

As is Vernon County's philosophy to manage waste locally and prioritize the needs of its residents, additional waste reduction, reuse, and recycling opportunities will continue to be evaluated and implemented, where feasible, during operation of the Expansion. To eliminate the need for landfilling requires societal changes on a global scale and no single alternative provides a comprehensive solution. Therefore, to continue to meet waste disposal needs of Vernon County residents at competitive prices, landfill activities will need to be expanded. Activities like waste diversion and recycling have been effective at reducing the quantity of waste entering the waste stream. However, not all materials are suitable for reuse or recycling, and waste reduction and recycling technologies still have residual waste which currently requires the need for landfilling. Recent reductions in the acceptance of United States recyclables by China (China Sword Policy) has resulted in recycled materials stacking up with little market value. Much of this material had to be landfilled while the recycling industry addressed recycling contamination issues and moved to identify alternative markets. Market value for recyclable materials have historically been volatile, and major market disruptions such as the China Sword Policy have significant short and long-term effects on the viability of recycling programs. Elimination of landfills, or not providing sufficient air space within landfills, will likely result in improper management of waste and create much larger environmental impacts than a properly designed and operated landfill.

13 References

- Allard, Bert, 1995, Groundwater, in: Salbu, B., and Steinnes, E., eds., Trace Elements in Natural Waters; CRC Pres, Boca Raton, FL, p. 151-176.
- Appel, C.A.J., and Postma, D., 1994, Geochemistry, Groundwater and Pollution; Balkema Publishers, Brookfield, VT, 536p.
- Black, R.F., 1970, Residuum and Ancient Soils of the Driftless Area of Southwestern Wisconsin; in: Pleistocene Geology of Southern Wisconsin; Wis. Geol. Nat. History Survey Info. Circ. No. 15, Part 1.
- Bricker, O.P., and Jones, B.F., 1995, Main Factors Affecting the Composition of Natural Waters; in: Salbu, B., and Steinnes, E., eds., Trace Elements in Natural Waters; CRC Press, Boca Raton, FL, p. 1-20.
- Bouwer, Herman, 1989, The Bouwer and Rice Slug Test – An Update; Ground Water, vol. 27, no. 3, pp. 304-309.
- Cottam, G., Loucks, O.L., and Curtis, J.T., 1965, Early Vegetation of Wisconsin; Wis. Geol. Nat. History Survey Page-size Map 11.
- Davis, R.A., 1970, The Prairie du Chien Group in the Upper Mississippi Valley; in: Field Trip Guidebook for Cambrian-Ordovician Geology of Western Wisconsin; Wis. Geol. Nat. History Survey Info. Circ. No. 11, pp. 35-42.
- Domenico, P.A., and Schwartz, F.W., 1990, Physical and Chemical Hydrogeology; John Wiley and Sons, Inc., New York, 824 p.
- Driscoll, F.G., 1986, Groundwater and Wells; Johnson Division, St. Paul, Minnesota, 1108 pp.
- Evans, T. J., 2003, "Geology of La Crosse County, Wisconsin," Wisconsin Geological and Natural History Survey, Bulletin 101.
- Fetter, C.W., 1994, Applied Hydrogeology, 3rd ed.; Macmillan College Publishers, New York, 691 p.
- Frankel, A., Mueeler, C., Barnhard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1997, Seismic-Hazard Maps for the Conterminous United States, Map F; U.S. Geol. Survey Open-File Report 97-131-F.
- Frolking, T.A., 1982, The Genesis and Distribution of Upland Red Clays in Wisconsin's Driftless Area; in: Quaternary History of the Driftless Area; Wis. Geol. Nat. History Survey Field Trip Guidebook No. 5, pp. 88-97.
- Hem, J.D., 1970, Study and Interpretation of the Chemical Characteristics of Natural Water, Second Edition; U.S. Geol. Survey Water Supply Paper 1473, 363 pp.
- Hole, F.D., 1950, Aeolian Silt and Sand Deposits of Wisconsin; Wis. Geol. Nat. History Survey Page-size Map 1.
- Hindall, S.M. and Borman, R.G., 1974, Water Resources of Wisconsin, Lower Wisconsin River Basin; U.S. Geol. Survey Hydrol. Invest. Atlas HA-479.
- Hunt, R. J., D. A. Saad, and D. M. Chapel, 2003, Numerical Simulation of Ground-Water Flow in La Crosse County, Wisconsin, and into Nearby Pools of the Mississippi River, Water-Resources Investigations Report 03-4154, U.S. Geological Survey, Reston, Virginia.

- Kehew, A.E., 2001, Applied Chemical Hydrogeology; Prentice Hall, Upper Saddle River, NJ, 268 p.
- Mandle, R.J., and Kontis, A.L., 1992 Simulation of Regional Ground-water Flow in the Northern Midwest, United States; U.S. Geol. Survey Prof. Paper 1405-C, 97 p.
- Martin, Lawrence, 1965, The Physical Geography of Wisconsin; University of Wisconsin Press, 608 pp.
- National Weather Service, 2023, National Online Weather Data, accessed July 25, 2023 ([Climate \(weather.gov\)](https://climate.weather.gov)).
- Newell, C.J., Hopkins, L.P., and P.B. Bedient, 1990, A Hydrogeologic Database for Ground-Water Modeling; Ground Water, vol. 28, no. 5, pp. 703-714.
- Odom, I.E., 1978, Mineralogy of Late Cambrian and Early Ordovician, Sandstones, Upper Mississippi Valley; in: Lithostratigraphy, Petrology, and Sedimentology of Late Cambrian-Early Ordovician Rocks Near Madison, Wisconsin; Wis. Geol. Nat. History Survey Field Trip Guidebook No. 3, pp. 46-66.
- Odom, I.E., and Ostrom, M.E., 1978 Lithostratigraphy, Petrology, Sedimentology, and Depositional Environments of Jordan Formation Near Madison, Wisconsin; in: Lithostratigraphy, Petrology, and Sedimentology of Late Cambrian-Early Ordovician Rocks Near Madison, Wisconsin; Wis. Geol. Nat. History Survey Field Trip Guidebook No. 3, pp. 23-45.
- Olcott, P.G., 1992 Ground Water Atlas of the United States: Iowa, Michigan, Minnesota, and Wisconsin; U.S. Geol. Survey Hydrologic Investigations Atlas HA-730J.
- Ostrom, M.E., 1970, Sedimentation Cycles in the Lower Paleozoic Rocks of Western Wisconsin; in: Field Trip Guidebook for Cambrian-Ordovician Geology of Western Wisconsin; Wis. Geol. Nat. History Survey Info. Circ. No. 11, pp. 10-34.
- Ostrom, M.E., 1978, Stratigraphic Relationships of Lower Paleozoic Rocks of Wisconsin; in: Lithostratigraphy, Petrology, and Sedimentology of Late Cambrian-Early Ordovician Rocks Near Madison, Wisconsin; Wis. Geol. Nat. History Survey Field Trip Guidebook No. 3, pp. 3-22.
- Ostrom, M. E., 1981, "Bedrock Geology of Wisconsin," UW Extension Geological and Natural History Survey
- Seaberg, K. John. July 2000. Overview of the Twin Cities Metropolitan Groundwater Model, Metropolitan Area Groundwater Model Project Summary.
- SEH. 2021. Alternate Geotechnical Program Request – Proposed Landfill Expansion, Vernon County Landfill. December 13, 2021.
- SEH. 2022. Response to AGIP Acceptance Letter – Proposed Landfill Expansion, Vernon County Landfill. July 27, 2022.
- Siegel, D.I., Geochemistry of the Cambrian-Ordovician System in the Northern Midwest, United States, U.S. Geol. Survey Prof. Paper 1405-D, 76 p.
- Slota, R.W., 1969, Soil Survey of Vernon County, Wisconsin, U.S. Dep. Agriculture, Soil Conservation Service, 82pp.

- Snyder, Jay, 1981, Prairie du Chien Group; in: Field Trip Guidebook for the Ordovician Geology of Southwestern Wisconsin; 13th Annual Wisconsin State University Field Conference, U.W. Platteville, pp. 37-40.
- U.S. Department of Agriculture (USDA), 2023, Web Soil Survey (WSS), National Cooperative Soil Survey, USDA Natural Resources Conservation Service (NRCS), accessed July 25, 2023 (<https://websoilsurvey.nrcs.usda.gov/app/>).
- United States Geological Survey. 1983. Avalanche Quadrangle 7.5 Minute Series Topographic Map.
- United States Geological Survey. 1985. Groundwater Flow in the Prairie du Chein-Jordan Aquifer Related to Contamination by Coal-Tar Derivatives, St. Louis Park, Minnesota.
- Walton, W.C., 1989, Analytical Groundwater Modeling; Lewis Publishers, Boca Raton, 173 p.
- Wisconsin Department of Natural Resources. July 2002. The State of the Lower Wisconsin River Basin.
- Wisconsin Department of Natural Resources. February 9, 2021. Conditional Plan of Operation Approval Modification for the Vernon County Sanitary Bafefill Landfill, Town of Viroqua, Vernon County, License No. 3268.
- Wisconsin Department of Natural Resources. March 30, 2022. Acceptance of Proposed Alternative Geotechnical Investigation Program for Feasibility Study, Vernon County Landfill, Vernon County, Wisconsin - License #3268.
- "Wisconsin Wetland Inventory Map," Wisconsin Department of Natural Resources, Surface Water Data Viewer, accessed July 25, 2023.
- Young, H.L., 1992, Hydrogeology of the Cambrian – Ordovician Aquifer System in the Northern Midwest, United States; U.S. Geol. Survey Prof. Paper 1405-B, 99 p.
- Young, H.L. and Borman, R.G., 1973, Water Resources of Wisconsin, Trempealeau – Black River Basin; U.S. Geol. Survey Hydrol. Invest. Atlas HA-474.
- Zeminski, Robert, 1981, Platteville Formation; in: Field Trip Guidebook for the Ordovician Geology of Southwestern Wisconsin, 13th Annual Wisconsin State University Field Conference, U.S.-Platteville, pp. 30-55.
- SEH. 2012. Organic Stability Plan- La Crosse County Disposal Facility. April 2012
- SEH. 2015. Master Land Use Management Plan – La Crosse County Landfill. November 13, 2015.
- SEH. 2015 Solid Waste Management Plan – La Crosse County Disposal System. November 25, 2015.
- SEH. 2019. Research. Development, and Demonstration (RD&D) Plan for the La Crosse County Municipal Landfill (License #03253). April 11, 2019.
- SEH. 2019. Initial Site Inspection Request – La Crosse County Landfill. June 14, 2019.
- SEH. 2019. Initial Site Report – Proposed Vertical and Horizontal Expansion. La Crosse County Landfill. October 22, 2019.
- Wisconsin Department of Natural Resources. September 27, 2004. DRAFT Landfill Needs and Site Life – A Guide for Applicants, DNR Staff and the Public. Madison, WI: DNR Waste Management Program.

Wisconsin Department of Natural Resources. May 10, 2005. Feasibility Determination for the Proposed Horizontal and Vertical Expansion of the La Crosse County Sanitary Landfill (LCSL) and construction of the Non-Contiguous Municipal Solid Waste Incinerator Ash Monofill.

Wisconsin Department of Natural Resources. February 10, 2006. Conditional Plan of Operation Approval for the Proposed Horizontal and Vertical Expansion of the La Crosse County Sanitary Landfill (LCSL) and construction of the Non-Contiguous Municipal Solid Waste Incinerator Ash Monofill.

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Table 5-1
Soil Borings within 300 feet of Proposed Expansion
Vernon County Landfill - Proposed Eastern Expansion

Soil Boring Nomenclature	Year Completed	Drilling Company	Ground Elevation (feet NAVD)	Depth to Saprolite (feet bgs)	Saprolite Elevation (feet NAVD)	Depth to Bedrock (feet bgs)	Bedrock Elevation (feet NAVD)	Total Depth of Boring (feet bgs)	Bottom Elevation of Boring (feet NAVD)
Existing Borings within 300-feet									
MW-3	1987	Ace Well Drilling	1233.0	14.0	1219.0	14.0	1219.0	180.0	1053.0
MW-4/-4P	1987	Ace Well Drilling	1232.9	14.0	1218.9	14.0	1218.9	160.0	1072.9
TB-4	1988	Wisconsin Test Drilling	1232.9	12.0	1220.9	14.5	1218.4	15.0	1217.9
TB-5	1988	Wisconsin Test Drilling	1221.0	22.0	1199.0	NE	NE	25.0	1196.0
TB-6	1988	Wisconsin Test Drilling	1218.7	13.5	1205.2	16.0	1202.7	16.5	1202.2
TB-7	1988	Wisconsin Test Drilling	1245.4	38.0	1207.4	NE	NE	47.5	1197.9
TB-8	1988	Wisconsin Test Drilling	1249.4	42.0	1207.4	45.0	1204.4	45.5	1203.9
MW-5A ⁽¹⁾	1989	Exploration Technology	1224.0	20.0	1204.0	35.0	1189.0	103.0	1121.0
MW-5	1988	Ace Well Drilling	1223.3	20.0	1203.3	35.0	1188.3	180.0	1043.3
MW-6	1988	Ace Well Drilling	1233.0	14.0	1219.0	14.0	1219.0	210.0	1023.0
MW-10	1989	Exploration Technology	1215.6	24.5	1191.1	61.0	1154.6	181.0	1034.6
MW-11	1989	Exploration Technology	1216.4	24.5	1191.9	61.0	1155.4	163.0	1053.4
MW-12	1989	Exploration Technology	1216.4	24.5	1191.9	61.0	1155.4	103.0	1113.4
TB-15	1989	Exploration Technology	1193.5	11.5	1182.0	NE	NE	12.0	1181.5
MW-14/14Z	2003	Traut Hydro Tech	1247.5	NONE	NONE	27.5 ⁽²⁾	1220.0	210.0	1037.5
B-15	2021	Mathy Construction Co	1252.9	NONE	NONE	40.0	1212.9	45.0	1207.9
B-16	2021	Mathy Construction Co	1245.9	NONE	NONE	32.0	1213.9	36.0	1209.9
B-17	2021	Mathy Construction Co	1238.8	NONE	NONE	28.0	1210.8	39.0	1199.8
Borings completed during 2022									
MW-14WT	2022	Braun Intertec	1247.2	28.5	1218.7	30.0	1217.2	109.0	1138.2
MW-15WT	2022	Braun Intertec	1220.6	39.5	1181.1	69.5	1151.1	99.0	1121.6
MW-16WT	2022	Braun Intertec	1184.7	34.5	1150.2	79.5	1105.2	76.0	1108.7
MW-16	2022	Braun Intertec	1184.3	34.5	1149.8	79.5	1104.8	98.0	1086.3
MW-17WT	2022	Braun Intertec	1196.4	11.0	1185.4	65.0	1131.4	93.0	1103.4
B-18	2022	Braun Intertec	1239.0	18.0	1221.0	24.0	1215.0	30.0	1209.0
B-19	2022	Braun Intertec	1233.3	20.0	1213.3	24.0	1209.3	28.0	1205.3
B-20	2022	Braun Intertec	1215.8	20.8	1195.0	24.0	1191.8	30.0	1185.8
B-21	2022	Braun Intertec	1226.1	NE	NE	NE	NE	31.0	1195.1

Notes:

bgs - Below ground surface.

NE - Not encountered.

NONE - No Saprolite present at this location.

(1) - Only page 1 of the soil boring log is available.

(2) - Depth to bedrock on the boring log appears to be skewed due to the Rotasonic drilling method used. The depth to bedrock provided here was determined using surrounding boring logs and geologic cross-section interpretations.

Table 5-2
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Geotechnical Results for the Landfill Property
Vernon County Landfill - Proposed Eastern Expansion

Boring ID	Sample No.	Sample Depth (feet bgs)	USCS Class	Moisture Content (w, %)	Grain-size Distribution					Atterberg Limits			Standard Proctor (ASTM D698)		Modified Proctor (ASTM D1557)		Soil Specific Gravity at 20C	Coefficient of Permeability (cm/sec)	Remolded Permeability (cm/sec)	Consolidated Undrained Test (total cohesion, tsf)	Consolidated Undrained Test (effective cohesion, tsf)	Density (pcf)
					Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	Percent Silt	Percent Clay	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Dry Density (pcf)	Optimum Moisture (%)	Maximum Dry Density (pcf)	Optimum Moisture (%)						
Loess																						
MW-1RZ	S-1	3-6	CL	--	0.0	2.1	97.9	75.3	22.6	34.6	18.7	15.9	--	--	--	--	--	--	--	--	--	
MW-7	S-4	4-5	CL	--	0.0	1.0	99.0	73.0	26.0	--	--	--	--	--	--	--	--	--	--	--	--	
TB-1	1	2-5	CL	--	0.0	3.1	96.9	76.9	20.0	31.5	--	8.6	--	--	--	--	2.44E-07	--	--	--	--	
TP-7	S1-7	1.5-2	CL	--	0.0	0.5	99.5	71.5	28.0	--	--	--	--	--	--	--	--	--	--	--	--	
TB-7	--	2.5-16	CL	--	--	--	100.0	78.0	22.0	32.3	--	12.2	--	--	--	--	--	--	--	--	--	
TB-8	--	2-6.5	CL	--	--	--	100.0	74.0	26.0	37.8	--	14.5	--	--	--	--	--	--	--	--	--	
TB-9	--	1.5-9	CL	--	--	--	100.0	76.0	24.0	25.4	--	8.1	--	--	--	--	--	--	--	--	--	
TB-10	S-2	3-4	CL	--	0.0	1.4	98.6	72.6	26.0	--	--	--	--	--	--	--	--	--	--	--	--	
TP-8	1	3-4	CL	--	--	--	98.3	73.3	25.0	39.6	--	16.8	--	--	--	--	--	--	--	--	116.9	
TP-10	1	2-3	CL	--	--	--	98.7	70.7	27.0	40.0	--	18.1	--	--	--	--	--	--	--	--	--	
TP-11	1	1-2	CL	--	--	--	94.5	67.5	27.0	39.5	--	16.6	--	--	--	--	--	--	--	--	--	
TP-15	1	1-2	CL	--	--	--	99.6	72.6	27.0	41.4	--	16.3	--	--	--	--	--	--	--	--	--	
TP-15	2	3-4	CL	--	--	--	99.6	77.6	22.0	38.3	--	17.0	--	--	--	--	--	--	--	--	--	
TP-20	1	2-3	CL	--	--	--	99.8	73.8	26.0	36.3	--	15.1	--	--	--	--	--	--	--	--	--	
TP-20	2	4-5	CL	--	--	--	99.7	72.7	27.0	41.5	--	18.2	--	--	--	--	--	--	--	--	--	
TP-20	3	8-9	CL	--	--	--	99.7	83.7	16.0	36.5	--	15.1	--	--	--	--	--	--	--	--	--	
TP-21	1	2-3	CL	--	--	--	99.7	69.7	30.0	41.3	--	19.3	--	--	--	--	--	--	--	--	--	
TP-21	2	6-7	CL	--	--	--	99.6	71.6	28.0	37.4	--	15.4	--	--	--	--	--	--	--	--	--	
TP-22	1	3-4	CL	--	--	--	99.8	80.8	19.0	38.8	--	15.6	--	--	--	--	--	--	--	--	--	
TP-25	1	1.5-2.5	CL	--	--	--	98.0	73.0	25.0	38.3	--	15.5	--	--	--	--	--	--	--	--	--	
TP-27	1	1.5-2.5	CL	--	--	--	99.0	72.0	27.0	40.5	--	17.6	--	--	--	--	--	--	--	--	--	
TP-C	1	3-3.5	CL	--	--	--	99.5	73.5	26.0	35.0	--	15.0	--	--	--	--	--	--	--	--	--	
TP-C	2	5-6	CL	--	--	--	99.0	69.0	30.0	43.8	--	20.8	--	--	--	--	--	--	--	--	--	
TP-D	1	3-4	CL	--	--	--	98.9	74.9	24.0	41.1	--	16.2	--	--	--	--	--	--	--	--	--	
Average				--	0.0	1.6	99.0	73.9	25.0	37.7	18.7	15.6	--	--	--	--	--	2.44E-07	--	--	--	116.9
Geometric Mean				--	0.0	1.3	99.0	73.8	24.8	37.4	18.7	15.3	--	--	--	--	--	2.44E-07	--	--	--	116.9
Minimum				--	0.0	0.5	94.5	67.5	16.0	25.4	18.7	8.1	--	--	--	--	--	2.44E-07	--	--	--	116.9
Maximum				--	0.0	3.1	100.0	83.7	30.0	43.8	18.7	20.8	--	--	--	--	--	2.44E-07	--	--	--	116.9
Fine-grained Residuum																						
MW-1RZ	S-7	71-73	CH	--	13.4	26.3	60.3	32.9	27.4	71.3	30.4	40.9	--	--	--	--	--	--	--	--	--	
MW-7	S-16	14-15	CL	--	2.4	23.4	74.2	30.2	44.0	--	--	--	--	--	--	--	--	--	--	--	--	
MW-14Z	S-1	48-50	CH	--	0.9	3.4	95.7	39.7	56.0	91.2	36.2	55.0	--	--	--	--	--	--	--	--	--	
MW-14Z	S-2	66	CL	--	0.6	29.9	69.5	48.1	21.4	32.4	16.5	15.9	--	--	--	--	--	--	--	--	--	
TB-1	4	9.5-10.5	CL	--	--	--	100.0	58.0	42.0	51.8	--	35.2	--	--	--	--	--	--	--	--	--	
TB-3	2 & 3	1.5-6.0	CL	--	--	--	100.0	58.0	42.0	47.1	--	27.9	--	--	--	--	2.34E-08	--	--	--	--	
TB-3	--	8.5-13	CL	--	4.0	37.3	58.7	6.7	52.0	48.5	--	29.8	--	--	--	--	--	--	--	--	--	
TB-4	2	2-4	CL	--	--	--	100.0	50.0	50.0	53.4	--	33.8	--	--	--	--	--	--	--	--	--	
TB-5	--	2-7.5	CL	--	--	--	100.0	31.0	69.0	55.3	--	32.2	--	--	--	--	1.13E-06	--	--	--	--	
TB-6	5 to 7	8-13.5	CL	--	--	--	100.0	53.0	47.0	--	--	--	--	--	--	--	--	--	--	--	--	
TB-10	S-4	14-16	CH	--	0.0	18.4	81.6	27.6	54.0	--	--	--	--	--	--	--	--	--	--	--	--	
TB-11	S-2	5-6	CL	--	0.0	14.3	85.7	60.7	25.0	--	--	--	--	--	--	--	--	--	--	--	--	
TB-11	S-5	20-21	CH	--	0.8	16.6	82.7	44.8	37.9	--	--	--	--	--	--	--	--	--	--	--	--	

Table 5-2
Page 2 of 3
Geotechnical Results for the Landfill Property
Vernon County Landfill - Proposed Eastern Expansion

Boring ID	Sample No.	Sample Depth (feet bgs)	USCS Class	Moisture Content (w. %)	Grain-size Distribution					Atterberg Limits			Standard Proctor (ASTM D698)		Modified Proctor (ASTM D1557)		Soil Specific Gravity at 20C	Coefficient of Permeability (cm/sec)	Remolded Permeability (cm/sec)	Consolidated Undrained Test (total cohesion, tsf)	Consolidated Undrained Test (effective cohesion, tsf)	Density (pcf)
					Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	Percent Silt	Percent Clay	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Dry Density (pcf)	Optimum Moisture (%)	Maximum Dry Density (pcf)	Optimum Moisture (%)						
Fine-grained Residuum																						
TP-7	2	3-4.5	CL	--	--	--	88.6	62.6	26.0	35.0	--	15.2	--	--	--	--	--	--	--	--	--	
TP-7	3	6-8	CH	--	--	--	78.5	28.5	50.0	56.0	--	29.9	--	--	--	--	--	--	--	--	--	
TP-8	2	5-5.5	CL	--	--	--	52.8	26.8	26.0	42.3	--	23.5	--	--	--	--	--	--	--	--	--	
TP-8	3	6-7	CH	--	--	--	95.3	70.3	25.0	54.8	--	29.4	--	--	--	--	--	--	--	--	--	
TP-10	2	6-7	CL	--	--	--	43.5	14.5	29.0	48.9	--	24.3	--	--	--	--	--	--	--	--	--	
TP-10	3	9-10	PT	--	--	--	96.9	28.9	68.0	113.5	--	56.4	--	--	--	--	--	--	--	--	--	
TP-11	2	3.5-4	CL	--	--	--	73.6	31.6	42.0	47.8	--	25.9	--	--	--	--	--	--	--	--	--	
TP-20	4	10-11	CL	--	--	--	61.2	22.2	39.0	45.0	--	23.3	--	--	--	--	--	--	--	--	--	
TP-21	3	8-9	CH	--	--	--	59.8	27.8	32.0	55.5	--	30.8	--	--	--	--	--	--	--	--	--	
TP-22	3	9-10	CL	--	--	--	73.4	37.4	36.0	49.5	--	23.6	--	--	--	--	--	--	--	--	--	
TP-23	1	6.5-10	CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	113.5	
TP-25	2	4-5	CH	--	--	--	78.9	21.9	57.0	63.6	--	35.7	--	--	--	--	--	--	--	--	--	
TP-27	2	4-5	CH	--	--	--	84.0	34.0	50.0	65.0	--	32.6	--	--	--	--	--	--	--	--	--	
TP-A	1	4-5	CH	--	--	--	91.5	37.5	54.0	62.8	--	32.4	--	--	--	--	--	--	--	--	--	
TP-A	2	7-8	CH	--	--	--	78.6	28.6	50.0	58.2	--	31.0	--	--	--	--	--	--	--	--	--	
TP-B	1	3-4	CL	--	--	--	96.4	62.4	34.0	38.9	--	16.4	--	--	--	--	--	--	--	--	--	
TP-B	2	5-6	CL	--	--	--	73.1	34.1	39.0	45.3	--	22.7	--	--	--	--	--	--	--	--	--	
TP-B	3	8-9	CH	--	--	--	84.8	15.8	69.0	63.5	--	32.5	--	--	--	--	--	--	--	--	--	
TP-C	3	7-8	CL	--	--	--	60.9	18.9	42.0	54.2	--	28.7	--	--	--	--	--	--	--	--	--	
B-18	499084	0-2	CL	20	1.1	14.6	84.3	54.0	30.3	38	19	19	--	--	--	--	--	--	--	--	--	
B-18	499085	2-3.5	CH	27	0.0	14.4	85.6	20.4	65.2	64	24	40	--	--	--	--	--	--	--	--	--	
B-18	499086	4.5-6	CH	27	0.0	36.5	63.5	17.7	45.8	51	19	32	--	--	--	--	--	--	--	--	--	
B-18	499090	12-13.5	CH	27	0.0	29.5	70.5	14.2	56.3	72	23	49	--	--	--	--	--	--	--	--	--	
B-18	B-18, 17.0	17-18.5	CH	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	497688, 499091, 522626	0-2	CH	---	0.0	25.5	74.5	30.5	44.0	50	17	33	105.0	19.6	116.7	15.0	2.67	--	5.4E-09	--	--	
B-19	522626	0-2	CH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.1E-09	--	--	
B-19	499092	2-3.5	CH	16	23.7	22.7	53.6	22.1	31.5	52	19	33	--	--	--	--	--	--	--	--	--	
B-19	B-19, 4.5	4.5-6	CH	44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	B-19, 7.0	7-8.5	CH	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	B-19, 9.5	9.5-11	CH	54	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	499093	17-18.5	CH	57	0.0	3.3	96.7	8.4	88.3	105	34	71	--	--	--	--	--	--	--	--	--	
B-19	B-19, 19.5	19.5-21	CH	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	499095, 522628	0-2	CH	---	0.0	35.1	64.9	16.2	48.7	58	16	42	106.0	19.6	--	--	2.66	--	3.0E-07	--	--	
B-20	B-20, 2.0	2-3.5	CL	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 4.5	4.5-6	CL	27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 7.0	7-8.5	CH	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 9.5	9.5-11	CL	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 12.0	12-13.5	CH	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 14.5	14.5-16	CH	46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-20	B-20, 17.0	17-18.5	CH	39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-21	499096, 497689	0-2	CH	---	0.0	25.4	74.6	26.4	48.2	67	19	48	100.0	22.1	112.3	16.1	--	--	--	--	--	
B-21	499098	2-3.5	CH	24	0.0	24.5	75.5	29.3	46.2	50	16	34	--	--	--	--	--	--	--	--	--	
B-21	B-21, 4.5	4.5-6	CH	25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-21	B-21, 7.0	7-8.5	ML	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-21	499099	9.5-11	CL	17	2.9	11.5	85.6	56.6	29.0	36	18	18	--	--	--	--	--	--	--	--	--	

Table 5-2
Page 3 of 3
Geotechnical Results for the Landfill Property
Vernon County Landfill - Proposed Eastern Expansion

Boring ID	Sample No.	Sample Depth (feet bgs)	USCS Class	Moisture Content (w, %)	Grain-size Distribution					Atterberg Limits			Standard Proctor (ASTM D698)		Modified Proctor (ASTM D1557)		Soil Specific Gravity at 20C	Coefficient of Permeability (cm/sec)	Remolded Permeability (cm/sec)	Consolidated Undrained Test (total cohesion, tsf)	Consolidated Undrained Test (effective cohesion, tsf)	Density (pcf)
					Percent Gravel	Percent Sand	Percent Passing No. 200 Sieve	Percent Silt	Percent Clay	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Dry Density (pcf)	Optimum Moisture (%)	Maximum Dry Density (pcf)	Optimum Moisture (%)						
Fine-grained Residuum																						
B-21	499100	12-13.5	CL	19	0.0	6.2	93.8	65.2	28.6	36	22	14	--	--	--	--	--	--	--	--	--	
B-21	B-21, 14.5	14.5-16	CL	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-21	499101	17-18.5	CL	18	0.0	11.6	88.4	58.8	29.6	36	18	18	--	--	--	--	--	--	--	--	--	
B-21	499102	19.5-21	CL	19	0.0	4.9	95.1	63.6	31.5	40	19	21	--	--	--	--	--	--	--	--	--	
B-21	B-21, 24.5	24.5-26	CL	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-21	499104	29.5-31	CL	18	0.0	1.4	98.6	72.7	25.9	33	20	13	--	--	--	--	--	--	--	--	--	
MW-14WT	499074	7-8.5	CH	37	0.0	32.0	68.0	9.8	58.2	64	22	42	--	--	--	--	--	--	--	--	--	
MW-14WT	498838	26-28.5	CL	25	--	--	--	--	--	--	--	--	--	--	--	--	3.1E-08	--	--	--	101.2	
MW-15WT	499075	17-18.5	CH	46	0.0	2.6	97.4	7.5	89.9	109	36	73	--	--	--	--	--	--	--	--	--	
MW-16	MW-16, 7-9	7-9	CL	--	--	--	--	--	--	43	22	21	--	--	--	--	--	--	0.9366	0.2976	--	
MW-16	499076, 498836	9.5-11.5	CL	24	0.0	3.9	96.1	66.0	30.1	37	21	16	--	--	--	--	3.0E-08	--	--	--	103.3	
Average				29.3	1.9	18.3	80.5	36.4	44.1	55.4	22.1	31.6	103.7	20.4	114.5	15.6	2.67	3.04E-07	1.04E-07	0.9366	0.2976	106.0
Geometric Mean				26.8	2.5	13.3	79.0	31.1	41.6	52.8	21.4	29.1	103.6	20.4	114.5	15.5	2.66	7.04E-08	2.15E-08	0.9366	0.2976	105.9
Minimum				15.0	0.0	1.4	43.5	6.7	21.4	32.4	16.0	13.0	100.0	19.6	112.3	15.0	2.66	2.34E-08	5.40E-09	0.9366	0.2976	101.2
Maximum				57.0	23.7	37.3	100.0	72.7	89.9	113.5	36.2	73.0	106.0	22.1	116.7	16.1	2.67	1.13E-06	3.00E-07	0.9366	0.2976	113.5
Coarse-grained Residuum																						
MW-1RZ	S-2	13-15	SC	--	1.1	65.0	33.9	19.4	14.4	24.1	10.7	13.4	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-3	15-20	SM	--	0.0	77.4	22.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-4	33-34	SM	--	10.2	68.0	21.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-5	49-50	SC	--	6.9	57.9	35.2	17.3	18.0	40.1	17.6	22.5	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-6	58-60	GM	--	49.6	30.7	19.7	10.6	9.1	--	--	--	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-8	76-78	SM	--	2.3	51.4	46.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-9	86-88	SP-SM	--	0.9	87.8	11.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-1RZ	S-10	88-90	SP-SM	--	67.7	21.1	11.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-14Z	S-3	76-78	SM	--	12.5	66.8	20.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TB-1	5	10.5-12	SC	--	0.0	55.4	44.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TB-1	--	12-13	SC	--	0.0	50.6	49.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TB-4	--	7-8	SC	--	6.7	74.5	18.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TB-5	--	7.5-10	SC	--	0.2	63.2	36.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TB-8	--	6.5-12	SC	--	0.5	81.3	18.2	9.2	9.0	--	--	--	--	--	--	--	1.35E-02	--	--	--	--	
TB-8	--	14-22	SC	--	10.2	51.9	37.9	--	--	--	--	--	--	--	--	--	2.96E-07	--	--	--	--	
TB-9	--	10-22	SM	--	1.7	86.2	12.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TP-11	3	6-7	SC	--	--	--	33.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TP-15	3	8-9	SC	--	--	--	29.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
TP-27	3	7-9	SC	--	--	--	32.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-18	B-18, 7.0	7-8.5	SP	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-18	499088	9.5-11	SC	15	0.0	58.6	41.4	8.9	32.5	39	15	24	--	--	--	--	--	--	--	--	--	
B-18	B-18, 14.5	14.5-16	SC	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	B-19, 12.0	12-13.5	GC	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
B-19	B-19, 14.5	14.5-16	GC	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-16	499077	24.5-26	SC	18	0.0	62.1	37.9	11.4	26.5	41	17	24	--	--	--	--	--	--	--	--	--	
MW-17WT	499079	4.5-6	SC	20	12.7	44.6	42.7	7.8	34.9	59	19	40	--	--	--	--	--	--	--	--	--	
MW-17WT	499080	7-8.5	SC	17	8.9	47.7	43.4	13.4	30.0	39	12	27	--	--	--	--	--	--	--	--	--	
MW-17WT	499082	9.5-11	SC	16	0.0	51.9	48.1	14.2	33.9	41	12	29	--	--	--	--	--	--	--	--	--	
Average				21.0	9.1	59.7	31.2	12.5	23.1	40.5	14.8	25.7	--	--	--	--	--	6.75E-03	--	--	--	--
Geometric Mean				19.4	4.6	57.0	28.4	11.9	20.5	39.3	14.4	24.6	--	--	--	--	--	6.32E-05	--	--	--	--
Minimum				10.0	0.0	21.1	11.2	7.8	9.0	24.1	10.7	13.4	--	--	--	--	--	2.96E-07	--	--	--	--
Maximum				40.0	67.7	87.8	49.4	19.4	34.9	59.0	19.0	40.0	--	--	--	--	--	1.35E-02	--	--	--	--

Notes:
bgs - Below ground surface.
-- - Information not analyzed or not available.

Table 5-3
Summary of Monitoring Wells and Piezometers within 300 feet of Proposed Expansion
Vernon County Landfill - Proposed Eastern Expansion

WDNR Point ID Number	Well Name	Date Installed	Ground Elevation (feet NAVD)	Top of Casing Elevation (feet NAVD)	Well Depth (feet bgs)	Screen Length (feet)	Screen Interval Elevation (feet NAVD)	Monitoring Point	Geologic Description of Screened Interval
Monitoring Wells and Piezometers Inside Expansion Footprint									
109	MW-5A	11/8/1989	1224.0	1225.81	103.3	15.0	1120.7 - 1135.7	Perched Water Table	dolomite, hard
108	MW-5	2/17/1988	1223.3	1225.32	150.6	10.0	1072.7 - 1082.7	Regional Water Table	dolomite, hard
119	MW-14Z	3/7/2003	1247.5	1250.22	210.8	5.0	1036.7 - 1041.7	Piezometer, Lower Zone	silty dolomitic sandstone
Monitoring Wells and Piezometers Within 150-feet									
118	MW-14	3/12/2003	1247.5	1249.69	186.1	15.0	1061.4 - 1076.4	Regional Water Table	fractured dolomite and sandy dolomite
125	MW-14WT	9/20/2022	1247.2	1249.70	106.0	15.0	1141.2 - 1156.2	Perched Water Table	Dolostone
127	MW-15WT	9/28/2022	1220.6	1223.24	85.0	10.0	1135.6 - 1145.6	Perched Water Table	Sandy Dolostone
129	MW-16WT	9/21/2022	1184.7	1187.41	75.0	10.0	1109.7 - 1119.7	Perched Water Table	Sandy Dolostone to Shale
131	MW-16	8/25/2022	1184.3	1186.92	97.0	5.0	1087.3 - 1092.3	Piezometer/Undefined	Sandy Dolostone
133	MW-17WT	9/26/2022	1196.4	1199.18	92.0	10.0	1104.4 - 1114.4	Perched Water Table	Weathered Sandstone
Monitoring Wells and Piezometers Within 300-feet									
105	MW-3	2/2/1988	1233.0	1235.25	180.0	5.0	1053.0 - 1058.0	Piezometer, Upper Zone	dolomite, hard
107	MW-4P	1/29/1988	1232.9	1235.19	95.0	10.0	1137.9 - 1147.9	Perched Water Table	dolomite, hard
110	MW-6	2/20/1988	1233.0	1235.37	202.2	5.0	1030.8 - 1035.8	Piezometer, Lower Zone	sandy dolomite
114	MW-10	9/15/1989	1215.6	1217.52	183.5	5.0	1032.1 - 1037.1	Piezometer, Lower Zone	dolomitic sandstone to sandy dolomite
115	MW-11	9/29/1989	1216.4	1218.56	162.5	15.0	1053.9 - 1068.9	Piezometer, Upper Zone	sandy dolomite to dolomitic sandstone
116	MW-12	9/22/1989	1216.4	1218.36	98.5	15.0	1117.9 - 1132.9	Perched Water Table	dolomite with occasional small vugs

Notes:
bgs - Below ground surface.

Table 5-4
Existing Static Water Elevations for Landfill Property (2018-2023)
Vernon County Landfill - Proposed Eastern Expansion

WDNR Point ID Number	Well Name	Date Installed	Ground Elevation (feet NAVD)	Top of Casing Elevation (feet NAVD)	Well Depth (feet bgs)	Screen Length (feet)	Screen Interval Elevation (feet NAVD)	Well Type/ Groundwater Zone	Static Water Elevation by Date (feet NAVD)															
									3/14/2018	9/10/2018	3/11/2019	9/9/2019	3/9/2020	9/14/2020	3/1/2021	9/1/2021	3/1/2022	9/22/2022	12/20/2022	1/24/2023	3/1/2023	3/27/2023	4/28/2023	5/30/2023
102	MW-1P	12/30/1987	1236.4	1238.41	111.1	10.0	1125.4 - 1135.4	Perched Water Table	1132.01	1132.07	1132.55	1133.01	1132.6	1132.56	1131.67	1131.76	1131.42	1130.90	1130.02	1131.71	1131.70	1131.59	1131.98	1132.64
101	MW-1	12/30/1987	1236.4	1238.11	158.0	10.0	1078.5 - 1088.5	Regional Water Table	1098.79	1099.2	1103.13	1104.78	1103.09	1102.14	1096.58	1093.67	1091.85	1089.95	1089.70	1089.62	1089.62	1090.36	1092.19	1094.43
121	MW-1PR	1/12/1994	1245.0	1247.61	127.7	15.0	1119.9 - 1134.9	Perched Water Table	1134.86	1134.79	1135.15	1135.67	1135.4	1135.22	1134.80	1134.34	1134.23	1133.50	1134.07	1134.04	1134.22	1134.14	1134.72	1134.97
120	MW-1R	1/12/1994	1244.6	1247.25	164.6	15.0	1082.6 - 1097.6	Regional Water Table	1098.69	1099.14	1103.04	1104.59	1102.97	1102.03	1096.50	1093.58	1091.81	1089.95	1090.85	1090.60	1089.61	1090.36	1092.13	1094.46
123	MW-1R2	3/12/2003	1244.0	1245.45	186.5	5.0	1057.5 - 1062.5	Piezometer, Upper Zone	1098.3	1098.75	1102.6	1104.2	1102.54	1101.58	1096.12	1093.19	1091.28	1089.51	1088.33	1089.11	1089.15	1089.84	1090.72	1093.86
104	MW-2P	1/17/1988	1252.5	1254.88	124.8	10.0	1128.0 - 1138.0	Perched Water Table	1139.82	1140.34	1140.64	1141.85	1141.03	1140.76	1139.87	1139.39	1139.33	1138.79	1138.81	1138.45	1139.36	1139.24	1139.98	1141.11
103	MW-2	1/17/1988	1252.5	1254.35	174.6	10.0	1078.3 - 1088.3	Regional Water Table	1092.72	1092.53	1095.31	1096.67	1095.32	1094.86	1091.56	1089.58	1087.79	1085.92	1086.19	1085.23	1086.01	1086.60	1087.51	1090.35
105	MW-3	2/2/1988	1233.0	1235.25	180.0	5.0	1053.2 - 1058.2	Piezometer, Upper Zone	1077.49	1077.22	1080.8	1082.59	1080.42	1080.22	1076.06	1073.14	1070.69	1069.14	1068.69	1068.66	1068.69	1069.06	1069.19	1071.08
107	MW-4P	1/29/1988	1232.9	1235.19	95.0	10.0	1138.3 - 1148.3	Perched Water Table	1149.04	1150.85	1151.66	1153.37	1150.88	1151.96	1149.32	1149.32	1148.16	1148.92	1147.07	1146.72	1148.30	1148.18	1148.24	1151.19
109	MW-5A	11/8/1989	1224.0	1225.81	103.3	15.0	1122.9 - 1137.9	Perched Water Table	1136.26	1136.54	1137.88	1139.73	1137.72	1138.27	1136.34	1135.86	1135.52	1135.74	1134.78	1134.27	1134.29	1135.12	1135.58	1136.90
108	MW-5	2/17/1988	1223.3	1225.32	150.6	10.0	1072.6 - 1082.6	Regional Water Table	1083.51	1083.69	1086.30	1087.23	1085.93	1086.23	1084.59	1084.36	1083.94	1084.05	1081.46	1082.51	1082.60	1083.14	1083.50	1086.28
110	MW-6	1/12/1900	1233.0	1235.37	202.2	5.0	1025.7 - 1030.7	Piezometer, Lower Zone	1070.54	1071.89	1073.9	1075.63	1073.88	1073.53	1069.39	1067.35	1065.30	1063.84	1062.81	1062.48	1062.35	1062.48	1062.25	1063.27
111	MW-7	11/7/1989	1255.7	1258.03	234.5	5.0	1023.5 - 1028.5	Piezometer, Lower Zone	1076.09	1077.19	1079.32	1080.77	1079.32	1078.89	1074.92	1072.83	1070.92	1069.39	1069.50	1068.20	1069.34	1074.93	1069.71	1070.14
112	MW-8R	11/13/1989	1256.1	1258.84	202.5	15.0	1056.3 - 1071.3	Piezometer, Upper Zone	1084.56	1084.3	1087.91	1088.96	1087.42	1086.93	1082.78	1079.31	1077.00	1075.30	1076.74	1075.12	1075.04	1075.74	1076.15	1079.52
113	MW-9	8/29/1989	1255.4	1257.50	126.8	15.0	1130.7 - 1145.7	Perched Water Table	1140.24	1140.36	1141.06	1142.21	1140.92	1141.14	1140.16	1139.74	1139.22	1138.73	1139.07	1139.25	1139.35	1139.24	1139.13	1139.79
114	MW-10	9/15/1989	1215.6	1217.52	183.5	5.0	1034.0 - 1039.0	Piezometer, Lower Zone	1092.78	1092.99	1097.75	1099.58	1098.09	1096.89	1090.39	1086.65	1084.18	1082.08	1083.12	1081.66	1080.14	1082.75	1081.73	1086.63
115	MW-11	9/29/1989	1216.4	1218.56	162.5	15.0	1056.0 - 1071.0	Piezometer, Upper Zone	1097.89	1095.62	1102.91	1104.98	1100.85	1102.01	1093.69	1089.81	1089.22	1085.59	1086.25	1086.73	1086.75	1087.68	1090.31	1092.04
116	MW-12	9/22/1989	1216.4	1218.36	98.5	15.0	1119.9 - 1134.9	Perched Water Table	1130.62	1131.75	1132.41	1134.17	1132.29	1132.13	1130.62	1130.50	1129.69	1130.45	1128.48	1130.17	1130.87	1131.77	1133.62	1133.71
117	MW-13P	2/26/2003	1224.5	1227.42	102.4	15.0	1122.1 - 1137.1	Perched Water Table	1134.05	1134.08	1134.44	1134.98	1134.6	1134.56	1134.00	1133.64	1133.46	1132.81	1133.40	1133.40	1133.21	1133.60	1134.40	1134.33
125	MW-14WT	9/20/2022	1247.2	1249.70	106.0	15.0	1141.2 - 1156.2	Perched Water Table	--	--	--	--	--	--	--	--	--	--	1141.87	1146.01	1145.92	1146.67	1146.77	1146.98
118	MW-14	3/12/2003	1247.5	1249.69	186.1	15.0	1061.4 - 1076.4	Regional Water Table	1083.05	1082.42	1086.86	1087.89	1086.34	1086.00	1081.36	1077.76	1075.24	1073.32	1073.63	1072.80	1072.54	1073.44	1073.91	1077.46
119	MW-14Z	3/7/2003	1247.5	1250.22	210.8	5.0	1036.7 - 1041.7	Piezometer, Lower Zone	1080.29	1078.48	1083.98	1082.36	1082.78	1083.11	1078.69	1073.19	1072.26	1071.89	1071.20	1071.17	1071.09	1071.30	1071.96	1072.58
127	MW-15WT	9/28/2022	1220.6	1223.24	85.0	10.0	1135.6 - 1145.6	Perched Water Table	--	--	--	--	--	--	--	--	--	--	DRY	DRY	DRY	DRY	DRY	DRY
129	MW-16WT	9/21/2022	1184.7	1187.41	75.0	10.0	1109.7 - 1119.7	Perched Water Table	--	--	--	--	--	--	--	--	--	--	DRY	DRY	DRY	DRY	DRY	DRY
131	MW-16	8/25/2022	1184.3	1186.92	97.0	5.0	1087.3 - 1092.3	Piezometer/Undefined	--	--	--	--	--	--	--	--	--	--	1093.09*	1101.68	1102.48	1104.29	1104.38	1107.62
133	MW-17WT	9/26/2022	1196.4	1199.18	92.0	10.0	1104.4 - 1114.4	Perched Water Table	--	--	--	--	--	--	--	--	--	--	1116.64	1117.78	FROZEN	1121.62	1124.88	1122.04

Notes:
bgs - Below ground surface.
NM - Not measured.
-- - Data not available due to monitoring point not yet installed.
* - Groundwater elevation not representative due to well still stabilizing post-well development.
BOLD -Monitoring well or piezometer used in monitoring of the proposed landfill expansion area.

Table 5-5
In-Field Hydraulic Conductivity Testing for the Landfill Property
Vernon County Landfill - Proposed Eastern Expansion

Well Name	Screen Interval Elevation (feet NAVD)	Well Type/ Groundwater Zone	Geologic Description of Screened Interval	Year Completed	Method	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)
Perched Water Table Wells							
MW-1PR	1119.9 - 1134.9	Perched Water Table	sandy dolostone to dolomitic sandstone	2003	Bouwer-Rice	5.97E-03	16.93
MW-2P	1128.0 - 1138.0	Perched Water Table	dolostone, hard	2023	Bouwer-Rice	1.64E-03	4.64
MW-4P	1138.3 - 1148.3	Perched Water Table	dolostone, hard	2003	Bouwer-Rice	5.93E-03	16.82
MW-5A	1122.9 - 1137.9	Perched Water Table	dolostone, hard	1989	NA	3.64E-04	1.03
MW-9	1130.7 - 1145.7	Perched Water Table	dolostone with occasional small vugs	2003	Bouwer-Rice	1.18E-02	33.54
MW-12	1119.9 - 1134.9	Perched Water Table	dolostone with occasional small vugs	2023	Bouwer-Rice	1.18E-03	3.34
MW-13P	1122.1 - 1137.1	Perched Water Table	dolostone with occasional small vugs	2003	Bouwer-Rice	3.28E-03	9.29
MW-14WT	1141.2 - 1156.2	Perched Water Table	dolostone	2023	Bouwer-Rice	9.94E-03	28.18
MW-17WT	1104.4 - 1114.4	Perched Water Table	clayey sandstone	2023	Bouwer-Rice	2.43E-05	0.07
Average						4.46E-03	12.65
Geometric Mean						1.83E-03	5.20
Minimum						2.43E-05	0.07
Maximum						1.18E-02	33.54
Regional Water Table Wells							
MW-1	1078.5 - 1088.5	Regional Water Table	dolostone, hard	1988	NA	1.86E-04	0.53
MW-1R	1082.6 - 1097.6	Regional Water Table	dolostone, hard	2023	Bouwer-Rice	6.67E-02	189.18
MW-2	1078.3 - 1088.3	Regional Water Table	dolostone, hard	1988	NA	4.63E-04	1.31
MW-5	1072.6 - 1082.6	Regional Water Table	dolostone, hard	1988	NA	2.62E-04	0.74
MW-14	1061.4 - 1076.4	Regional Water Table	fractured dolostone and sandy dolostone	2003	Bouwer-Rice	1.39E-02	39.48
Average						1.63E-02	46.25
Geometric Mean						1.84E-03	5.21
Minimum						1.86E-04	0.53
Maximum						6.67E-02	189.18
Piezometers							
MW-1RZ	1057.5 - 1062.5	Piezometer, Upper Zone	sandy dolostone to dolomitic sandstone	2003	Bouwer-Rice	3.07E-02	87.11
MW-3	1053.2 - 1058.2	Piezometer, Upper Zone	dolostone, hard	2003	Bouwer-Rice	1.67E-03	4.73
MW-6	1025.7 - 1030.7	Piezometer, Lower Zone	sandy dolostone	2003	Bouwer-Rice	1.59E-03	4.51
MW-7	1023.5 - 1028.5	Piezometer, Lower Zone	sandy dolostone with sandstone and shale interbeds	2003	Bouwer-Rice	1.05E-02	29.81
MW-8R	1056.3 - 1071.3	Piezometer, Upper Zone	sandy dolostone with sandstone interbeds	2003	Bouwer-Rice	3.19E-03	9.05
MW-10	1034.0 - 1039.0	Piezometer, Lower Zone	dolomitic sandstone to sandy dolostone	2003	Bouwer-Rice	2.01E-03	5.71
MW-11	1056.0 - 1071.0	Piezometer, Upper Zone	sandy dolostone to dolomitic sandstone	2003	Bouwer-Rice	2.19E-04	0.62
MW-14Z	1036.7 - 1041.7	Piezometer, Lower Zone	silty dolomitic sandstone	2003	Bouwer-Rice	1.18E-03	3.34
MW-16	1087.3 - 1092.3	Piezometer/Undefined	sandy dolostone	2023	Bouwer-Rice	3.71E-04	1.05
Average						5.72E-03	16.21
Geometric Mean						2.01E-03	5.69
Minimum						2.19E-04	0.62
Maximum						3.07E-02	87.11
Summary of All Hydraulic Conductivity Values							
Average						7.53E-03	21.35
Geometric Mean						1.90E-03	5.39
Minimum						2.43E-05	0.07
Maximum						6.67E-02	189.18

Notes:
cm/sec - centimeters per second.
ft/day - feet per day.
NA - Not available due to no description present on soil boring log.

Table 5-6
Vertical Hydraulic Gradients
Vernon County Landfill - Proposed Eastern Expansion

Well Name	TOC Elevation (feet NAVD)	Ground Elevation (feet NAVD)	Screen Bottom Elevation (feet NAVD)	Screen Top Elevation (feet NAVD)	Screen Interval Elevation (feet NAVD)	Vertical Gradient by Date																Average	Direction
						3/14/2018	9/10/2018	3/11/2019	9/9/2019	3/9/2020	9/14/2020	3/1/2021	9/1/2021	3/1/2022	9/22/2022	12/20/2022	1/24/2023	3/1/2023	3/27/2023	4/28/2023	5/30/2023		
Perched Water Table vs Regional Water Table																							
MW-1P	1238.41	1236.4	1125.4	1135.4	1125.4 - 1135.4	33.220	32.870	29.420	28.230	29.510	30.420	35.090	38.090	39.570	40.950	40.320	42.090	42.080	41.230	39.790	38.210		
MW-1	1238.11	1236.4	1078.5	1088.5	1078.5 - 1088.5	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900	46.900		
MW-1P/MW-1						0.708	0.701	0.627	0.602	0.629	0.649	0.748	0.812	0.844	0.873	0.860	0.897	0.897	0.879	0.848	0.815	0.774	Downward
MW-1PR	1247.61	1245.0	1119.9	1134.9	1119.9 - 1134.9	36.170	35.650	32.110	31.080	32.430	33.190	38.300	40.760	42.420	43.550	43.220	43.440	44.610	43.780	42.590	40.510		
MW-1R	1247.25	1244.6	1082.6	1097.6	1082.6 - 1097.6	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300	37.300		
MW-1PR/MW-1R						0.970	0.956	0.861	0.833	0.869	0.890	1.027	1.093	1.137	1.168	1.159	1.165	1.196	1.174	1.142	1.086	1.045	Downward
MW-2P	1254.88	1252.5	1128.0	1138.0	1128 - 1138	47.100	47.810	45.330	45.180	45.710	45.900	48.310	49.810	51.540	52.870	52.620	53.220	53.350	52.640	52.470	50.760		
MW-2	1254.35	1252.5	1078.3	1088.3	1078.3 - 1088.3	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700	49.700		
MW-2P/MW-2						0.912	0.912	0.912	0.909	0.920	0.924	0.972	1.002	1.037	1.064	1.059	1.071	1.073	1.059	1.056	1.021	0.994	Downward
MW-5A	1225.81	1224.0	1122.9	1137.9	1122.9 - 1137.9	52.750	52.850	51.580	52.500	51.790	52.040	51.750	51.500	51.580	51.690	53.320	51.760	51.690	51.980	52.080	50.620		
MW-5	1225.32	1223.3	1072.6	1082.6	1072.6 - 1082.6	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800	52.800		
MW-5A/MW-5						0.999	1.001	0.977	0.994	0.981	0.986	0.980	0.975	0.977	0.979	1.010	0.980	0.979	0.984	0.986	0.959	0.984	Downward
Regional Water Table vs Piezometer																							
MW-1R	1247.25	1244.6	1082.6	1097.6	1082.6 - 1097.6	0.390	0.390	0.440	0.390	0.430	0.450	0.380	0.390	0.530	0.440	2.520	1.490	0.460	0.520	1.410	0.600		
MW-1RZ	1245.45	1244.0	1057.5	1062.5	1057.5 - 1062.5	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100	30.100		
MW-1R/MW-1RZ						0.013	0.013	0.015	0.013	0.014	0.015	0.013	0.013	0.018	0.015	0.084	0.050	0.015	0.017	0.047	0.020	0.023	Downward
MW-14	1249.69	1247.5	1061.4	1076.4	1061.4 - 1076.4	2.760	3.940	2.880	5.530	3.560	2.890	2.670	4.570	2.980	1.430	2.430	1.630	1.450	2.140	1.950	4.880		
MW-14Z	1250.22	1247.5	1036.7	1041.7	1036.7 - 1041.7	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700	29.700		
MW-14/MW-14Z						0.093	0.133	0.097	0.186	0.120	0.097	0.090	0.154	0.100	0.048	0.082	0.055	0.049	0.072	0.066	0.164	0.100	Downward
Upper Piezometer vs Lower Piezometer																							
MW-3	1235.25	1233.0	1053.2	1058.2	1053.2 - 1058.2	6.950	5.330	6.900	6.960	6.540	6.690	6.670	5.790	5.390	5.300	5.880	6.180	6.340	6.580	6.940	7.810		
MW-6	1235.37	1233.0	1025.7	1030.7	1025.7 - 1030.7	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500	27.500		
MW-3/MW-6						0.253	0.194	0.251	0.253	0.238	0.243	0.243	0.211	0.196	0.193	0.214	0.225	0.231	0.239	0.252	0.284	0.232	Downward
MW-8R	1258.84	1256.1	1056.3	1071.3	1056.3 - 1071.3	8.470	7.110	8.590	8.190	8.100	8.040	7.860	6.480	6.080	5.910	7.240	6.920	5.700	0.810	6.440	9.380		
MW-7	1258.03	1255.7	1023.5	1028.5	1023.5 - 1028.5	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800	37.800		
MW-8R/MW-7						0.224	0.188	0.227	0.217	0.214	0.213	0.208	0.171	0.161	0.156	0.192	0.183	0.151	0.021	0.170	0.248	0.184	Downward
MW-11	1218.56	1216.4	1056.0	1071.0	1056 - 1071	5.110	2.630	5.160	5.400	2.760	5.120	3.300	3.160	5.040	3.510	3.130	5.070	6.610	4.930	8.580	5.410		
MW-10	1217.52	1215.6	1034.0	1039.0	1034 - 1039	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000		
MW-11/MW-10						0.189	0.097	0.191	0.200	0.102	0.190	0.122	0.117	0.187	0.130	0.116	0.188	0.245	0.183	0.318	0.200	0.173	Downward

Notes:
 ** - Well or piezometer was installed during 2022
 -- - Data not available.

Table 5-7
Existing NR140 Exemptions for Public Health/Public Welfare Parameters
Vernon County Landfill - Proposed Eastern Expansion

Parameter	Well ID	Public Health (NR140.10)		Public Welfare (NR140.12)	
		ES	PAL	ES	PAL
Iron	MW-1PR			X	
	MW-1R				X
	MW-3			X	
	MW-5A			X	
	MW-7			X	
	MW-9			X	
	MW-12			X	
	P-1			X	
Fluoride	MW-2		X		
	MW-2P		X		
	MW-3		X		
	MW-4P		X		
	MW-5A		X		
	MW-6		X		
	MW-8R		X		
	MW-11		X		
	MW-12		X		
Manganese	MW-14		X		
Nitrate+Nitrite (as N)	MW-1RZ		X		
	MW-13P		X		
	MW-14		X		
	MW-14Z	X			

Notes:

ES - Enforcement Standard.
PAL - Preventative Action Limit.

Table 5-8
Proposed NR140 Exemptions for Public Health/Public Welfare Parameters
Vernon County Landfill - Proposed Eastern Expansion

Parameter	Well ID	Public Health (NR140.10)		Public Welfare (NR140.12)	
		ES	PAL	ES	PAL
Arsenic	MW-14WT		X		
Manganese	MW-14WT	X			
Nitrate+Nitrite (as N)	MW-6		X		

Notes:

ES - Enforcement Standard.

PAL - Preventative Action Limit.

Table 6-1
Waste Characterization
Vernon County Landfill - Proposed Eastern Expansion

Year	WDNR Waste Category										Total
	Category 1		Category 5		Category 19		Category 25		Category 28		
	Municipal Solid Waste		POTW Sludges		Fee Exempt Waste Used for Daily Cover		Construction & Demolition Waste		Waste Generated by Natural Disaster		
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	
2018	12,337	69.4%	83	0.5%	283	1.6%	3,295	18.5%	1,784	10.0%	17,782
2019	18,897	93.6%	0	0.0%	0	0.0%	1,290	6.4%	0	0.0%	20,187
2020	19,817	94.7%	0	0.0%	0	0.0%	1,119	5.3%	0	0.0%	20,936
2021	17,706	96.2%	0	0.0%	0	0.0%	691	3.8%	0	0.0%	18,397
2022	16,266	93.9%	0	0.0%	136	0.8%	925	5.3%	0	0.0%	17,327
Average (Last 5 Years)	17,005	89.6%	17	0.1%	84	0.5%	1,464	7.9%	357	2.0%	18,926

Notes:

1. Waste tonnage data obtained from WDNR annual tonnage reports (<https://dnr.wisconsin.gov/topic/Landfills/Fees.html>).
2. Other WDNR waste categories which had zero tonnage for the previous 5 years are excluded from the table for clarity.

Table 6-2
Page 1 of 3
Leachate Characterization
Vernon County Landfill - Proposed Eastern Expansion

Analytical Parameter	Active Landfill ⁽¹⁾ License No. 3268
Volatile Organic Compounds	
1,1,1,2-Tetrachloroethane (Ug/L)	ND
1,1,1-Trichloroethane (Ug/L)	ND
1,1,2,2-Tetrachloroethane (Ug/L)	ND
1,1,2-Trichloroethane (Ug/L)	ND
1,1-Dichloroethane (Ug/L)	ND
1,1-Dichloroethylene (Ug/L)	ND
1,1-Dichloropropene (Ug/L)	ND
1,2,3-Trichlorobenzene (Ug/L)	ND
1,2,3-Trichloropropane (Ug/L)	ND
1,2,4,5-Tetrachlorobenzene (Ug/L)	ND
1,2,4-Trichlorobenzene (Ug/L)	ND
1,2,4-Trimethylbenzene (Ug/L)	ND - 6.3
1,2-Dibromo-3-Chloropropane (Ug/L)	ND
1,2-Dibromoethane(Edb) (Ug/L)	ND
1,2-Dichloroethane (Ug/L)	ND
1,2-Dichloropropane (Ug/L)	ND
1,2-Diphenylhydrazine (Ug/L)	ND
1,3,5-Trimethylbenzene (Ug/L)	ND
1,3-Dichloropropane (Ug/L)	ND
1-Methylnaphthalene (Ug/L)	ND - 8.3
2,2-Dichloropropane (Ug/L)	ND
2,3,4,6-Tetrachlorophenol (Ug/L)	ND
2,4,5-Trichlorophenol (Ug/L)	ND
2,4,6-Trichlorophenol (Ug/L)	ND
2,4-Dichlorophenol (Ug/L)	ND
2,4-Dimethylphenol (Ug/L)	ND
2,4-Dinitrophenol (Ug/L)	ND
2,4-Dinitrotoluene (Ug/L)	ND
2,6-Dichlorophenol (Ug/L)	ND
2,6-Dinitrotoluene (Ug/L)	ND
2-Chloronaphthalene (Ug/L)	ND
2-Chlorophenol (Ug/L)	ND
2-Hexanone (Ug/L)	ND - 110
2-Methylnaphthalene (Ug/L)	ND - 0.51
2-Nitroaniline (Ug/L)	ND
2-Nitrophenol (Ug/L)	ND
3,3'-Dichlorobenzidine (Ug/L)	ND
3-Nitroaniline (Ug/L)	ND
4,6-Dinitro-O-Cresol (Ug/L)	ND
4-Bromophenyl Phenyl Ether L (Ug/L)	ND
4-Chlorophenylphenyl Ether (Ug/L)	ND
4-Methyl-2-Pentanone(Mibk) (Ug/L)	ND
4-Nitroaniline (Ug/L)	ND
4-Nitrophenol (Ug/L)	ND
Acenaphthene (Ug/L)	ND
Acenaphthylene (Ug/L)	ND
Acetone (Ug/L)	ND - 720
Acetophenone (Ug/L)	ND - 0.88
Aniline (Ug/L)	ND
Anthracene (Ug/L)	ND
Benz(A)Anthracene (Ug/L)	ND
Benzene (Ug/L)	ND - 5.7
Benzidine (Ug/L)	ND
Benzo(A)Pyrene (Ug/L)	ND
Benzo(B)Fluoranthene (Ug/L)	ND
Benzo(Ghi)Perylene (Ug/L)	ND
Benzo(K)Fluoranthene (Ug/L)	ND
Benzyl Alcohol (Ug/L)	ND
Bis(2-Chloroethoxy) Methane (Ug/L)	ND
Bis(2-Chloroethyl) Ether (Ug/L)	ND
Bis(2-Chloroisopropyl) Ether (Ug/L)	ND
Bis(2-Ethylhexyl) Phthalate (Ug/L)	ND - 1.1
Bromobenzene (Ug/L)	ND
Bromochloromethane (Ug/L)	ND
Bromodichloromethane (Ug/L)	ND
Bromomethane (Ug/L)	ND - 9.2
Butyl Benzyl Phthalate (Ug/L)	ND

Table 6-2
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Leachate Characterization
Vernon County Landfill - Proposed Eastern Expansion

Analytical Parameter	Active Landfill ⁽¹⁾ License No. 3268
Volatile Organic Compounds Continued	
Butylbenzene, N- (Ug/L)	ND
Butylbenzene, Sec- (Ug/L)	ND
Butylbenzene, Tert- (Ug/L)	ND
Carbazole (Ug/L)	ND - 1.5
Carbon Disulfide (Ug/L)	ND
Carbon Tetrachloride (Ug/L)	ND
Chlorobenzene (Ug/L)	ND - 7.2
Chloroethane (Ug/L)	ND
Chloroform (Ug/L)	ND
Chloromethane (Ug/L)	ND
Chrysene (Ug/L)	ND
Cis-1,2-Dichloroethene (Ug/L)	ND
Cis-1,3-Dichloropropene (Ug/L)	ND
Cresol, M & P-, (Ug/L)	ND - 73
Dibenz(A,H)Anthracene (Ug/L)	ND
Dibenzofuran (Ug/L)	ND
Dibromochloromethane (Ug/L)	ND
Dibromomethane (Ug/L)	ND
Dichlorodifluoromethane (Ug/L)	ND
Dichloromethane (Ug/L)	ND - 26
Diethyl Phthalate (Ug/L)	ND - 3.2
Diisopropyl Ether (Ug/L)	ND
Dimethyl Phthalate (Ug/L)	ND
Di-N-Butyl Phthalate (Ug/L)	ND - 0.81
Di-N-Octyl Phthalate (Ug/L)	ND
Ethylbenzene (Ug/L)	ND - 17
Fluoranthene (Ug/L)	ND
Fluorene (Ug/L)	ND
Fluorotrichloromethane (Ug/L)	ND
Hexachlorobenzene (Ug/L)	ND
Hexachlorobutadiene (Ug/L)	ND
Hexachlorocyclopentadiene (Ug/L)	ND
Hexachloroethane (Ug/L)	ND
Hexachloropropene (Ug/L)	ND
Indeno(1,2,3-Cd)Pyrene (Ug/L)	ND
Isophorone (Ug/L)	ND
Isopropylbenzene (Ug/L)	ND
M-Dichlorobenzene (Ug/L)	ND - 4.5
Methyl Ethyl Ketone (Mek) (Ug/L)	ND - 990
Methyl Tert-Butyl Ether (Mtbe) (Ug/L)	ND
Naphthalene (Ug/L)	ND - 7.2
Nitrobenzene (Ug/L)	ND
N-Nitrosodimethylamine (Ug/L)	ND
N-Nitrosodi-N-Propylamine (Ug/L)	ND
N-Nitrosodiphenylamine (Ug/L)	ND
N-Nitrosopyrrolidine (Ug/L)	ND
N-Propylbenzene (Ug/L)	ND
O-Chlorotoluene (Ug/L)	ND
O-Cresol (2-Methylphenol) (Ug/L)	ND - 3.7
O-Dichlorobenzene (Ug/L)	ND
P-Chloroaniline (Ug/L)	ND
P-Chloro-M-Cresol (Ug/L)	ND
P-Chlorotoluene (Ug/L)	ND
P-Dichlorobenzene (Ug/L)	ND - 9.2
Pentachlorophenol (Pcp) (Ug/L)	ND
Phenanthrene (Ug/L)	ND
Phenol (Ug/L)	ND
P-Isopropyltoluene (Ug/L)	ND - 6.7
Pyrene (Ug/L)	ND
Pyridine (Ug/L)	ND
Styrene (Ug/L)	ND
Tetrachloroethylene (Ug/L)	ND
Tetrahydrofuran (Ug/L)	180 - 410
Toluene (Ug/L)	ND - 17
Trans-1,2-Dichloroethene, Total (Ug/L)	ND
Trans-1,3-Dichloropropene (Ug/L)	ND
Tribromomethane (Ug/L)	ND
Trichloroethylene (Tce) (Ug/L)	ND
Vinyl Chloride (Ug/L)	ND - 2.6
Xylene, O, M & P-, (Ug/L)	ND - 23

Table 6-2
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Leachate Characterization
Vernon County Landfill - Proposed Eastern Expansion

Analytical Parameter	Active Landfill ⁽¹⁾ License No. 3268
Inorganics	
Alkalinity, Carbonate (Mg/L As Caco3)	--
Alkalinity, Total (Mg/L As Caco3)	3600 - 5900
Alkalinity, Total Filtered (Mg/L As Caco3)	--
Antimony, Total (Ug/L Sb)	--
Arsenic, Dissolved (Ug/L As)	--
Arsenic, Total (Ug/L As)	--
Barium, Total (Ug/L Ba)	--
Beryllium, Total (Ug/L Be)	--
Biochemical Oxygen Demand (Mg/L, 5 Day - 20Deg C)	65 - 440
Cadmium, Dissolved (Ug/L Cd)	--
Cadmium, Total (Ug/L Cd)	ND - 0.78
Calcium, Total (Mg/L Ca)	--
Chemical Oxygen Demand, Filtered (Mg/L)	--
Chemical Oxygen Demand, Unfiltered (Mg/L)	770 - 2200
Chloride, Total Or Dissolved (Mg/L Cl)	1000 - 2300
Chromium, Total (Ug/L Cr)	--
Copper, Total (Ug/L Cu)	--
Cyanide, Total (Mg/L Cn)	--
Fluoride, Dissolved (Mg/L F)	--
Fluoride, Total (Mg/L F)	--
Hardness, Calcium (Ca) (Mg/L As Caco3)	--
Hardness, Total (Mg/L As Caco3)	356 - 877
Hardness, Total, Filtered (Mg/L As Caco3)	--
Iron, Dissolved (Mg/L Fe)	--
Iron, Total (Mg/L Fe)	ND - 13
Lead, Dissolved (Ug/L Pb)	--
Lead, Total (Ug/L Pb)	ND - 5.3
Magnesium, Total (Mg/L Mg)	--
Manganese, Total (Ug/L Mn)	845 - 1840
Mercury, Dissolved (Ug/L Hg)	--
Mercury, Total (Ug/L Hg)	ND - 0.38
Nickel, Total (Ug/L Ni)	--
Nitrogen, Ammonia, Total (Mg/L As N)	120 - 970
Nitrogen, Kjeldahl, Total (Mg/L As N)	540 - 970
Phosphate, Total (Mg/L As Po4)	--
Phosphorus, Total (Mg/L P)	--
Potassium, Total (Mg/L K)	--
Selenium, Total (Ug/L Se)	--
Silver, Total (Ug/L Ag)	--
Sodium, Dissolved (Mg/L Na)	--
Sodium, Total (Mg/L Na)	496 - 1515
Solids, Total Suspended (Mg/L)	4 - 110
Sulfate, Dissolved (Mg/L So4)	--
Sulfate, Total (Mg/L So4)	2 - 34
Sulfide, Dissolved (Mg/L S)	--
Sulfide, Total (Mg/L S)	--
Thallium, Total (Ug/L Tl)	--
Zinc, Total (Ug/L Zn)	--
Field Parameters	
Ph, Field (Standard Units)	6.52 - 8.42
Specific Conductance, Field (Umho/Cm @ 25C)	1211 - 14700
Temperature, Water (Degrees Centigrade)	8.96 - 21.38

Notes:

(1) - Vernon County leachate sampling and analysis range results, 2018 - 2022.

ND - Value is below the limit of reporting.

-- - Parameter not analyzed.

Table 6-3
Estimated Leachate Generation Rates for Worst Case Closure
Vernon County Landfill - Proposed Eastern Expansion

Landfill Cover Status	Area (acres)	Infiltration ¹ (inches/year)	Leachate Generation Rate (gpm)
Worst-Case Scenario			
<i>Open Area</i>			
Closure Area C-2	4.64	6	1.44
Closure Area C-3	4.94	6	1.53
sum	9.58	6	2.97
<i>Closed</i>			
Closure Area C-1	5.00	1	0.26
sum	5.00	1	0.26
Total	14.58	Varies	3.23
Final Closure²			
<i>Closed</i>	14.58	1	0.75
Total	14.58	1	0.75

Notes:

1. Leachate Generation Rate (gallons/min) = [Area (ac) x Infiltration (in/yr) x 43,560 (sf/ac) x 7.48 (gal/cf)] / [12 (in/ft) x 525,600 (min/year)].

2. 'Final Closure includes all closure areas, C-1, C-2, and C-3.

Table 8-1
Preliminary Soil Balance
Vernon County Landfill - Proposed Eastern Expansion

Phase	Topsoil (CY)	Rooting Zone (CY)	Liner/Cap Clay (CY)	Sand Drainage Layer (CY)	Rock Drainage Layer (CY)	Earth Work		
						Common Excavation (CY)	Common Fill (CY)	Net (CY)
On-Site Clay Borrow (In-situ)								
Clay Borrow Area A (northwest)			119,190					
Clay Borrow Area B (southwest)			28,580					
Sum			147,770					
Construction Event								
Phase VII			(12,370)		(2,490)	8,699	(95,192)	(86,500)
Phase VIII			(12,730)		(2,510)	8,986	(26,074)	(17,090)
Phase IX			(12,710)		(2,670)	11,841	(16,106)	(4,270)
C-1 Closure	(4,880)	(18,770)	(17,050)	(8,960)				
C-2 Closure	(4,050)	(15,880)	(15,120)	(7,750)				
C-3 Closure	(4,250)	(16,710)	(16,090)	(8,200)				
sum	(13,180)	(51,360)	61,700	(24,910)	(7,670)		sum	(107,860)

Notes:

- 1 - Existing soil stockpiles on-site not considered, since stockpiles are currently for daily cover.
- 2 - Clay Borrow areas not estimated for potential topsoil and rooting zone layer soils present.
- 3 - Clay Borrow Area A had an initial estimated acceptable clay volume of 315,300 cy with an estimated 119,190 cy remaining.
- 4 - Clay Borrow Area B had an initial estimated acceptable clay volume of 69,750 cy with an estimated 28,850 cy remaining.
- 5 - Quantities shown as "(X,XXX)" indicate a negative preliminary material balance or deficit.

Table 10-1
Statutory Authority Summary
Vernon County Landfill - Proposed Eastern Expansion

Statutes	Statute Authority	General Description
§289, Wisconsin State Statutes	WDNR	Solid Waste
1989 Wisconsin Act 335	WDNR	Recycling Laws
Wisconsin Act 31	WDNR	40-Year Period for Closure and Long-term Care Costs
Wisconsin Act 93	WDNR	Landfill Needs
NR 103, WAC	WDNR	Wetland Exemption
NR 140, WAC	WDNR	Water Quality
NR 141, WAC	WDNR	Groundwater Monitoring Well Requirements
NR 151 and NR 216, WAC	WDNR	Stormwater discharge and quality
NR 299, WAC	WDNR	State Water Quality Certification
NR 406, WAC	WDNR	Air Construction Permit
NR 407, WAC	WDNR	Air Operating Permit
NR 445, WAC	WDNR	Control of Hazardous Air Pollutants
NR 500 through NR 520, WAC	WDNR	FR and POO Approval
NR 812, WAC	WDNR	Drinking Water
Sections 401 and 404 CWA	U.S. Army Corps of Engineers	Water Quality
40CFR258.71, 258.72	EPA	Financial Assurance for Closure and Post-Closure
40CFR258.10	FAA	Airport Safety
Local	Town of Viroqua	Code of Ordinances
Local	Town of Viroqua	Siting Agreement

Table 10-2
Potential Physical Impacts due to Expansion
Vernon County Landfill - Proposed Eastern Expansion

Impact	Adverse Effect	Beneficial Effect	Proposed Mitigation
Odors	Odors from MSW and LFG	Beneficial use of LFG	Proper waste placement and cover approaches
			LFG system optimization
Windblown Debris	Nuisance and visually unappealing	None	Fencing, waste covering, utilization of external core berms
Dust	Continued dust from operations and construction activities	None	Water roads and utilize gravel haul roads
Emissions	Fugitive LFG and emissions from combustion engines	None	LFG system optimization and maintenance of equipment
Changes to Landscape	Change in topography	None	Remaining topography and landscaping plan will mitigate view shed (Host Agreement)
	Removal of trees		
Noise	Continued noise from operations	None	Compliance with Host Agreement
			Maintain equipment

Table 10-3
Potential Biological Impacts due to Expansion
Vernon County Landfill - Proposed Eastern Expansion

Impact	Adverse Effect	Beneficial Effect	Proposed Mitigation
Grubbing, excavation, construction	Loss/Disturbance of existing plant and animal habitat	Diversion of habitat away from landfill operations	Vegetation restoration
			Improve habitat for migration away from landfill operations
End Use Plan	Delay implementation of final end use	Utilization of property for recreation purposes	Implementation of land use plan
		Provides green space for plant and animal habitat	Ongoing outreach with community regarding goals and vision

Table 11-1
Remaining Site Capacity and Service Area Population Characteristics
Vernon County Landfill - Proposed Eastern Expansion

Site Name	Service Area ⁽¹⁾	Remaining Site Capacity as of January 2023 ⁽²⁾ (CY)	Service Area Population 2020 Census ⁽³⁾	Service Area Population 2023 Estimate ⁽³⁾	Population Numeric Change	Population Percent Change	Population Annual Growth Rate
Vernon County Landfill	Vernon County	33,769	30,714	30,914	200	0.65%	0.22%

Notes:

(1) The service area for Vernon County Landfill, through local ordinance, consists of Vernon County only.

(2) Estimated site capacity data was collected from WDNR 2022 Wisconsin Municipal and Industrial Waste Landfill Tonnage Report - Capacity as of Jan. 2023 (<http://dnr.wi.gov/topic/Landfills/Fees.html>).

(3) Population data from Wisconsin Department of Administration (DOA) Wisconsin Demographic Services Center "January 1, 2023 Preliminary Population Estimates" https://doa.wi.gov/Pages/LocalGovtsGrants/Population_Estimates.aspx.

Table 11-2
Historical Waste Acceptance and Annual Air Space Consumed
Vernon County Landfill - Proposed Eastern Expansion

Year	Waste Accepted - All⁽¹⁾ (Tons)	Estimated Volume Consumed⁽²⁾ (CY)	Annual Waste Demand Growth (%)
2007 ⁽³⁾	14,461	19,281	--
2008	15,544	20,725	7.49%
2009	14,967	19,956	-3.71%
2010	14,958	19,944	-0.06%
2011	16,806	22,408	12.35%
2012	15,321	20,428	-8.84%
2013	16,972	22,629	10.78%
2014	17,377	23,169	2.39%
2015	16,283	21,711	-6.30%
2016	17,420	23,227	6.98%
2017	15,991	21,321	-8.20%
2018	17,783	23,711	11.21%
2019	20,187	26,916	13.52%
2020	20,937	27,916	3.72%
2021	18,397	24,529	-12.13%
2022	17,327	23,103	-5.82%
Mean Year to Year	16,920.69	22,560.92	1.56%
Median Year to Year	16,889.00	22,518.67	2.39%
Avg Year to Year Past 5 Yrs	18,926.20	25,234.93	2.10%
Growth Previous 5 Years ⁽⁴⁾	--	--	1.62%

Notes:

- (1) Tonnage intake rates from WDNR Tonnage Reports. (<http://dnr.wi.gov/topic/Landfills/Fees.html>). Includes all waste types.
- (2) Volume consumed estimated using a waste density of 1,500 lb/cy per Draft WDNR Landfill Needs and Site Life Guidance Doc. (2004).
- (3) The year 2007 represents when all waste types were diverted to the MSW Landfill after the small sized C&D site closed.
- (4) Growth rate calculated represents the compound annual growth rate.

**Table 11-3
Statewide Waste Disposal Rates
Vernon County Landfill - Proposed Eastern Expansion**

Year	Wisconsin Population ⁽¹⁾	Total Volume of Waste Disposed In Wisconsin MSW & Industrial Landfills			Disposal Rate								
		MSW ⁽²⁾	Non-MSW ⁽³⁾	Total	MSW ⁽²⁾	Non-MSW ⁽³⁾	Total	MSW ⁽²⁾	Non-MSW ⁽³⁾	Total	MSW ⁽²⁾⁽⁴⁾	Non-MSW ⁽³⁾⁽⁴⁾	Total
		(tons)			(tons/capita/year)			(lbs/cap/day)			(CY/year)		
2010	5,686,986	4,153,036	4,116,909	8,269,945	0.73	0.72	1.45	4.00	3.97	7.97	5,537,381	5,489,212	11,026,593
2011	5,694,236	4,040,494	4,003,406	8,043,900	0.71	0.70	1.41	3.89	3.85	7.74	5,387,325	5,337,875	10,725,200
2012	5,703,525	3,930,734	4,779,108	8,709,842	0.69	0.84	1.53	3.78	4.59	8.37	5,240,979	6,372,144	11,613,123
2013	5,717,110	3,908,613	3,941,357	7,849,970	0.68	0.69	1.37	3.75	3.78	7.52	5,211,484	5,255,143	10,466,627
2014	5,732,981	3,977,291	4,187,777	8,165,068	0.69	0.73	1.42	3.80	4.00	7.80	5,303,055	5,583,703	10,886,757
2015	5,753,324	3,991,389	4,228,574	8,219,963	0.69	0.73	1.43	3.80	4.03	7.83	5,321,852	5,638,099	10,959,951
2016	5,775,120	4,108,436	4,470,469	8,578,905	0.71	0.77	1.49	3.90	4.24	8.14	5,477,915	5,960,625	11,438,540
2017	5,783,278	4,222,091	4,234,245	8,456,336	0.73	0.73	1.46	4.00	4.01	8.01	5,629,455	5,645,660	11,275,115
2018	5,816,231	4,286,143	4,507,659	8,793,802	0.74	0.78	1.51	4.04	4.25	8.28	5,714,857	6,010,212	11,725,069
2019	5,843,443	4,421,479	4,277,037	8,698,516	0.76	0.73	1.49	4.15	4.01	8.16	5,895,305	5,702,716	11,598,021
2020	5,893,718	4,350,249	3,603,942	7,954,191	0.74	0.61	1.35	4.04	3.35	7.40	5,800,332	4,805,256	10,605,588
2021	5,901,473	4,478,130	3,703,388	8,181,518	0.76	0.63	1.39	4.16	3.44	7.60	5,970,840	4,937,851	10,908,691
2022	5,949,155	4,398,873	4,051,449	8,450,322	0.74	0.68	1.42	4.05	3.73	7.78	5,865,164	5,401,932	11,267,096
Average 2018-2022 (Last 5 Years)					0.75	0.69	1.43	4.09	3.76	7.84	5,849,300	5,371,593	11,220,893

Notes:

(1) Population data from Wisconsin Department of Administration (DOA) Wisconsin Demographic Services Center "January 1, 2022 Final Population Estimates Summary"
https://doa.wi.gov/Pages/LocalGovtsGrants/Population_Estimates.aspx.

(2) Category 1 Wastes from WDNR Landfill Tonnage Reports. <https://dnr.wisconsin.gov/topic/Landfills/Fees.html>.

(3) All other remaining WDNR Waste Categories (i.e., Categories 2 - 6 and 19 - 33). <https://dnr.wisconsin.gov/topic/Landfills/Fees.html>.

(4) Conversion factor of 1,500 lbs/CY used to calculate an estimated volume.

Table 11-4
Per Capita Service Area Disposal Rate
Vernon County Landfill - Proposed Eastern Expansion

Statewide Average Disposal Rate (2018-2022)⁽¹⁾	1.43	ton/person/yr
Service Area Population (2023)⁽²⁾	30,914	
Estimated Annual Service Area Disposal	44,250	ton/year
Average Waste Density⁽³⁾	1,500	lbs./CY
Estimated Annual Service Area Disposal	59,000	CY/year

Notes:

(1) Disposal rate is the average total (MSW and Non-MSW) waste disposed statewide from 2018-2022. Statewide disposal rate calculated in Table 11-3.

(2) Population data from Wisconsin Demographic Services Center.

(3) Volume of waste derived from assumed average waste density of 1,500 lb/cy per Draft WDNR Landfill Needs and Site Life Guidance Doc. (2004).

Table 11-5
Projected Expansion Site Life Based on Historical Waste Acceptance
Vernon County Landfill - Proposed Eastern Expansion

Most Conservative Waste Growth Rate Calculated from 1.56%

Table 11-2:

Previous 5 Year Average (2018-2022) Annual Waste Volume: 25,234.93

Year	Historical Waste Disposal Volumes		
	Annual Volume of Waste Accepted ⁽¹⁾ (CY)	Available Waste Disposal Capacity as of January of Listed Year ⁽²⁾ (Total)	Available Waste Disposal Capacity (Expansion Only) as of January of Listed Year (CY)
2023	25,628	33,769	--
2024 ⁽³⁾	26,028	438,141	430,000
2025	26,433	412,113	403,972
2026	26,845	385,680	377,539
2027	27,263	358,835	350,694
2028	27,688	331,572	323,431
2029	28,120	303,884	295,743
2030	28,558	275,764	267,623
2031	29,003	247,206	239,066
2032	29,455	218,204	210,063
2033	29,914	188,749	180,608
2034	30,380	158,835	150,694
2035	30,853	128,456	120,315
2036	31,334	97,602	89,461
2037	31,822	66,268	58,127
2038	32,318	34,446	26,305
2039	32,822	2,128	-6,013
2040	33,333	-30,694	-38,835

Notes:

(1) Annual volume of waste accepted based on previous 5 year average (2018-2022) with annual waste volumes increasing by growth rate listed above.

(2) Available waste disposal capacity for 2023 based on 2022 WDNR tonnage report.

(3) Approval of expansion volume assumed to occur in early 2024.



Table 11-6
Remaining Site Life Without Proposed Expansion - Per Capita Method
Vernon County Landfill - Proposed Eastern Expansion

Year	Available Disposal Capacity (CY)	Estimated Disposal⁽²⁾⁽⁴⁾ (CY)	Remaining Years of Disposal Capacity⁽³⁾
2023 ⁽¹⁾	33,769	59,000	1
2024	-25,231	59,127	0
2025	-84,358	59,256	-1
2026	-143,614	59,384	-2
2027	-202,998	59,513	-3
2028	-262,510	59,641	-4
2029	-322,152	59,771	-5
2030	-381,922	59,900	-6
2031	-441,822	60,030	-7
2032	-501,852	60,160	-8
2033	-562,012	60,290	-9
2034	-622,302	60,421	-10
2035	-682,723	60,552	-11
2036	-743,274	60,683	-12
2037	-803,957	60,814	-13
2038	-864,771	60,946	-14
2039	-925,717	61,078	-15
2040	-986,795	61,210	-16

Notes:

(1) Available disposal capacity as of January 1, 2023 per 2022 tonnage report, as noted on Table 11-1.

(2) Estimated disposal rate is based on service area population and per capita disposal rate calculated in Table 11-4.

(3) Remaining years of disposal capacity as of January 1 of year shown.

(4) Waste disposal rate increase is commensurate with population growth rate calculated in Table 11-1 (0.22%).

Table 11-7
Projected Site Life With Proposed Expansion - Per Capita Method
Vernon County Landfill - Proposed Eastern Expansion

Year	Available Disposal Capacity (CY)	Estimated Disposal⁽²⁾⁽⁴⁾ (CY)	Remaining Years of Disposal Capacity⁽³⁾
2023 ⁽¹⁾	33,769	59,000	1
2024	404,769	59,127	7
2025	345,642	59,256	6
2026	286,386	59,384	5
2027	227,002	59,513	4
2028	167,490	59,641	3
2029	107,848	59,771	2
2030	48,078	59,900	1
2031	-11,822	60,030	0
2032	-71,852	60,160	-1
2033	-132,012	60,290	-2
2034	-192,302	60,421	-3
2035	-252,723	60,552	-4
2036	-313,274	60,683	-5
2037	-373,957	60,814	-6
2038	-434,771	60,946	-7
2039	-495,717	61,078	-8
2040	-556,795	61,210	-9

Notes:

(1) Available disposal capacity as of January 1, 2023 per 2022 tonnage report, as noted on Table 11-1.

(2) Estimated disposal rate is based on service area population and per capita disposal rate calculated in Table 11-4.

(3) Remaining years of disposal capacity as of January 1 of year shown.

(4) Waste disposal rate increase is commensurate with population growth rate calculated in Table 11-1 (0.22%).

Table 11-8
Statewide Landfill Disposal Rate and Remaining Capacity Without New Landfills or Expansions
Vernon County Landfill - Proposed Eastern Expansion

Year	Available Disposal Capacity as of January of Listed Year⁽¹⁾ (CY)	Estimated Disposal⁽²⁾ (CY)	Remaining Years Of Disposal Capacity
2022	136,427,385	11,267,096	12
2023	127,211,893	11,309,911	11
2024	115,901,982	11,352,889	10
2025	104,549,093	11,396,030	9
2026	93,153,064	11,439,335	8
2027	81,713,729	11,482,804	7
2028	70,230,925	11,526,439	6
2029	58,704,487	11,570,239	5
2030	47,134,248	11,614,206	4
2031	35,520,042	11,658,340	3
2032	23,861,702	11,702,642	2
2033	12,159,060	11,747,112	1
2034	411,948	11,791,751	0

Notes:

(1) Available disposal capacity as of January 1, 2022 and January 1, 2023 per 2022 WDNR tonnage report.

(2) Estimated disposal rate calculated to increase commensurate with State population growth rate of 0.38% beginning with 2022 tonnage data.

Appendix A

WDNR Completeness Checklists

A-1 – Feasibility Report Completeness Checklist, NR 512

A-2 – Design and Construction Criteria Completeness Checklist, NR 504

A-1 – Feasibility Report Completeness Checklist, NR 512

Feasibility Report Completeness Checklist

Chapter NR 512, Wis. Adm. Code



Revised January 2022

Waste & Materials Management
P.O. Box 7921
Madison, WI 53707-7921

Instructions: This checklist is intended for use by department staff for the review of landfill feasibility reports to determine completeness. This checklist is intended to be used in conjunction with the Design and Construction Criteria Completeness Checklist, Chapter NR 504, Wis. Adm. Code. Applicants may complete this checklist and submit it with a landfill feasibility report to facilitate department review. Please refer to applicable statutes and codes for exact requirements.

General Information

Facility Name: Vernon County Landfill

Facility Type: Expansion of an Existing MSW Landfill

Proposed Waste Types: MSW, C&D, special waste

Proposed Total Design Capacity: 427,355 CY (including daily and intermediate covers)

Initial Submittal: Date Received: ___/___/___ Completeness Due: ___/___/___ DNR Response: ___/___/___ (Complete: ___ yes ___ no)

Addendum # ___ Date Received: ___/___/___ Completeness Due: ___/___/___ DNR Response: ___/___/___ (Complete: ___ yes ___ no)

Addendum # ___ Date Received: ___/___/___ Completeness Due: ___/___/___ DNR Response: ___/___/___ (Complete: ___ yes ___ no)

Addendum # ___ Date Received: ___/___/___ Completeness Due: ___/___/___ DNR Response: ___/___/___ (Complete: ___ yes ___ no)

Addendum # ___ Date Received: ___/___/___ Completeness Due: ___/___/___ DNR Response: ___/___/___ (Complete: ___ yes ___ no)

Has the assigned DNR hydrogeologist started to fill out a **Feasibility Internal Procedures** form for this project? Y N

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 500.05 GENERAL SUBMITTAL REQUIREMENTS.					
(1) Has the adequate review fee specified in s. 520.04 been submitted?	X				Submitted by Vernon County
(2) Has a cover letter detailing the desired action been submitted?	X			Cover Letter	
(3) Have 5 copies (2 Regions, 3 Central Office) been submitted to the department?	X				Per correspondence w/Colin Maus
(4) Are the report and plan sheets submitted under the seals and certifications of a P.E. and P.G.?	X			Certification Page Drawings	
(5) Technical Procedures:					
Were all test procedures specified in the report?	X			Section 5.2, Appendix J	
Were all technical procedures used to investigate the facility current standard procedures?	X			Section 5.2, Appendix J	
Were explanations and reasons given for deviations from the current standard procedures?	X			Section 5.2, Appendix J	
(6) Do all maps, plan sheets, drawings, isometrics, cross-sections, figures, photographs and tables meet the following requirements?					
(a) No larger than 24 inches x 36 inches & no smaller than 8 ½ inches x 11 inches.	✓			Drawings, Appendices	
(b) Appropriate scale to show required detail.	✓			Drawings, Appendices	
(c) Do visuals meet the following requirements? ✓ numbered ✓ legends for all symbols ✓ referenced in the narrative ✓ horizontal & vertical scales ✓ titled ✓ drafting and origination dates	✓			Drawings, Appendices	
(d) Were uniform scales used?	✓			Drawings	
(e) Were north arrows shown?	✓			Drawings	
(f) Was a USGS datum used as basis for all elevations?	✓			Drawings, Appendices	
(g) Do visuals contain a survey grid based upon monuments established in the field and which is referenced to the state plane coordinates?	✓			Drawings	
(h) Is the original topography and a grid system shown on the plan sheets that show construction, operation and closure topography?	✓			Drawings	
(i) Do cross-sections meet the following requirements? ✓ Show survey grid locations, ✓ Reference major plan sheets, ✓ Include a reduced diagram of plan view showing cross-section location.	✓			Drawings11-22	
(7) Was a table of contents provided listing all sections of the submittal?	✓			Report	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(8) Was an appendix provided listing the following? ☒ names of all references ☒ all raw data, ☒ testing and sampling procedures ☒ calculations	☒			Appendices I, J, K, L, P	References found in Report Section 13
NR 504.04(3) LOCATIONAL CRITERIA. Does the report indicate that the proposed limits of filling are within:					
(a) 1,000 feet of any navigable lake, pond or flowage not including landfill drainage or sedimentation control structures? ☐ yes ☒ no ☐ If yes, was an exemption requested?	☒			Section 7.1.1, Appendices B, F, G	
(b) 300 feet of any navigable river or stream? ☐ yes ☒ no ☐ If yes, was an exemption requested?	☒			Section 7.1.2, Appendices B, F, G	
(c) A 100-year flood plain? ☐ yes ☒ no ☐ If yes, was an exemption requested?	☒			Section 7.1.3, Appendices B, F, G	
(d) 1,000 feet of the nearest edge of the right-of-way of any state trunk highway, interstate or federal aid primary highway or any public park or state natural area? ☐ yes ☒ no ☐ If yes, was a line of site study provided showing that the landfill would not be visible from the road, park or natural area through the use of screening and/or, ☐ was an exemption requested? Note: If waste may be visible for periods of time even with the use of screening, then an exemption should be requested.	☒			Section 7.1.4, Appendices B, F	
(e) 10,000 feet of the end of an airport runway designed or planned to be designed and used by turbojet aircraft or within 5,000 feet of any airport runway designed for and used by piston type aircraft? ☐ yes ☒ no Is FAA notification required? ☒ yes ☐ no Note: If the proposed limits of waste filling would be within <u>5 miles</u> (for expansions of an existing MSW landfill, initially accepting waste prior to 4/5/2000) or within <u>6 miles</u> (for new MSW landfills, after 4/5/2000) of the end of the runway of any airport used by turbojet or piston type aircraft, the applicant must provide notice to both the Federal Aviation Administration (FAA) and the affected airport. The report should contain all correspondence related to the notices including any determinations made by the FAA. (Ref. 49 U.S.C. § 44718(d), See FAA Advisory Circular AC 150/5200-34A, dated 1/26/2006)	☒			Section 4.6, Section 7.1.5, Appendices B, F, H	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(f) 1,200 feet of any water supply well (i.e. public, private, irrigation or stock water supply wells)? ☒ yes ☐ no ☒ was an exemption requested? If yes, have the following been provided for each identified well? ☐ well location ☐ former and present well owner ☐ well driller ☐ well construction log ☐ Has an NR 812 well variance application been submitted? (Note: This is not a feasibility completeness item; however, an NR 812 variance application must be received by the department before an NR 504.04 exemption may be granted.) Note: Exemptions may not be granted if the above information is not provided.	X			Section 1.3.2, Section 7.1.6	Exemption granted within previous Feasibility Determination on June 28, 2004.
(g) 200 feet of a fault that has had displacement in Holocene time? ☐ yes ☒ no If yes, was an exemption requested?	✓			Section 7.1.7, Appendices B, F	
(h) Seismic impact zones? ☐ yes ☒ no If yes, was an exemption requested?	✓			Section 7.1.8, Appendices B, F	
(i) Unstable areas? ☐ yes ☒ no If yes, was an exemption requested?	✓			Section 7.1.8, Appendices B, F	
NR 504.04(4) PERFORMANCE STANDARDS. Does the report indicate that the proposed landfill or any proposed noncommercial soil borrow source(s) will have:					
(a) A significant adverse impact on wetlands? ☐ yes ☒ no Note: If a significant adverse impact would occur to wetlands (e.g. filling or excavation) then a wetland permit would be required under s. 281.36, Stats. A wetland permit would supersede the NR 103 water quality standards for wetlands. The wetland permit application requires a practicable alternatives analysis, a wetland functional values analysis and a public comment period specific to the wetland permit application. Wetland mitigation may also be required. ☐ Has a wetland permit been submitted with the feasibility report or has a wetland application been submitted to the department? ☒ Has a wetland delineation and functional values report been submitted with the feasibility report?	✓			Section 7.2.1, Appendices B,G	
(b) A take of an endangered or threatened species in accordance with s. 29.604, Stats? ☐ yes ☒ no	✓			Section 4.5.3, Section 7.2.2, Appendix B	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(c) A detrimental effect on any surface water? ☐ yes ☒ no Note: Exemptions are <u>not</u> granted.	✓			Section 7.2.3, Appendix B	
(d) A detrimental effect on groundwater quality or will cause or exacerbate an attainment or exceedance of any preventive action limit or enforcement standard at a point of standards application as defined in ch. NR 140? ☐ yes ☒ no ☒ Has an exemption been requested to the groundwater standards in accordance with ss. NR 507.29 and NR 140.28, Wis. Adm. Code? If an exemption is required, does the feasibility report include: ☒ A list of the specific wells and parameters for which an exemption is being requested. ☒ A discussion of how the criteria listed in s. NR 140.28(2), (3) and (4) are met.	X			Section 1.3.1, Section 5.4.3, Table 5-7, Table 5-8	
(e) The migration and concentration of explosive gases in excess of 25% of the lower explosive limit for such gases at any time? ☐ yes ☒ no	✓			Section 7.2.5, Section 8.13	
(f) The emission of any hazardous air contaminant exceeding the limitations for those substances contained in s. NR 445.04 or 445.05? ☐ yes ☒ no	✓			Section 7.2.6, Section 8.13	
NR 512.04 INITIAL SITE REPORT.					
Has the department rendered an initial site report opinion? ☒ yes ☐ no Date: February 15, 2022	✓			Section 1.4, Appendix B	
Has an optional pre-feasibility report been submitted? ☐ yes ☒ no Date:			✓		
NR 512.05 GENERAL SUBMITTAL REQUIREMENTS.					
Does the report address all of the department's review comments on the initial site report or any applicable pre-feasibility report?	✓			Section 1.4, Appendix B	
Does the report contain justification for requests for any exemptions to the locational and performance standards listed in s. NR 504.04?	✓			Section 1.3	
For an alternative design to s. NR 504.05 – 504.09 requirements, does the report include an analysis to predict whether the facility will meet or exceed performance standards of s. NR 504.04(4)(d) regarding groundwater quality?			✓		

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 512.06 PROCEDURAL REQUIREMENTS.					
(1) Local approvals: Does the report contain the following:					
☒ Documentation that each affected municipality (towns, villages, cities, and counties) has been notified and that application has been made for applicable local approvals, at least 120 days prior to submittal. Note: Act 241, effective June 18, 1998 changes the definition of affected municipalities. The new law defines affected municipality as a town, city, village or county within <u>1,500</u> feet of the facility.	✓			Section 1.4, Appendix C	
☒ A copy of all requests for the specification of applicable local approvals.				Section 2.1, Appendix C	
☐ Responses from all affected municipalities regarding any applicable local approvals.			✓		
☒ The standard municipal notice required by the waste facility siting board.	✓			Section 2.1, Appendix C	
☐ Follow up applications for any applicable local approvals submitted to the clerk of the governing board of each participating municipality per s. 289.23(2), Stats.			✓		
(2) Documentation of and when copies of the ISR, the ISR opinion, any applicable pre-feasibility report, and the feasibility report have been submitted to each participating municipality under s. 289.33(6)(b), Stats.	✓			Appendix B, Appendix C	
NR 512.07 GENERAL FACILITY INFORMATION. Does the report include all of the following:					
☒ Project title	✓			Section 3.1	
☒ Name, address and phone number of primary contacts, including the landfill's owner, operator and any consultants	✓			Distribution List, Section 3.2	
☒ Present property owner	✓			Section 3.3	
☒ Proposed owner and operator	✓			Section 3.3	
☒ Proposed landfill location by ¼ -¼ section	✓			Section 3.4	
☒ Total acreage of property	✓			Section 3.5	
☒ Total acreage of proposed fill area	✓			Section 3.5	
☒ Proposed design capacity	✓			Section 3.6	
☒ Proposed site life in years	✓			Section 3.6	
☒ Anticipated date of closure	✓			Section 3	
☒ Municipalities and industries to be served	✓			Section 3.7	
☒ Anticipated waste types and characteristics	✓			Section 3.8	
☒ Anticipated volumes of each major waste stream and any seasonal fluctuations taking into account waste reduction, reuse, recycling, composting and the recovery of energy from solid waste	✓			Section 3.8	
☒ Anticipated cover frequency	✓			Section 3.9	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
☒ Mode of operation	☒			Section 3.10	
☒ Anticipated sub-base, base and final grades	☒			Section 8.5, 8.6, 8.14	Plan Sheets 23, 24, 26
☒ Preliminary design concepts	☒			Section 8	
NR 512.08 LAND USE INFORMATION. Does the report include a thorough discussion of <u>any changes</u> in land uses or zoning within one mile of the proposed limits of filling since the submittal of the ISR?					
☒ Does the report include a discussion of any changes in the identification of adjacent landowners discussed? Note: this information may be presented on a plat map if it accurately shows current land ownership conditions.	☒			Section 4.4, Appendix F	
☒ Are any changes in zoning discussed?	☒			Section 4.3	
☒ Are any changes in present land uses discussed with emphasis on known recreational, historical, archaeological or state/local natural areas, county forest lands, and critical habitat?	☒			Section 4.5, Appendix B	
☒ Are any changes in existing and/or proposed transportation routes and access roads, including any new weight restrictions, discussed?	☒			Section 4.7	
☒ Does the report include any information or bird study requested by the Department or the FAA? Note: This applies only if the owner proposes to accept putrescible waste and the limits of filling are within 5 miles (for expansions) or 6 miles (for new landfills) of the end of an airport runway. [Ref. s. NR 504.04(3)(e) and 49 U.S.C. § 44718(d), See FAA Advisory Circular AC 150/5200-34A, dated 1/26/2006]	☒			Section 4.6, Appendix F	
NR 512.085 ALTERNATIVE GEOTECHNICAL INVESTIGATION PROGRAM.					
Has the applicant proposed an alternative geotechnical investigation program that includes the following: ☒ Detailed description of the proposed alternative program ☒ Detailed explanation of the rationale for the proposed differences to NR 512.09 or 512.10 ☒ Anticipated benefits of the proposed alternative program ☒ Is a copy of the accepted program included in the feasibility report? Note: The applicant may propose an alternative geotechnical investigation program prior to initiating the geotechnical investigations required for a feasibility report. The program may not be implemented prior to receipt of written review by the department. The formal approval of the accepted alternative geotechnical program is made in the department's feasibility determination.	X			Section 5.1, Section 5.2, Appendix I, Appendix J	Also see corresponding tables and figures referenced within the sections and appendix listed.

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 512.09 SITE-SPECIFIC GEOTECHNICAL INFORMATION.					
Has an alternate geotechnical investigation program been approved by the department in writing? <u>X</u> yes ___ no <u>X</u> If yes, does the report include justification for the approved alternative geotechnical investigation program?	X			Section 5.1, Appendix B, Appendix I	
(1) BORINGS. Have borings been made both inside and outside the proposed limits of filling?					
(a) Have the required number of borings been completed in or within 300 feet of the proposed limits of filling? <u>X</u> 10 borings for the first 5 or less acres of proposed fill area <u>X</u> 2 additional borings for each additional 5 or less acres of proposed fill area <u>X</u> Proposed limits of filling in acres <u>X</u> Number of borings required <u>X</u> Number of borings made within 300 feet of proposed limits of filling	X			Section 5.1, Section 5.2, Appendix J	During the Alternative Geotechnical Investigation of 2022, eight soil borings were completed within 300-feet of the proposed expansion (Table 5-1). There are also an additional 18 historical soil borings within 300-feet of the proposed expansion (Table 5-1).
(b) Do all borings extend at least 25 feet below anticipated sub-base grades? Note: For borings located outside the proposed limits of filling, applicable sub-base grade is the elevation of the bottom of the proposed base liner nearest to the borehole.			X	Section 5.2, Appendix J	The required amount of borings extend at least 25 feet below the anticipated sub-base grades.
(c) Has 1 boring been extended at least 5 feet into bedrock, if bedrock is within 50 feet of the lowest elevation of the proposed sub-base grades? Was bedrock drilling performed in accordance with ch. NR 141 and s. NR 507.05?	X			Section 5.1, Section 5.2, Appendix J	An exemption was granted for bedrock drilling, see Section 5.1.
(d) Were samples collected and retained and borings logs prepared in accordance with ss. NR 507.05 and 507.14? Note: The following requirements refer to NR 507.05 and 507.14.	X			Section 5.1, Section 5.2, Appendix J	
<u>X</u> Fine-grained soils: Was continuous sampling to 25 feet below sub-base grades performed?	X			Appendix J	
<u>X</u> Coarse-grained soils or following continuous sampling in fine-grained soils: Were samples collected from each major soil unit and at maximum 5 foot intervals?	X			Appendix J	
___ Sample at the depth of well screen: Was a soil sample collected at the depth of the well screen of any subsequently placed monitoring well and analyzed for grain size distribution using mechanical and hydrometer methods and Atterberg limits, as appropriate for the soil type?			X	Section 5.1, Appendix J	Due to all wells set within dolostone bedrock, soil samples were not able to be collected at the depth of each well screen. See exemption within Section 5.1.
___ Bedrock samples: Were continuous core samples collected?			X	Section 5.1, Appendix J	An exemption was granted for bedrock drilling, see Section 5.1.

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
<u>X</u> Soil samples: Do descriptions of each major soil sample unit include? <u>X</u> Structure <u>X</u> Lenses <u>X</u> Mottling <u>X</u> Geologic origin <u>X</u> Voids <u>X</u> USCS classified <u>X</u> Layering	X			Section 5.1, Appendix J	Full soil descriptions are provided within soil boring logs within Appendix J.
<u>X</u> Do descriptions of continuous bedrock core samples include? <u>X</u> General rock properties <u>X</u> Rock Quality Designation (RQD) <u>X</u> Fracture frequency <u>X</u> Percent recovery	X			Section 5.1, Appendix J	An exemption was granted for bedrock drilling, see Section 5.1.
<u>X</u> Does the report contain a boring log for each boring that includes the following? <u>X</u> Elevations of land surface and bottom of boring corrected to USGS (national geodetic survey) datum <u>X</u> If converted to a well, water level at the time of drilling, date of water level measurement, and a well construction diagram on the boring log	X			Appendix J, Appendix K	Mud rotary drilling was needed to drill and install wells; therefore, a water level was not able to be taken on the day of drilling. The date of the water level is noted within the boring log.
(e) Have all borings not converted to wells been abandoned in accordance with ss. NR 507.08 and 141.25 and been documented as instructed on Department forms (3300-5B)?	X			Appendix J	Abandonment forms are located within Attachment B of Appendix J.
(2) GROUNDWATER MONITORING WELLS.					
(a) Have the required number of water table observation wells with screens intersecting the water table been installed to adequately define the water table surface? <u>X</u> 5 water table observation wells for the first 5 or less acres of proposed fill area <u>X</u> 1 additional water table observation well for each additional 5 or less acres of proposed fill area <u>4</u> Proposed limits of filling in acres <u>5</u> Number of water table observation wells required <u>9</u> Number of water table observation wells installed	X			Section 5.2, Appendix J	Four perched water table wells and one piezometer was installed during 2022. An exemption of code NR512.09(10 and 2) was granted to use one existing perched water table well, two existing regional water table wells, and five existing piezometers for the monitoring network.

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(b) Have the required number of piezometers been installed? <u>X</u> 1 piezometer adjacent to a water table observation well at 2 separate locations for the first 5 or less acres of proposed fill area <u>X</u> 1 additional piezometer for each additional 10 or less acres of proposed fill area to create additional well nests <u>X</u> At least 1 well nest within the proposed limits of filling for every 20 acres of proposed fill area <u>4</u> Proposed limits of filling in acres <u>4</u> Number of piezometers required <u>4</u> Number of piezometers installed	X			Section 5.2, Appendix J	Four perched water table wells and one piezometer was installed during 2022. An exemption of code NR512.09(10 and 2) was granted to use one existing perched water table well, two existing regional water table wells, and five existing piezometers for the monitoring network.
(c) If the proposed site is in a fine-grained soil environment does each well nest required above in (b) consist of 3 wells (a water table observation well, a piezometer installed at or just below the proposed subbase grades and a deeper piezometer installed at least 15 feet below the bottom of the upper piezometer's well screen?			X	Section 5.1, Section 5.4.2, Appendix J	Well nests of 2 or 3 but all within bedrock. Wells within nests vary between perched water table wells, regional water table wells, and piezometers.
(d) Are all wells located no more than 300 feet from the proposed limits of filling and are at least half of the wells located no more than 150 feet from the proposed limits of filling?	X			Appendix J, Table 5-3, Plan Sheet 11	
(e) Are all wells designed, installed, developed, documented, and sampled in accordance with ch. NR 141 and ss. NR 507.06, 507.07, 507.14 and 507.17, or have alternative methods of well design and installation been approved by the department prior to well construction?	X			Appendix J	Well construction forms are within Attachment C of Appendix J and Well development forms are within Attachment D of Appendix J.
(3) FIELD DIRECTION. Did a Professional Geologist (P.G.) or qualified technician directly supervised by a P.G. perform the following tasks?					
<u>X</u> Observe and direct drilling of all borings <u>X</u> Observe and direct installation, development and abandonment of all wells <u>X</u> Conduct all in-field hydraulic conductivity tests <u>X</u> Visually describe and classify all geologic samples	X			Appendix J	Wisconsin Professional Geologist Melanie Niday provided all field direction. Melanie Niday's PG number is located on the certification page of the report.
(4) LABORATORY AND FIELD ANALYSIS.					
(a) Have 5 grain-size analyses per major soil unit (mechanical & hydrometer) with USCS classifications and Atterberg limits where appropriate been provided? <u>2</u> Number of major soil units <u>10</u> Number of grain size analyses required	X			Section 5.4.1, Table 5-2, Appendix J	The saprolite and dolostone units are not adequate for collecting hydrometer and atterberg limit samples.
(b) Have lab hydraulic conductivity tests been provided for 2 undisturbed samples from each major fine-grained soil unit?	X			Section 5.4.2, Table 5-2, Appendix J	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(d) Have <i>in-field hydraulic conductivity test</i> data and results been provided for each well?	X			Section 5.4.2, Table 5-5, Appendix J	
(e) Does report include 6 monthly water level measurements for all wells?	X			Table 5-4	
(f) Does report include 6 monthly surface water level measurements for any surface water bodies including streams, lakes, ponds, drainage ditches and wetlands located within 1,000 feet of the proposed limits of filling?			X		
(g) <i>Baseline groundwater quality</i> for all wells located outside the proposed limits of filling in accordance with s. NR 507.18: NOTE: If a groundwater standard is attained or exceeded in any of the 4 baseline groundwater quality sample rounds, see ss. NR 140.28 and 507.29 for exemption criteria.	X			Section 5.4.3 Appendix J	
Note: The following requirements refer to s. NR 507.18. <u>X</u> 4 monthly rounds for each detection monitoring parameter listed in Appendix 1, Tables 1 and 2 of ch. NR 507, as appropriate, for the particular waste types to be accepted <u>X</u> 4 monthly rounds for Public Health and Welfare parameters listed in Appendix I, Table 3 of ch. NR 507 <u>X</u> 2 monthly rounds for VOCs, plus 2 additional sampling rounds for any wells that have VOC concentrations above their limit of detection	X			Section 5.4.3, Appendix J	Baseline analytical parameters are provided within Table 6 of Appendix J. A summary of baseline monitoring results is provided within Table 7 of Appendix J. Laboratory reports for baseline events are provided within Attachment I of Appendix J.
(h) Has the department required other work such as groundwater modeling, pump tests, geophysical investigations, isopach maps or a fence diagram to assess the hydrogeologic conditions at the proposed facility?	X			Section 5.1, Section 5.4.1.4, Appendix J, Plan Sheets 12-22	Geophysical investigation requested and completed. Gamma logs are provided within Attachment E of Appendix J and within cross-sections.
(5) SAMPLE RETENTION					
Have all soil and bedrock samples collected from the proposed property been retained in accordance with NR 507.05?	X			Section 5.1, Appendix J	
(6) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES.					
(a) Does the landfill meet the requirements of (b) and (c) below for a facility where MSW is accepted and the leachate collection lines exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope?			X		

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FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(b) Does the report include the following: <u> </u> A minimum of one boring in the area of each proposed cell drilled to physically characterize subbase conditions for landfill foundation assessment of stability and settlement <u> </u> Borings that extend a minimum of 50 feet below the proposed subbase grades or to competent bedrock, whichever is shallower. <u> </u> Samples taken at each significant soil layer <u> </u> A minimum of one sample from each fine grained layer and from each soft or compressible coarse grained layer subjected to geotechnical testing to define parameters used in assessment of stability and settlement of the liner			X		
(c) Does the report include the consolidation testing data include the data summarized in the major soil unit table required by NR 512.10(2)(d)?			X		
NR 512.10 SUBSURFACE DATA ANALYSIS.					
(1) Does the subsurface investigations presented in the report include the minimum following requirements (unless an alternative geotechnical investigation plan was accepted in writing)?	X			Section 5, Appendix B, Appendix I, Appendix J	An AGIP was accepted in writing. See Appendix I for the AGIP and Appendix B for the WDNR AGIP approval letter.
(2) SOIL AND BEDROCK DESCRIPTIONS.					
(a) Have grain size distributions, geologic origin, USCS classification been provided for each major soil unit?	X			Section 5.4.1, Appendix J	
(b) Does the report describe the lateral and vertical extent of each major soil unit including descriptions of any lenses or other heterogeneities, and if bedrock was encountered by borings, the strike and dip of any rock formations?	X			Section 5.3.4, Section 5.4.1	Due to the poor quality of bedrock core collected during drilling, no strike and dip was able to be taken at site. See Section 5.3.4 for regional data.
(c) Does the report describe the presence and frequency of joints, fractures, voids, solution openings, faults or other structural features?	X				
(d) Does the report include a table summarizing the following testing data by major soil unit? <u> </u> X Geologic origin <u> </u> X Liquid limit <u> </u> X Sample ID number <u> </u> X Plasticity index <u> </u> X Percent gravel, sand, silt and clay <u> </u> X Percent P200 content <u> </u> X Lab & field hydraulic conductivities <u> </u> X Statistical analyses for averaged values	X			Table 5-2, Table 5-5, Appendix J	Data for 2022 only is provided within Appendix J. Data for the landfill property is provided within Table 5-2 and Table 5-5.
(3) HYDROGEOLOGIC PROPERTIES AND FUNCTIONS. Does the report discuss the following properties and functions of each saturated soil unit or rock formation?					
(a) Hydraulic conductivity	X			Section 5.4.2	
(a) Role as a confining unit	X			Section 5.3.5	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(c) Hydraulic connections to other units	X			Section 5.3.5	
(d) Actual/potential use as a water supply unit	X			Section 5.3.5	
(e) Depth to groundwater & seasonal variations in groundwater elevations	X			Section 5.4.2	
(f) Location & extent of perched groundwater	X			Section 5.4.2	
(f) Local & regional flow directions including the locations of groundwater divides	X			Section 5.3.5, Section 5.4.2	
(h) Horizontal & vertical gradients	X			Section 5.4.2	
(4) APPENDIX. Does the Appendix include the following?					
<u>x</u> All raw data <u>x</u> Soil boring log information forms 4400-122 <u>x</u> Well information forms (4400-89) <u>x</u> Groundwater and surface water level measurements <u>x</u> Monitoring well development forms (4400-113B) <u>x</u> Baseline groundwater quality sampling <u>x</u> Monitoring well construction forms (4400-113A) <u>x</u> Soil test results <u>x</u> Well/drillhole/borehole abandonment forms 3300-5B	X			Appendix J to P	All raw data from the 2022 investigation is provided within Appendix J attachments. All previously collected data, as applicable, is provided within Appendix K to Appendix P.
NR 512.11 DATA PRESENTATION. Are the results from the subsurface investigation presented on 24" x 36" plan sheets?	X			Plan Sheets 4-22	
(1) EXISTING CONDITIONS PLAN SHEET. Is a detailed topographical survey of all areas within 1500 feet of the proposed limits of filling provided (minimum scale 1" = 200' with maximum 2 foot contour interval) and does it show all of the following:	X				
(a) 100-year floodplain area	X			Appendix F	
(b) Surface waters, including intermittent & ephemeral streams & wetlands	X			Appendix F	
(c) Residences, buildings, utility lines & other cultural features	X			Appendix F	
(d) Surrounding land uses (residential, commercial, agricultural & recreational)	X			Appendix F	
(e) Property & proposed limits of filling, including any previous fill areas	X			Plan Sheet 3	
(f) Access control including fences & gates	X			Plan Sheet 3	
(g) Water supply wells including public, private, irrigation, & stock	X			Plan Sheet 3	
(h) Boring, test pit, and well locations for the proposed landfill	X			Plan Sheet 3	
(i) Other structures including storm water control systems, agricultural drain tile systems, access & internal roads, storm & sanitary sewerage systems	X			Plan Sheet 3	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(2) GEOLOGIC CROSS-SECTIONS.					
Have geologic cross-sections been constructed as follows: <u>X</u> Through <u>all</u> borings, both perpendicular and parallel to the proposed landfill's baseline <u>X</u> For proposed contiguous expansions, through all previous borings for the existing landfill <u>X</u> 1 cross-section parallel to groundwater flow	X			Section 5.1, Plan Sheets 12-22	
Do the geologic cross-sections include the following:					
(a) Inferred/questionable lithostratigraphic boundaries shown with a dashed line or question mark	X			Plan Sheets 12-22	
(b) Numbers/symbols used to label each major soil unit with a key that describes each major soil unit including geologic description and origin, USCS classification and color	X			Plan Sheets 12-22	
(C) Boring logs show USCS classification, geologic origin, grain size analyses, Atterberg limits, and field hydraulic conductivities	X			Plan Sheets 12-22	
(d) <u>X</u> Well construction details shown to scale including well screen and filter pack length, upper and any lower seals, and stabilized water levels measured on same day <u>X</u> If two or more observation wells are presented, a line representing the water table surface drawn and date the measurements were taken specified in the key	X			Plan Sheets 12-22	
(3) WATER TABLE MAPS.					
<u>X</u> Are at least two water table maps (seasonal high & low) provided?	X			Plan Sheets 4-7	
<u>X</u> For a proposed contiguous expansion, do the water table maps include the observation wells and measured water table elevations for each observation well for the existing landfill?	X			Plan Sheets 4-7	
<u>X</u> Has a bedrock piezometric map been provided if 3 or more bedrock wells have been installed?	X			Plan Sheets 8-9	
(4) BEDROCK MAP.					
Has a bedrock contour map been provided if 3 or more borings have been drilled into bedrock?	x			Plan Sheet 10	
(5) FLOW NET.					
Has a flow net , parallel to the direction of groundwater flow to show distribution of recharge & discharge been provided?	X			Plan Sheet 21	

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FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 512.12 WASTE AND LEACHATE CHARACTERIZATION.					
(1) INDUSTRIAL WASTES. Have the physical & chemical characteristics of any high volume industrial waste anticipated to individually constitute more than 5% of the total proposed design capacity and leachates been analyzed and described?	✓			Section 6.1, Table 6-1	
(2) MUNICIPAL WASTES. Does the report include actual field leachate data from existing landfills of similar size, design and waste type or an estimate of the anticipated leachate strength and quality?	✓			Section 6.2.1, Table 6-2, Appendix S	
(3) LEACHATE GENERATION. Does the report include the estimated daily volume of leachate that will be collected for unclosed and closed areas?					
(a) A minimum of 6 inches per year for all unclosed areas of the proposed limits of filling for landfills with a composite liner and a minimum of 4 inches per year for landfills that do not have a composite liner?	✓			Section 6.3, Table 6-3	
(b) One inch per year for all closed areas of the proposed limits of filling for landfills with a composite cap and a minimum of 3 inches per year for all closed areas that will not have a composite cap?	✓			Section 6.3, Table 6-3	
NR 512.13 CONSTRAINTS ON LANDFILL DEVELOPMENT.					
(1) LOCATIONAL CRITERIA AND PERFORMANCE STANDARDS. Does the report contain a demonstration that the proposed landfill will meet the locational and performance standards in s. NR 504.04?	✓			Section 7.1, Section 7.2, Appendix B	
(2) GEOTECHNICAL INFORMATION. Does the report contain an analysis of the following:					
<u> </u> geologic <u> </u> hydrogeologic <u> </u> topographic <u> </u> hydrologic features of the proposed property that may be favorable or unfavorable for landfill development	X			Section 5.3, Section 5.4, Section 7.3	
(3) CONSTRUCTION AND OPERATION. Does the report contain a discussion of the following materials and support services required for landfill construction and operation?					
<u> </u> ✓ Leachate treatment alternatives <u> </u> ✓ Identification and detailed evaluation of the capability of any proposed wastewater treatment plant(s) to treat the leachate <u> </u> ✓ Quality & quantity of liner and cap materials <u> </u> ✓ Specialized engineering structures to support landfilling activities	✓			Section 7.3.5, Section 7.3.6, Section 7.3.7, Section 7.3.8	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(4) EXISTING FACILITY PERFORMANCE. For a proposed contiguous, horizontal or vertical expansion, does the report evaluate the compliance status and performance of the existing landfill?					
(a) Does the report reference the discussion on the compliance status and performance of the existing landfill contained in any applicable pre-feasibility report and include any changes since the submittal of that report?	X			Section 5.4.3	
(b) Does the report contain an exemption request under s. NR 140.28 and in accordance with s. NR 507.29 if a PAL or ES has been attained or exceeded at the site?	X			Section 1.3.1, Section 5.4.3	
NR 512.14 PROPOSED PRELIMINARY DESIGN.					
(1) PRELIMINARY DESIGN REPORT.					
(a) Does the report contain preliminary materials balance calculations for the necessary volume of clay to construct the liner and final cap of the first phase of the landfill?	✓			Section 8.15, Section 9, Appendix T	
(b) Does the report discuss proposed methods for leachate and gas control? ☒ Leachate collection ☒ Leachate containment ☒ Leachate treatment ☒ Gas collection ☒ Gas containment ☒ Gas treatment	✓			Section 8.8, Section 8.9, Section 8.10, Section 8.11, Section 8.13	
(c) Does the report discuss the proposed operating procedures, including the general filling sequence?	✓			Section 8.17.1, Section 8.17.2	
(d) Does the report include a description of the proposed monitoring programs to be implemented to meet the requirements of chs. NR 140 and 507? ☒ Groundwater ☒ Leachate ☒ Surface Water ☒ Gas ☒ Air ☒ Unsaturated zone ☒ Other monitoring ☒ Does the report contain a sampling plan for all monitoring devices in accordance with s. NR 507.16?	X			Section 5.4.3, Section 8.18, Appendix R	
(e) ☒ Does the report discuss the proposed methods for storm water control in accordance with ch. NR 216? ☒ Does the report discuss visual screening?	✓			Section 8.4, Section 8.16	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(f) Does the report discuss the proposed final use?	✓			Section 8.19	
(2) PRELIMINARY ENGINEERING PLANS. (24" x 36" Plan Sheets w/max. 5-foot contours):					
(a) Does the report include an existing conditions map that shows the following? ☒ Proposed access ☒ Limits of filling ☒ Internal roads ☒ Load out & scale facilities ☒ Sub-base & base grades ☒ Leachate collection system ☒ Lift station/sewer hook up ☒ Associated buildings ☒ Storm water diversions ☒ Sedimentation basins ☒ Phase of facility development ☒ Slopes ☒ Leachate storage tank	✓			Drawings	
(b) Does the report include geologic cross-sections plan sheet(s) that display the following information? ☒ Present topography ☒ Proposed sub-base grades ☒ Proposed base grades ☒ Proposed final grades ☒ Liner and final cap configuration	✓			Drawings 12-22	
(c) Does the report include a plan sheet showing the proposed closure sequence and final grades?	✓			Drawings 26	
NR 512.15 IDENTIFICATION OF SOIL BORROW SOURCES. Note: It may be necessary to obtain federal, state and/or local permits prior to excavating soil from a borrow source near surface waters or wetlands. For example, s. 30.19(1)(c), Stats., requires a permit for grading or removing top soil from the bank of any navigable stream, lake or body of navigable water where the area exposed by such grading or removal will exceed 10,000 square feet. It is the responsibility of the applicant or property owner to request an initial site inspection in accordance with ch. NR 509 and to obtain any federal, state and/or local permits that are required.					
(1) Does the report include a copy of the department's initial site inspection evaluation letter for the proposed borrow source(s) needed to construct, operate and close the first phase of the landfill?			✓	Appendix T	Pre-approved borrow source located on existing owned property

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(2) Does the report include documentation for soil borrow sources as described in NR 504.075 for the proposed soil borrow sources designated to be used in the construction, operation or closure of the first phase of the landfill? See below.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
NR 504.075 SOIL BORROW SOURCES.					
(1) GENERAL.					
Is the soil borrow source being developed for the purpose of construction, operating or closing a landfill? If yes, this section applies. Note: Written approval from the department shall be obtained prior to initiating soil borrow activities at any borrow source subject to these requirements.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(2) EXEMPTIONS. The following activities are exempt from the requirements of this section:					
(a) ___ The production of processed aggregate products. ___ Excavation of soils from construction projects off of the landfill property and not being used for compacted clay liner or capping layer, soil barrier layer, leachate collection layer or final cover drain layer?			✓		Pre-approved borrow source located on existing owned property
(b) Is the soil borrow source within the proposed or approved limits of filling for a landfill? If yes, then the landfill is not subject to the requirements of subs. (3) and (4)(b).			✓		Pre-approved borrow source located on existing owned property
(3) INITIAL SITE INSPECTION.					
Does the report include a copy of the department's initial site inspection for each proposed borrow source?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(4) LOCATIONAL INFORMATION.					
(a) Does the submittal describe the following: ☐ Total acreage ☐ Ownership ☐ Location (¼-¼ section) ☐ Present land use ☐ Transportation routes ☐ Any access restrictions ☐ Travel distance to and from landfill			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the submittal include the following: ☐ Surface water drainage patterns ☐ Significant hydrologic features (surface waters, springs, drainage divides and wetlands) ☐ Areas of special natural resource interest (critical habitat or state/local natural areas) ☐ Historical/archaeological areas within and adjacent to proposed limits of excavation			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(5) FIELD AND LABORATORY INVESTIGATIONS FOR CLAY BORROW SOURCES AND SOIL BARRIER LAYER SOURCES.					
Does the submittal for soil borrow sources include field and laboratory investigations to define the physical characteristics of any clay borrow source or soil barrier layer source designated to be used for a liner or final cover?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
Has an alternate geotechnical investigation program been approved by the department in writing prior to the field and laboratory investigation? ☐ yes ☐ no If yes, does the report include a copy of and justification for any approved alternative geotechnical investigation program? Note: An alternative geotechnical investigation program may be submitted in cases where previous information exists regarding the proposed soil borrow source.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(a) Have the required number of test pits or borings been completed on a uniform grid pattern across the proposed borrow source(s)? ☐ 10 test pits/borings for the first 5 or less acres ☐ 1 additional test pit/boring for each additional 3 or less acres ☐ Proposed acreage of proposed borrow source(s) ☐ Number of test pits/borings required ☐ Number of test pits/borings made ☐ Have logs identifying geologic origin, testing results, USCS classification, and visual description of each major soil unit encountered also been included?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the report include Atterberg limits and grain size analyses to 0.002 mm particle size for 2 samples from each test pit/boring?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

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FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(c) Does the report include the relationship of water content to dry density using either the modified or standard Proctor method (curves must be developed with a minimum of 5 points) for 1 sample from each major soil unit and no fewer than 3 samples for uniform clay deposits?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(d) Does the report include laboratory hydraulic conductivity test results for each sample used to develop the Proctor curves?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(6) STOCKPILING.					
Does the report include discussion of segregating stockpiled soils by USCS soil type, soil gradation, Atterberg limits and compaction specifications? Note: Stockpiling of soils obtained from clay borrow sources and soil barrier layer sources for landfill liner of final cover construction shall be conducted in an organized manner that minimizes mixing of dissimilar soil types. Soils from differing sources may not be commingled unless soil properties are similar.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(7) DATA PRESENTATION FOR ALL CLAY BORROW SOURCES AND SOIL BARRIER LAYER SOURCES. Does the submittal for soil borrow sources for clay and soil barrier layers include the following?					
(a) Calculated volume of soil needed and the volume of acceptable soil available			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Property boundaries and test pit/boring locations on a topographic map (scale: 1" = 500') that extends a minimum of 500 feet beyond the proposed borrow source			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(c) Isopach map showing thickness of acceptable soil			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(d) Description of methods for separating acceptable soil from unacceptable soil			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(e) Proposal for maintaining drainage and sedimentation control			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(f) All data from the testing program			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(8) DATA PRESENTATION FOR OTHER BORROW SOURCES. Does the submittal for soil borrow sources other than those used for clay and soil barrier layers include the following?					
(a) Property boundaries shown on a topographic map (scale: 1" = 500') that extends a minimum of 500 feet beyond the proposed borrow source			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Proposal for drainage and sedimentation control			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(9) STORMWATER MANAGEMENT.					
Does the submittal for a soil borrow source include a stormwater management plan that complies with the requirements of s. NR 504.09(1)(a) to (f) and (h) to (j), unless the borrow source is subject to other permits with equivalent authority and requirements, such as a stormwater discharge permit or non-metallic mining reclamation permit?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(10) RECLAMATION OR BORROW SITES.					
(a) Does the report include reclamation plans for borrow sources on the landfill property that include the following: ___ post-mining land use that is integrated with the existing and proposed drainage ___ surface water discharge requirements ___ grades and final use of the landfill Is the reclamation plan consistent with NR 135.06 to 135.12?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) For soil borrow areas not on landfill property, is the reclamation plan consistent with NR 135? If required, has a reclamation plan been submitted and a nonmetallic mining reclamation permit been received from the appropriate regulatory authority?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(11) OTHER REQUIRMENTS.					
(a) If the proposed clay borrow source(s) contains less than a five foot, but greater than 2 foot uniform clay thickness, does the report contain a construction methodology and documentation procedure to ensure the liner meets the soil index property requirements of s. NR 504.06(2)(a)?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the report include a description of measures to be taken to comply with wetlands protection requirements, runoff and sediment controls and surface water discharge permit requirements and to minimize effects on areas of special natural resource interest and historical or archaeological areas within and adjacent to the proposed limits of excavation?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
NR 512.16 ENVIRONMENTAL REVIEW. To aid the department in complying with ch. NR 150, Wis. Adm. Code, the report must include an environmental analysis (EA) section. Does the EA section include the following: Note: Information provided in previous sections of the ISR, any applicable pre-feasibility report, or the feasibility report may be referenced to satisfy this section's requirements.					
(1) PROJECT SUMMARY. Does the EA section contain a Project Summary that includes the following:					
x Brief overview of the project x Listing of statutory authority x Relevant local, state and federal permits or approvals required x Need for exemptions, zoning changes & other special permits or approvals	X			Section 10.1 Table 10-1	

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FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(2) PROPOSED PHYSICAL CHANGES. Does the EA section contain a brief description of the proposed physical changes that includes all of the following:					
(a) Changes in terrestrial resources to include a discussion of the following: <u>X</u> Quantity of soil to be excavated and the lateral extent of soil removal <u>X</u> Quantity and source of soils designated to be used in the construction, operation or closure of the landfill <u>X</u> Description of all earthen modifications (such as clearing & grubbing, excavation, soil placement needed to reach the proposed sub-base grades, construction of access roads, stockpiles and storm water controls).	X			Section 10.2	
(b) Changes in aquatic resources including: <u>X</u> Potential impacts to streams, wetlands, ponds, lakes & flowages <u>X</u> Discharge rates and volumes under existing conditions as well as that anticipated during active operations and following closure for: <u>NA</u> Groundwater control structures <u>X</u> Leachate collection systems <u>X</u> Storm water control structures <u>X</u> Information or reports on how the proposed landfill and soil borrow sources for the first phase of the proposed landfill comply with s. 30.19 Stats., and ch. NR 103.	X			Section 10.2.2 Section 8.8 Table 6-3 Section 8.16 Appendix G	
(c) Discussion of buildings, treatment units, roads and other structures (such as sedimentation basins and fences) to be constructed including: <u>NA</u> size of the facilities (i.e., structures) <u>NA</u> miles of road to be constructed:	X			Section 10.2.3	
(d) Emissions and discharges (such as dust, engine exhaust, odors, noise, gases, leachate, storm water and collected groundwater) associated with the following: <u>X</u> Landfill preparation <u>X</u> Closure <u>X</u> Construction <u>X</u> Post-closure <u>X</u> Operation	x			Section 10.2.4	
(e) Other changes anticipated with landfill development			X		
(f) Maps, plans and other descriptive material to clarify the discussion such as but not limited to the following: <u>X</u> County map <u>X</u> Proposed service area map <u>X</u> USGS map <u> </u> Plat map <u> </u> Zoning map <u>X</u> County wetlands map <u>X</u> Soils map <u>X</u> Landfill development plan	X			Appendix F	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(3) EXISTING ENVIRONMENT. Does the EA section contain a brief description of the existing environment that may be affected that includes the following:					
(a) A description of the existing physical environment including: <u>X</u> Regional & local topography <u>X</u> Geology <u>X</u> Surface waters & drainage features <u>X</u> Hydrogeologic conditions <u>X</u> Air quality <u>X</u> Wetlands <u>X</u> Designated soil borrow sources	X			Section 10.3	
(b) A description of the following: <u>X</u> dominant aquatic and terrestrial plant and animal species and habitats found in the area including: <u>X</u> Any threatened/endangered species <u>NA</u> Amount, type & hydraulic value of wetlands	X			Section 10.3.2 Appendix B	
(c) Land use including dominant features and zoning in the area	X			Section 10.3.3	
(d) Social and economic conditions including any ethnic or cultural groups	X			Section 10.3.4	
(e) Other special resources such as: <u>X</u> Archaeological <u>X</u> Historical <u>X</u> State/local natural areas <u>X</u> Prime agricultural lands	X			Section 10.3.5	
(4) ENVIRONMENTAL CONSEQUENCES. Does the EA section contain a brief discussion of the probable adverse and beneficial impacts including primary, indirect and secondary impacts that includes the following:					
(a) Physical impacts associated with landfill design, construction and operation, including: <u>X</u> Air quality <u>X</u> Windblown paper <u>X</u> Dust <u>X</u> Visual impacts	X			Section 10.4 Table 10-2 Table 10-3	
(b) Biological impacts including: <u>X</u> Destruction and creation of habitat <u>X</u> Alteration of the physical environment <u>NA</u> Impacts to endangered/threatened species	X			Section 10.4 Table 10-3 Appendix B	
(c) Impacts on land use	X			Section 10.4.3	
(d) Social and economic impacts (such as effects on taxes, noise, traffic and roads, and consistency with local planning and zoning) to the following groups served by the landfill: <u>X</u> Local residents <u>X</u> Communities <u>X</u> Cultural groups <u>X</u> Industries	X			Section 10.4.4	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(e) Other special resources such as but not limited to: <u>X</u> Archaeological <u>X</u> Historical <u>X</u> State/local natural areas <u>X</u> Prime agricultural lands	X			Section 10.4.5	
(f) Probable adverse impacts that cannot be avoided including: <u>N</u> Groundwater and surface water impacts <u>X</u> Modifications of topography <u>N</u> Soil borrow source limitations on development around the landfill <u>X</u> Loss of agricultural or forest land <u>X</u> Displacement of wildlife [in and around the landfill] <u>X</u> Adverse aesthetic impacts for people	X			Section 10.4.6 Table 10-1 Table 10-2	
(5) ALTERNATIVES. Does the report identify, describe and discuss feasible alternatives?					
Alternatives: <u>X</u> Taking no action <u>X</u> Enlarging, reducing or modifying the project to mitigate impacts <u>X</u> Other landfills, locations or methods to the proposed action and their impacts	X			Section 10.5	
Has particular attention been given to alternatives which might avoid some or all adverse environmental impacts, including planned and existing waste reduction & recycling, incineration, solid waste disposal, and transfer facilities that may serve to handle the waste expected to be disposed of at the proposed landfill, taking into account the economics of waste collection, transportation and disposal?	X			Section 10.5.4 Section 10.5.5	
NR 512.17 NEED AND DESIGN CAPACITY. Note: In determining the design capacity of the proposed landfill under s. 289.29(1)(d), Stats., the department considers the effect of planned and existing waste reduction and recycling activities and other existing or proposed competing solid waste facilities, regardless of whether or not the other facilities are located within the service area, as defined under s. 289.28(1), Stats., of the proposed landfill.					
Is the proposed landfill part of a prospection or mining operation or a landfill for the disposal of waste generated by a pulp or paper mill and exempt under s. 289.28(2)? <u> </u> yes <u>X</u> no			X		

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
In addition to the information specified in s. 289.28(1), Stats. (below) does the report include the following: <u>X</u> Identification of the following activities/facilities used to manage solid wastes generated within the anticipated service area of the proposed landfill: <u>X</u> Identification of existing waste reduction/recycling activities <u>X</u> Identification of existing solid waste facilities <u>X</u> Remaining design capacity of each facility identified <u>X</u> Information for the activities/facilities, identified above, for which a significant commitment or implementation or development has been made	X			Section 11.3.4	
289.28(1), Stats. DETERMINATION OF NEED.					
(a) An approximate service area for the proposed facility which takes into account the economics of waste collection transportation and disposal.	X			Section 11.2	
(b) The quantity of waste suitable for disposal at the proposed facility generated within the anticipated service area.	X			Section 11.3	
(c) The design capacity of the following facilities located within the anticipated service area:	X			Section 11.4	
1. Approved facilities, including the potential for expansion of those facilities on contiguous property owned or controlled by the applicant.	X			Section 11.4.1	
2. Nonapproved facilities which are environmentally sound.	X			Section 11.4.2	
3. Other proposed facilities for which feasibility reports are submitted and determined to be complete by the department.	X			Section 11.4.3	
4. Facilities for the recycling of solid waste or for the recovery of resources from solid waste which are licensed by the department	X			Section 11.4.4	
5. Proposed facilities for the recycling of solid waste or for the recovery of resources from solid waste which have plans of operation which are approved by the department.	X			Section 11.4.5	
6. Solid waste incinerators licensed by the department.	X			Section 11.4.6	
7. Proposed solid waste incinerators which have plans of operation which are approved by the department.	X			Section 11.4.7	
(d) If the applicant is a municipality and the need for a proposed facility cannot be established under the criteria listed under (a) through (c) above, does the report demonstrate need based on the extent to which the proposed facility is needed to replace other facilities of that municipality at the time those facilities are projected to be closed in the plans of operation?			X		

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
289.29(1)(d), Stats. CRITERIA FOR DETERMINATION OF FEASIBILITY.					
Does the report indicate that the anticipated site life is between 10 to 15 years for a new facility or less than 15 years for an expansion? ☒ yes ☐ no	X			Section 11.7	
NR 512.18 EVALUATION OF ALTERNATIVES TO LAND DISPOSAL. Does the feasibility report contain an analysis of the alternatives to land disposal of waste, including potential and existing waste reduction, reuse, recycling, composting and energy recovery initiatives and services?					
(1) ANALYSIS OF ALTERNATIVES TO LAND DISPOSAL. Does the analysis include a discussion of the trends affecting the waste stream, an estimate of the cost per ton for each alternative, when available and an evaluation of the feasibility of implementing each potential alternative?	X			Section 12	
(2) EVALUATION OF IMPLEMENTING ALTERNATIVES TO LAND DISPOSAL. Does the feasibility report evaluate the feasibility of implementing waste reduction initiatives and recycling services in connection with the proposed landfill and describe any waste reduction incentives and recycling services to be provided at the proposed landfill?	X			Section 12.2	
NR 512.19 NONCOMPLIANCE WITH PLANS OR ORDERS					
Does the report include the following: ☐ Identify all persons owning a 10% or greater interest in the applicant or assets of applicant ☐ Identify other Wisconsin solid and hazardous waste facilities owned by applicants ☐ Indicate whether all plan approvals and orders for facilities owned by applicants are being complied with	X			Section 2.5	
289.24(1)(c), Stats. COUNTY SOLID WASTE MANAGEMENT PLANS					
Does the feasibility report contain a description of how the proposed facility relates to any applicable county solid waste management plan approved under s. 289.10, Stats? Note: Applicants must address all DNR approved County plans within their proposed service area.	X			Section 2.3	

Facility Name: Vernon County Landfill

FEASIBILITY REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
289.24(1)(d) ADVISORY AND PUBLIC OPINION PROCESS					
Does the feasibility report contain a description of the advisory process undertaken by the applicant prior to submittal of the feasibility report to provide information to the public and affected municipalities and to solicit public opinion on the proposed facility?	X			Section 2.4	

Legal Note: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

A-2 – Design and Construction Criteria Completeness Checklist, NR 504

Design and Construction Criteria Completeness Checklist

Chapter NR 504, Wis. Adm. Code



Revised January 2022

Waste & Materials Management
P.O. Box 7921
Madison, WI 53707-7921

Instructions: This checklist is intended for use by department staff for the review of landfill plan of operation and feasibility reports to determine completeness. The checklist may also be used by applicants and submitted with a landfill plan of operation or feasibility report to facilitate department review. Refer to applicable statutes and codes for exact requirements.

General Information

Facility Name: Vernon County Landfill

License/Monitoring # 3268

Facility Type: Expansion of an existing MSW Landfill

Initial Submittal: Date Received: / / Completeness Due: / / DNR Response: / / (Complete: yes no)

Addendum # Date Received: / / Completeness Due: / / DNR Response: / / (Complete: yes no)

Addendum # Date Received: / / Completeness Due: / / DNR Response: / / (Complete: yes no)

Proposed Waste Types: MSW, C&D, special waste

Proposed Total Design Capacity: 427,355 CY (including daily and intermediate covers)

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 504.04(3) LOCATIONAL CRITERIA. Are the proposed limits of filling within:					
(a) 1,000 feet of any navigable lake, pond or flowage not including landfill drainage or sedimentation control structures? <u> </u> yes <u>✓</u> no <u> </u> If yes, was an exemption requested?	✓			Section 7.1.1, Appendix B	
(b) 300 feet of any navigable river or stream? <u> </u> yes <u>✓</u> no <u> </u> If yes, was an exemption requested?	✓			Section 7.1.2, Appendix B	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(c) A 100-year flood plain? ☐ yes ☒ no ☐ If yes, was an exemption requested?	✓			Section 7.1.3, Appendix B	
(d) 1,000 feet of the nearest edge of the right-of-way of any state trunk highway, interstate or federal aid primary highway or any public park or state natural area? ☐ yes ☒ no ☐ If yes, was a line of site study provided showing that the landfill would not be visible from the road, park or natural area through the use of screening and/or, ☐ was an exemption requested? Note: If waste may be visible for periods of time even with the use of screening, then an exemption should be requested.	✓			Section 7.1.4, Appendix B	
(e) 10,000 feet of the end of an airport runway designed or planned to be designed and used by turbojet aircraft or within 5,000 feet of any airport runway designed for and used by piston type aircraft? ☐ yes ☒ no Is FAA notification required? ☒ yes ☐ no Note: If the proposed limits of waste filling would be within <u>5 miles</u> (for expansions of an existing MSW landfill) or within <u>6 miles</u> (for new MSW landfills, after year 2000) of the end of the runway of any airport used by turbojet or piston type aircraft, the applicant must provide notice to both the Federal Aviation Administration (FAA) and the affected airport. The report should contain all correspondence related to the notices including any determinations made by the FAA. (Ref. 49 U.S.C. § 44718(d), See FAA Advisory Circular AC 150/5200-34A, dated 1/26/2006)	✓			Section 7.1.4, Section 7.1.5, Appendix B, Appendix H	
(f) 1,200 feet of any water supply well (i.e. public, private, irrigation or stock water supply wells)? ☐ yes ☒ no ☐ was an exemption requested? If yes, have the following been provided for each identified well? ☐ well location ☐ former and present well owner ☐ well driller ☐ well construction log Note: Exemptions may not be granted if the above information is not provided.	✓			Section 7.1.6, Appendix B	
(g) 200 feet of a fault that has had displacement in Holocene time? ☐ yes ☒ no ☐ If yes, was an exemption requested?	✓			Section 7.1.7	
(h) Seismic impact zones? ☐ yes ☒ no ☐ If yes, was an exemption requested?	✓			Section 7.1.8	
(i) Unstable areas? ☐ yes ☒ no ☐ If yes, was an exemption requested?	✓			Section 7.1.9	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 504.04(4) PERFORMANCE STANDARDS. Will the proposed landfill cause the following:					
(a) A significant adverse impact on wetlands? ☐ yes ☒ no Has a practicable alternatives analysis and a wetland functional values analysis been completed in accordance with ch. NR 103, if a wetland will be affected by the proposed landfill or any noncommercial soil borrow source activity? Note: See DNR wetland regulation website (https://dnr.wisconsin.gov/topic/Wetlands/permits) to help determine if a wetland permit may be needed per s. 281.36, Stats.	✓			Section 7.2.1, Appendix B, Appendix G	
(b) A take of an endangered or threatened species in accordance with s. 29.604, Stats? ☐ yes ☒ no	✓			Section 7.2.2, Appendix B	
(c) A detrimental effect on any surface water? ☐ yes ☒ no Note: Exemptions are <u>not</u> granted.	✓			Section 7.2.3, Appendix B	
(d) A detrimental effect on groundwater quality or will cause or exacerbate an attainment or exceedance of any preventive action limit or enforcement standard at a point of standards application as defined in ch. NR 140? ☐ yes ☒ no ☐ Has an exemption been requested to the groundwater standards in accordance with ss. NR 507.29 and NR 140.28, Wis. Adm. Code? If an exemption is required, does the feasibility report include: ☐ A list of the specific wells and parameters for which an exemption is being requested. ☐ A discussion of how the criteria listed in s. NR 140.28(2), (3) and (4) are met.	✓			Section 7.2.4, Section 5.4.3, Appendix B	
(e) The migration and concentration of explosive gases in excess of 25% of the lower explosive limit for such gases at any time? ☐ yes ☒ no	✓			Section 7.2.5, Section 8.13	
(f) The emission of any hazardous air contaminant exceeding the limitations for those substances contained in s. NR 445.04 or 445.05? ☐ yes ☒ no	✓			Section 7.2.6	
NR 504.05 GENERAL DESIGN AND CONSTRUCTION CRITERIA.					
(1) Is the landfill designed in substantial conformance with the design criteria in ss. NR 504.06 to 504.09?	✓			Section 7.3.6	
(2) Is supporting justification included for any differences from ss. NR 504.06 to 504.09?			✓		
(3) Is the proposed operating life of the landfill between 10 and 15 years?	✓			Section 3.6, 8.2, 11.6	
If the proposed life is not between 10-15 years is the facility exempted in s. 289.28(2), Stats. or the expansion of an existing facility?			✓		

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 504.06 MINIMUM DESIGN AND CONSTRUCTION CRITERIA FOR LANDFILL LINERS AND LEACHATE COLLECTION SYSTEMS.					
(1) GENERAL.					
(a) If the landfill is proposed to accept municipal solid waste does the design incorporate a composite liner and a leachate collection system capable of limiting the average leachate head on the composite liner to 1 foot or less during operation and after closure of the landfill?	✓			Section 8.7, Section 8.8	
Does the composite liner consist of the following: ☒ An upper geomembrane component with nominal 60-mil minimum thickness ☒ A lower component of 4 foot minimum compacted clay meeting NR 504.06(2)(a)	✓			Section 8.7	
(2) COMPOSITE OR CLAY LINED LANDFILLS. Does the composite liner or clay liner design meet the following requirements:					
(a) Will all clay used in liner construction meet the following specifications: ☒ A minimum of 50% by weight passing 200 sieve ☒ A saturated hydraulic conductivity of 1×10^{-7} cm/sec or less ☒ An average liquid limit of 25 or greater with no values less than 20 ☒ An average plasticity index of 12 or greater with no values less than 10	✓			Section 8.7.1	
(b) Is there at least a 10 foot separation between the seasonal high groundwater table and the bottom of the clay liner component? Note: For zone of saturation landfills select NA.	✓			Section 8.5	
(c) Is there at least a 10 foot separation between the bedrock surface and the bottom of the clay liner component?	✓			Section 8.5.1	
(d) Is there a minimum 2% liner surface slope toward the leachate collection system?	✓			Section 8.6	
(e) Is there a minimum 4 foot thick clay component of a composite liner or a minimum 5 foot clay liner thickness?	✓			Section 8.7.1	
(f) 1. Are the clay layers proposed to be constructed in the following manner: ☒ Lift heights no greater than 6 inches after compaction ☒ Footed compaction equipment having feet at least as long as the loose lift height ☒ Disking or mechanical processing of clay to break up clods and adjust moisture ☒ Clod size no greater than 4 inches ☒ All compaction equipment to have a minimum static weight of 30,000 pounds ☐ Alternative procedures or equipment proposed	✓			Section 8.7.1	Constructed in accordance with NR 504.06(2)(f)
2. A sufficient number of equipment passes to ensure complete remolding of clay?	✓			Section 8.7.1	
3. Is clay compaction proposed to be 90% modified Proctor density at 2% wet of the optimum or 95% standard Proctor density at wet of the optimum moisture content? Alternately, the line of optimums method may be used.	✓			Section 8.7.1	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(g) Are interior sidewall slopes at a maximum of 3H:1V or at a minimum of 5H:1V?	✓			Section 8.6	
(h) Are clay components of the liner in adjacent phases keyed together?		✓		Section 1.3.1	
Is the keying accomplished by excavating a minimum of 4 steps with a total width of spliced area measuring at least 15 feet?		✓		Section 1.3.1	
(3) COMPOSITE-LINED LANDFILLS. If the landfill is composite lined, are the following requirements specified in the plan of operation:					
(a) Is the geomembrane specifically formulated for waste containment purposes?	✓			Section 8.7.2	
Is the nominal geomembrane thickness 60 mil or greater with no thickness below minimum industry accepted manufacturing tolerances?	✓			Section 8.7.2	
(b) Is there geomembrane protection along areas of traffic or concentrated activity such as sumps, sideslope risers and entry ramps?	✓			Section 8.7.2	
(c) For slopes in excess of 10%, will geomembrane panels be installed with panel seams perpendicular to the contour lines of the slope?	✓			Section 8.7.2	
(d) Prior to geomembrane placement, will the clay surface be prepared as follows: ✓ Rolling and grading of clay surface to remove irregularities, protrusions, loose soil and abrupt changes in grade, ✓ Free of stone, grading stakes, construction debris and contain no areas softened by high water content ✓ Sufficiently dry and dense clay surface such that the construction equipment will not create ruts ✓ Depressions and large cracks filled with tamped clay	✓			Section 8.7.2, Section 8.14.3	
(e) Will the geomembranes be welded as follows: ✓ Geomembrane panels welded by double-tracked, fusion welding machines for all linear seams, ✓ Fusion welding of corners, butt seams and long repairs where possible, ✓ Extrusion or fusion welding for all other repairs, detail work and patches, ✓ Request for Department approval for other welding methods.	✓			Section 8.7.2, Section 8.14.3	
(f) Will geomembrane components in adjacent phases be welded together to form a continuous geomembrane surface?	✓			Section 8.7.2	
Will the liner extended beyond the proposed edge of waste at a phase junction be protected from traffic and weather?	✓			Section 8.7.2	
(g) Will wrinkles which are taller than they are wide be smoothed or cut out prior to covering with soil?	✓			Section 8.7.2	
Will guidance be provided to machine operators placing soil on geomembrane by the use of an observer with an unobstructed view of the advancing lift of soil.	✓			Section 8.7.2	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(h) Are the following minimum soil thickness on geomembrane proposed before vehicular traffic may occur: ☒ 1 foot for vehicles with ground pressure less than 5 pounds per square inch, ☒ 2 feet for other vehicles equipped with tracks and floatation tires, ☒ 3 feet or more for trucks or wheeled hauling equipment.	✓			Section 8.8.2.2	
(i) In order to lessen desiccation effects, will the landfill base and the lower 10 feet of the sideslope be covered with a drainage blanket within 30 days after completing quality control and quality assurance testing?	✓			Section 8.8.2	
Will the remaining sideslope be covered with either drainage material or geotextile to prevent damage to the geomembrane?	✓			Section 8.8.2.2	
(j) Will placement of soil over the geomembrane be performed during cooler temperature periods to the extent possible using methods which minimize wrinkling?	✓			Section 8.8.2.2	
(k) Will anchor trenches be designed and constructed around the landfill to secure the permanent edges of the geomembrane?	✓			Section 8.7.2	
Will geomembrane be seamed completely to the edge of the panel end to minimize potential of tear propagation?	✓			Section 8.7.2	
(4) ZONE-OF-SATURATION LANDFILLS. Landfills with proposed base grades below the groundwater table must meet the following:					
(a) Is the landfill located in a fine-grained soil environment?			✓		
(b) Does the landfill meet the requirements of sub. (2)(a), (d), (e), (f), (g) and (h) and the requirements under sub. (3), if the landfill will accept municipal solid waste?			✓		
(c) Has an analysis been performed on the effect which groundwater may have on uplift of the liner and the short and long-term stability of the geomembrane component?			✓		
Does the analysis evaluate the effect of an underdrain or other dewatering system?			✓		
(d) Have borings, backhoe pits or other means of exposing the subsurface soils been proposed on a 100-foot grid to a minimum 5 foot depth below the subbase grades of the liner?			✓		
Are all granular or silty soils detected within this 5 foot depth proposed to be removed?			✓		

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(5) LEACHATE COLLECTION SYSTEMS. The leachate collection system must incorporate the following design features:					Design will be completed during the Plan of Operation
(a) Does the leachate collection system design include the following features: ☒ A leachate collection system included in each horizontal phase, ☒ Leachate routed to the landfill perimeter in the most direct manner possible, ☒ Limit average leachate head on the liner to 1 foot or less, ☒ Limit maximum leachate flow distance to the perforated collection pipe to 130 feet.	✓			Section 8.8.2	
(b) Is the slope on the leachate collection pipe a minimum of 0.5%?	✓			Section 8.8	
(c) Is the minimum diameter of all leachate collection pipes 6 inches?	✓			Section 8.8	
Are all collection pipes proposed to be Schedule 80 PVC pipe or an approved substitute?	✓			Section 8.8	
(cm) Are the proposed pipe fittings for use with PVC and HDPE pipe secured to the leachate collection pipe as follows: ☒ PVC fittings and pipe solvent-welded ☒ HDPE fittings and pipe fusion welded	✓			Section 8.8	
(d) Do the leachate collection trenches conform to the following: ☐ Rectangular leachate collection trenches for clay liners ☒ V-trenches with a maximum 18 inches depth and 3H: 1V sideslope for composite liners ☒ V-trenches smooth-drum rolled prior to placement of the membrane	✓			Section 8.8.2.3	
(dm) ☒ Is a geotextile with a weight of 12 oz/yd ² used to line the trench base and sidewalls and is it placed directly over the geomembrane ☒ Does the design show that the geotextile does not overlap across the top of the trench. ☒ Are the geotextile specifications, including manufacturer's data for grab and puncture strength, used to demonstrate the resistance to damage from the aggregate to be placed over the geotextile?	✓			Section 8.8.2.3, Section 8.9.1	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(e) Does the leachate collection pipe trench backfill conform to the following: ☒ Uniformity coefficient of less than 4, ☒ Maximum particle diameter of 1 ½ inches, ☒ Maximum of 5% passing the number 4 sieve, ☒ Rounded to subangular gravel, ☒ Minimum 4 inches bedding depth before installation of leachate pipe, ☒ Minimum 6 inches of granular material above the pipe, and an additional 12 inches of material mounded above the trench, ☒ Graded soil filter or geotextile to minimize migration of drainage blanket into the trench, in cases where particle size of the bedding is significantly less than the collection trench bedding ☒ No use of limestone and dolomite as trench backfill. ☒ If limestone and dolomite are proposed for use as trench backfill, does the plan of operation address that there is no other suitable material reasonably available?	✓			Section 8.8.2.2	
(f) Have the sand and gravel sizes and geotextile and pipe openings been analyzed for the control of piping of soil materials and have the materials been chosen to achieve a stable and self-filtering structure under all conditions of leachate flow?	✓			Section 8.8.2.2	
(g) Do leachate collection lines have cleanout access on both ends of pipes?	✓			Section 8.8	
Does each leachate collection line have a maximum distance of 1,200 feet from the end of one cleanout to the toe of the opposite slope?	✓			Section 8.8	
(h) Are there no vertical liner penetrations due to leachate lines, manholes and other engineering structures?	✓			Section 8.8	
For clay lined landfills, are liner penetrations limited to leachate transfer lines in the horizontal direction only? For composite lined landfills, are there no liner perforations?	✓			Section 8.8	
(i) Is a 4'x4', 5 foot thick, anti-seep collar placed around any leachate transfer line penetrating the clay liner?			✓		

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(j) Is the composite lined landfill designed with a sump and sideslope riser meeting the following requirements: <u>✓</u> 1. Sump volume and pump capacity sized to accommodate an annual leachate collection rate of 6 inches taking into account the potential for solids to build up over time. <u>✓</u> 2. Sump base protected with polyethylene plate or other acceptable means and placed prior to sideslope riser and backfill installation. <u>✓</u> 3. Leachate discharge pipe between the sideslope riser and the tank installed with valves to prevent backflow into the waste disposal area. <u>✓</u> 4. Sideslope riser pipe has a minimum diameter of 18 inches and geometry at the junction of the sump and sidewall to assure passage of the pump and hardware and assure correct positioning of the intake of the pump. <u>✓</u> 5. The area of the sump and depth of gravel fill are sized to allow remedial installation of access and hardware for removal of leachate if the sideslope riser and pump system fail.	✓			Section 8.9.1, Section 8.9.2, Section 8.9.3	
(k) Are gravity lines transporting leachate out of the landfill constructed with valves for flow control, and are the valves compatible with the leachate and operable from the ground surface?	✓			Section 8.10	
(l) Are all leachate lines located outside the landfill double-cased or in an approved secondary containment?	✓			Section 8.10	
Are all leachate transfer lines proposed to be pressure tested prior to use?	✓			Section 8.9	
Is the upslope end of secondary pipe sealed and the downslope end open to drain into the manhole?	✓			Section 8.9	
(m) Are all leachate transfer lines, manholes, lift stations and other structures outside the waste limits designed to meet the following: <u>✓</u> Designed as shallow as practical, and as far from the waste limits as possible so repair of these devices would not infringe on the landfill cover or liner systems <u>✓</u> Constructed above the seasonal high groundwater table. ___ If not constructed above the water table, is it not technically feasible to do so and does the design meet the requirements of (l) above.	✓			Section 8.10	
(n) Are leachate collection tanks and manholes designed with the following: <u>✓</u> Secondary containment to prevent leachate discharge to ground and surface water <u>✓</u> Means to monitor the tank or manholes for leaks within the secondary containment ___ If no, is an alternative method proposed?	✓			Section 8.10	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(o) Are the leachate tanks designed to: ☒ Contain leachate volume generated over a 4 day period, ☒ Withstand the soil and liquid loads encountered during installation and use ☒ Follow the consultant and manufacturer installation instructions.	✓			Section 8.10	
(p) Does the leachate loadout station design contain the following: ☒ Measures to prevent accidental leachate discharge at the loadout from entering ground or surface water, ☒ A loadout station paved and sloped to a catch basin to direct all spills to a catch basin.	✓			Section 8.10	
(q) Are leachate and gas system manholes and enclosures vented and do they have controlled access?	✓			Section 8.9, Section 8.10, Section 8.13	
For landfills designed with active extraction, are manholes and enclosures designed to minimize air intrusion?	✓			Section 8.9, Section 8.10, Section 8.13	
(r) Are all pumps, valves and meters designed to be controlled and operated from ground surface?	✓			Section 8.9, Section 8.10	
(s) Are all leachate and groundwater collection systems designed to monitor the liquid volume removed?	✓			Section 8.10	
(t) Is there a minimum one foot thick granular drainage blanket placed on top of the geomembrane for a composite liner or on top of the clay component of a clay liner which contains the following elements: ___ no more than 5% passing 200 sieve ___ If the granular layer contains gravel greater than ¼", a certified needle free minimum 12 oz/yd ² nonwoven geotextile below the drainage blanket	✓			Section 8.8.2.2	
(tm) ___ Hydraulic conductivity (at anticipated field density) equal to or greater than 1 cm/sec for sites that accept any amount of MSW or 1x10 ⁻² cm/sec for landfills that do not accept MSW ___ Was the gradation of the drainage blanket (and associated hydraulic conductivity) selected to maintain the maximum head in the drain within the drain thickness?	✓			Section 8.8.2.2	
(u) If the major horizontal clay lined phase is above the saturated zone, is each phase designed with collection basin lysimeter (except for composite lined landfills)?			✓		

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(6) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES. Landfills with leachate collection lines that exceed 1,200 feet and will accept MSW must meet the following:					
(a) Do any leachate collection lines exceed 1,200 feet when measured from the end of <u>each</u> cleanout to the toe of the opposite slope? Will the landfill accept MSW? If no, check NA for (b) through (f) below.			✓		
(b) Is the maximum length of each leachate collection line 2,000 feet or less from the access point at one end to the toe of the opposite slope?			✓		
(c) Is the slope on the leachate collection pipe a minimum of 0.5% after accounting for primary and secondary settlement of the subgrade? Note: The minimum design slope is selected following computation of 100% of the primary and secondary consolidation settlement beneath the facility, which includes, as applicable, in-situ soil, added geologic material structural fill material, and compacted clay liner. Secondary settlement shall be calculated using a 100-year timeframe.			✓		
(d) Is the pipe bedding material composed of course, uniform gravel with hydraulic conductivity greater than or equal 1 cm/sec? Note: This requirement is in addition to meeting the other requirements of s. NR 504.06(5)(e).			✓		
(e) Has the maximum anticipated construction, operation and post-closure overburden loads over the leachate collection piping been calculated and used in selecting pipe material and wall thickness? ___ Were the calculations based on a 6 inch pipe diameter and appropriate in-field consolidated density?			✓		
(f) Have all components of the leachate collection system incorporated the following design features: ___ prefabricated or smooth sweep bends with a minimum radius of 10 pipe diameters ___ pipe alignments that minimize horizontal and vertical alignment changes for the entire pipe length ___ elimination or minimization of obstructions which impose drag on pipe cleaning jetter hose or nozzles			✓		
(7) COMPOSITE-LINED LANDFILLS USING GCLs.					
Is GCL proposed for use in a composite liner? If no, indicated NA for the following and (a) – (c).			✓		
Does the landfill accept only non MSW waste? Or if it accepts MSW will the GCL be placed over the 4 foot clay liner? If yes to either, the design must meet the requirements of (a) – (c). If no to both, then GCL may not be used as proposed.			✓		
(a) Has the hydraulic performance of the GCL been assessed by use of compatibility testing?			✓		

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(b) Does the GCL meet the specifications of NR 504.07(4)(a)1 to 11?			✓		
(c) Is the GCL underlain by a soil barrier layer a minimum 2 feet thick and meets the specifications of NR 504.07 (4)(a) 12. To 17.			✓		
NR 504.07 MINIMUM DESIGN AND CONSTRUCTION CRITERIA FOR FINAL COVER SYSTEMS.					
(1) GENERAL.					
(a) Is the final cover system designed to? ☒ Minimize leachate generation by limiting the amount of percolation through the cap ☒ Reduce landfill maintenance by design of compatible surface slopes and vegetation ☒ Account for differential settlement and other stresses on the capping layer ☒ Minimize freeze-thaw effects and desiccation of clay capping layer ☒ Provide for removal of leachate and venting of gas from landfills accepting wastes with high moisture content or that which is readily biodegradable	✓			Section 8.14	
(b) Does the final cover system meet the requirements of subs. (2) to (9) below unless it is established (to the satisfaction of the department) that portions of final cover system are not needed based on proposed waste type and design?	✓			Section 8.14	
Is the geomembrane component included in the final cover design unless this is proposed to be an exclusively high volume industrial, or other landfill that does not accept municipal solid waste and is not composite lined?	✓			Section 8.14.3	
(c) If the landfill is designed with a composite liner, is it also designed with a final cover system meeting subs. (2) to (9) below?	✓			Section 8.14	
(d) Does the landfill accept papermill sludge or other industrial solid wastes with high water contents and low strength? Will the strength of the waste prohibit the type of cover system specified in this section (subs. (2) to (9))? If yes, an alternate final cover system may be proposed.			✓		
(2) GRADING LAYER.					
If this is a municipal solid waste landfill, does the design include a 6 inch grading layer above the final waste elevation?	✓			Section 8.14.1	
(3) SUPPORT LAYER AND LOW-STRENGTH WASTES.					
If the landfill accepts industrial wastes with high water content and low strength, does the design include a support layer for stabilization, reinforcement and removal of leachate and gas?			✓		
(4) CLAY CAPPING LAYER.					
☐ Does the landfill design include a two foot clay cap that meets the specification of NR 504.06(2)(a) listed below? ☐ A minimum of 50% by weight passing 200 sieve	✓			Section 8.14.2	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
___ A saturated hydraulic conductivity of 1×10^{-7} cm/sec or less ___ An average liquid limit of 25 or greater with no values less than 20 ___ An average plasticity index of 12 or greater with no values less than 10 ___ Will the clay capping layer be constructed according to NR 504.06(2)(f)?	✓			Section 8.14.2	
(a) If the two foot clay cap is replaced with a GCL and 2 foot soil barrier layer, does it meet the following: ___ 1. GCL consist of a layer of bentonite clay between 2 geotextiles ___ 2. GCL will be covered with a geomembrane the same day it is placed and in dry conditions ___ 3. GCL will be installed in a relaxed condition, free of tension or stress ___ 4. Adjoining panels of GCL have a minimum 6 inches overlap on longitudinal seams and a minimum 20 inches of overlap on panel end seams ___ 5. Irregular shapes, cuts or tears in the GCL are covered with a GCL patch with a minimum 12 inch overlap ___ 6. A seal of loose bentonite granules will be placed in seam overlaps at a minimum rate of 1 quarter pound per linear foot of seam for all seams ___ 7. Loose bentonite or bentonite amended soil will be placed at all patches and penetrations ___ 8. GCL panels are certified needle-free through magnetic and metal detection tests ___ 9. GCL will be placed in direct contact with a soil barrier layer ___ 10. Vehicle traffic on subgrade of GCL and on GCL will be restricted to minimum weight and number of machines to deploy GCL and geomembrane; vehicles operated to minimize damage to subgrade, GCL and geomembrane; deployment methods selected to prevent tearing or coming out of fibers of the GCL ___ 11. Soil cover placement over the geosynthetics will be completed in the same construction season as the geosynthetic construction ___ 12. Soil barrier layer will consist of fine-grained soil or a well graded sandy soil with fines, meeting USCS soil types ML, CL, CH, SM, or SC or dual -symbols classifications of these soils, with 25% by weight passing P200 sieve; upper one foot will have maximum particle size of 2 inches and lower one foot will have maximum particle size of 4 inches ___ 13. Soil barrier layer will be compacted in lift heights of no greater than 12 inches after compaction using footed compaction equipment with feet at least 6 inches long; each lift will be disked to break up clods; clods no greater than 4 inches ___ 14. Soil barrier layer will be compacted to ensure complete remolding of soil with equipment having a minimum static weight of 30,000 pounds			✓		

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
___ 15. Soil barrier layer will be compacted to 90% modified or 95% standard Proctor density or greater at a moisture content at or wet of optimum ___ 16. Each lift of will be keyed into clay or soil barrier layer soils in adjacent phases to form a continuous seal; steps will be a minimum width of 2 feet and there will be a minimum of 2 steps ___ 17. The surface of the top lift will be graded or compacted to be smooth and firm and will be inspected for removal of course grave, cobbles and debris prior to placement of GCL			✓		
(b) For industrial waste landfills that predominantly accept compressible wastes or wastes with high water contents and low strength, will the landfill be replacing the clay layer with a GCL overlying a minimum one foot sand layer? If yes, will the gradation of the sand layer be a uniform sand selected to vent gas, drain leachate and provide hydration water to the GCL?			✓		
(c) For industrial waste landfills that predominantly accept ash, will the landfill be replacing the clay layer with a GCL overlying a minimum two feet soil barrier layer? If yes, will the soil barrier layer meet the requirement of (a)13 to 17 above and will the upper foot of soil barrier layer meet the requirements of (a)12 above? Note: The lower foot shall be designed to provide a capillary break between the ash and the upper one foot of soil barrier layer.			✓		
(d) If the lower one foot of the clay layer is replaced with a one foot of foundry green sand system sand, will the sand meet the following: ___ Bentonite content of greater than 6% ___ Liquid limit of greater than 20 ___ Plasticity index of greater than 6 ___ Hydraulic conductivity of less than 1×10^{-7} cm/sec ___ Compaction of 90% modified or 95% standard Proctor density or greater at a moisture content at or wet of optimum			✓		
(5) GEOMEMBRANE LAYER.					
If a geomembrane layer is proposed, does it meet the requirements of NR 504.06(3)(c) to (j) and the following:	✓			Section 8.14.3	
(a) Nominal geomembrane thickness 40 mils or greater, and no thickness measurements below accepted industry tolerance	✓			Section 8.14.3	
(b) Geomembrane installed in direct contact with the clay capping surface	✓			Section 8.14.3	
(c) Geomembrane penetrations fitted with prefabricated collar or a plate welded at the angle of final cover slope, which allows for differential settlement of waste without damage to the membrane seal	✓			Section 8.14.3	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(6) DRAINAGE ROOTING ZONE LAYER. Does the design include a drainage and rooting zone layer over the geomembrane or the clay cap that meets the following requirements:					
A minimum thickness of 2.5 feet and is not densely compacted	✓			Section 8.14.4, Section 8.14.5	
(a) Drainage layer is designed to be placed immediately above the capping layer and consists of a 1-foot sand layer with a min. hydraulic conductivity of 1×10^{-3} cm/sec., or a geosynthetic drain layer of equivalent or greater transmissivity, including: ☒ Design includes an analysis which demonstrates whether the maximum head in the drain layer will be confined within the thickness of the drain, ☒ Drain calculations include infiltration rates based on saturated characteristics of the topsoil and rooting zone, and ☒ Drain calculations include hydraulic gradient of one through the topsoil and rooting zone.	✓			Section 8.14.4	
(b) A perimeter drain pipe at the low end of all final cover sideslopes with the following design elements: ☒ Drain pipe surrounded by a minimum of 6 inches of gravel or sand having a minimum hydraulic conductivity of 1×10^{-2} cm/sec ☒ Drain pipe sloped to outlets spaced 200 feet apart unless different spacing is supported by modeling	✓			Section 8.14.4	
(7) TOPSOIL.					
☒ Is a minimum of 6 inches of topsoil included over the cover layer? ☒ Is fertilizer and lime addition proposed per section 630, WDOT or other spec.?	✓			Section 8.14.6, Section 8.14.7	
(8) REVEGETATION.					
☒ Is seed type and fertilizer based upon type and quality of topsoil, and compatibility with the native vegetation and final use? ☒ Is seed mix and application rates per section 630 WDOT specifications unless the department approved different seed mix and application rates? ☐ Are fertilizer and mulch application rates specified?	✓			Section 8.14.7	
(9) FINAL USE.					
(a) Is final use compatible with the final cover system?	✓			Section 8.19	
(b) Are the following activities prohibited when landfill is no longer in operation? ☒ Use of waste disposal area for agricultural purposes ☒ Establishment or construction of any buildings over the waste disposal areas ☒ Excavation of final cover or any waste materials	✓			Section 8.19	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 504.075 SOIL BORROW SOURCES.					
(1) GENERAL.					
Is the soil borrow source being developed for the purpose of construction, operating or closing a landfill? If yes, this section applies. Note: Written approval from the department shall be obtained prior to initiating soil borrow activities at any borrow source subject to these requirements.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(2) EXEMPTIONS. The following activities are exempt from the requirements of this section:					
(a) ___ The production of processed aggregate products. ___ Excavation of soils from construction projects off of the landfill property and not being used for compacted clay liner or capping layer, soil barrier layer, leachate collection layer or final cover drain layer?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Is the soil borrow source within the proposed or approved limits of filling for a landfill? If yes, then the landfill is not subject to the requirements of subs. (3) and (4)(b).			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(3) INITIAL SITE INSPECTION.					
Does the report include a copy of the department's initial site inspection for each proposed borrow source?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(4) LOCATIONAL INFORMATION.					
(a) Does the submittal describe the following: ___ Total acreage ___ Ownership ___ Location (¼-¼ section) ___ Present land use ___ Transportation routes ___ Any access restrictions ___ Travel distance to and from landfill			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the submittal include the following: ___ Surface water drainage patterns ___ Significant hydrologic features (surface waters, springs, drainage divides and wetlands) ___ Areas of special natural resource interest (critical habitat or state/local natural areas) ___ Historical/archaeological areas within and adjacent to proposed limits of excavation			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(5) FIELD AND LABORATORY INVESTIGATIONS FOR CLAY BORROW SOURCES AND SOIL BARRIER LAYER SOURCES.					
Does the submittal for soil borrow sources include field and laboratory investigations to define the physical characteristics of any clay borrow source or soil barrier layer source designated to be used for a liner or final cover?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
Has an alternate geotechnical investigation program been approved by the department in writing prior to the field and laboratory investigation? __ yes __ no If yes, does the report include a copy of and justification for any approved alternative geotechnical investigation program? Note: An alternative geotechnical investigation program may be submitted in cases where previous information exists regarding the proposed soil borrow source.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(a) Have the required number of test pits or borings been completed on a uniform grid pattern across the proposed borrow source(s)? __ 10 test pits/borings for the first 5 or less acres __ 1 additional test pit/boring for each additional 3 or less acres __ Proposed acreage of proposed borrow source(s) __ Number of test pits/borings required __ Number of test pits/borings made __ Have logs identifying geologic origin, testing results, USCS classification, and visual description of each major soil unit encountered also been included?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the report include Atterberg limits and grain size analyses to 0.002 mm particle size for 2 samples from each test pit/boring?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(c) Does the report include the relationship of water content to dry density using either the modified or standard Proctor method (curves must be developed with a minimum of 5 points) for 1 sample from each major soil unit and no fewer than 3 samples for uniform clay deposits?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(d) Does the report include laboratory hydraulic conductivity test results for each sample used to develop the Proctor curves?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(6) STOCKPILING.					
Does the report include discussion of segregating stockpiled soils by USCS soil type, soil gradation, Atterberg limits and compaction specifications? Note: Stockpiling of soils obtained from clay borrow sources and soil barrier layer sources for landfill liner of final cover construction shall be conducted in an organized manner that minimizes mixing of dissimilar soil types. Soils from differing sources may not be commingled unless soil properties are similar.			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(7) DATA PRESENTATION FOR ALL CLAY BORROW SOURCES AND SOIL BARRIER LAYER SOURCES. Does the submittal for soil borrow sources for clay and soil barrier layers include the following?				Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(a) Calculated volume of soil needed and the volume of acceptable soil available			✓		
(b) Property boundaries and test pit/boring locations on a topographic map (scale: 1" = 500') that extends a minimum of 500 feet beyond the proposed borrow source			✓		
(c) Isopach map showing thickness of acceptable soil			✓		
(d) Description of methods for separating acceptable soil from unacceptable soil			✓		
(e) Proposal for maintaining drainage and sedimentation control			✓		
(f) All data from the testing program			✓	↓	↓
(8) DATA PRESENTATION FOR OTHER BORROW SOURCES. Does the submittal for soil borrow sources other than those used for clay and soil barrier layers include the following?				Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(a) Property boundaries shown on a topographic map (scale: 1" = 500') that extends a minimum of 500 feet beyond the proposed borrow source			✓	↓	↓
(b) Proposal for drainage and sedimentation control			✓		
(9) STORMWATER MANAGEMENT.					
Does the submittal for a soil borrow source include a stormwater management plan that complies with the requirements of s. NR 504.09(1)(a) to (f) and (h) to (j), unless the borrow source is subject of other permits with equivalent authority and requirements, such as a stormwater discharge permit or non-metallic mining reclamation permit?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(10) RECLAMATION OR BORROW SITES.					
(a) Does the report include reclamation plans for borrow sources on the landfill property that include the following: ___ post-mining land use that is integrated with the existing and proposed drainage ___ surface water discharge requirements ___ grades and final use of the landfill Is the reclamation plan consistent with NR 135.06 to 135.12?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) For soil borrow areas not on landfill property, is the reclamation plan consistent with NR 135? If required, has a reclamation plan been submitted and a nonmetallic mining reclamation permit been received from the appropriate regulatory authority?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(11) OTHER REQUIRMENTS.					
(a) If the proposed clay borrow source(s) contains less than a five foot, but greater than 2 foot uniform clay thickness, does the report contain a construction methodology and documentation procedure to ensure the liner meets the soil index property requirements of s. NR 504.06(2)(a)?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
(b) Does the report include a description of measures to be taken to comply with wetlands protection requirements, runoff and sediment controls and surface water discharge permit requirements and to minimize effects on areas of special natural resource interest and historical or archaeological areas within and adjacent to the proposed limits of excavation?			✓	Section 9, Appendix T	Pre-approved borrow source located on existing owned property
NR 504.08 MINIMUM DESIGN AND CONSTRUCTION CRITERIA FOR LANDFILL GAS EXTRACTION SYSTEMS.					
(1) GENERAL.					
If the landfill has the potential to generate landfill gas, is the landfill designed to prevent the migration of explosive gases generated by the waste?	✓			Section 8.13	Design will be finalized in Plan of Operation
(2) ACTIVE GAS EXTRACTION AND TREATMENT. Does landfill design include an active gas recovery system which includes the following features:					
(a) Vertical gas extraction wells with a maximum 150 foot radius of influence per well with lesser radii of influence on wells near the perimeter Note: The radii of influence of adjacent wells shall overlap. Alternate well spacings may be proposed if site specific data is obtained through performance of pump tests.	✓			Section 8.13, Drawing 27	
(b) Vertical gas extraction wells extending to 10 feet above the leachate collection system, and installed in 36 inch diameter boreholes Note: An exemption may be proposed to allow for placement of gas extraction wells closer to the leachate collection system.	✓			Section 8.13	
(c) The pipe in the boreholes are a minimum 6 inch diameter, Schedule 80 PVC or an approved equal	✓			Section 8.13	
(d) The lower 2/3 to 3/4 of the pipe in the borehole is slotted or perforated pipe	✓			Section 8.13	
(e) Backfill around slotted pipe is one inch to 1 ½ inch washed stone and the top 10 feet of the borehole is sealed	✓			Section 8.13	
(f) Each gas extraction well has a flow control valve and sampling port	✓			Section 8.13	
(g) The header system is looped to allow alternate flow paths for the gas	✓			Section 8.13	
(h) A minimum slope of 2% for header pipes over the waste	✓			Section 8.13	
(i) Polyethylene is used for the header and lateral pipes	✓			Section 8.13	
(j) The blower, header and laterals are sized such that a minimum vacuum of 10 inches of water column is available at the well furthest from the blower	✓			Section 8.13	
(k) A drip leg or equivalent is installed immediately before the blower while preserving suction at the wells under maximum operating vacuum	✓			Section 8.13	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(l) All condensate and gas transfer piping outside waste limits are encased in 2 feet of clay, double-cased pipe or another approved secondary containment If the piping is not encased is the proposed system designed with multiple drip legs within the landfill where the bulk of the condensate has been removed?	✓			Section 8.13	
(m) The system has the ability to collect and treat all condensate, measure volumes and collect samples	✓			Section 8.13	
(n) A flare designed to meet the requirements of ch. NR 445	✓			Section 8.13	
(3) GAS MONITORING WELLS.					
✓ Does the design provide at least one gas monitoring well on each side of the landfill? ✓ Will the wells be constructed per NR 507.11?	✓			Section 8.18.3	
(4) PASSIVE GAS EXTRACTION SYSTEMS. If the landfill accepts only industrial waste with the potential to generate gas and which does not use an active gas extraction system, is a passive gas venting system proposed which includes the following:			✓		
☐ A design that allows gas venting from the entire landfill surface? ☐ An analysis to determine vent trench spacing for an effective system and to ensure compliance with ch. NR 445 limits for hazardous air contaminants ☐ A continuous 1 foot layer of granular soil placed under the capping layer with a minimum hydraulic conductivity of 1×10^{-3} cm/sec Note: This layer may be part of the support layer required in s. NR 504.07(3). ☐ A series of flexible, perforated pipes connected to a series of outlets			✓		
NR 504.09 STORM WATER MANAGEMENT AND MISCELLANEOUS DESIGN AND CONSTRUCTION CRITERIA FOR LANDFILLS.					
(1) STORM WATER MANAGEMENT.					
(a) Are drainage ditches, structures and sedimentation basins proposed to be constructed during the initial stages of site construction to control runoff and limit entrained sediment from reaching surface water bodies?	✓			Section 8.16	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(b) Are the following concepts incorporated in the design of the temporary and permanent erosion and sediment control measures: ☒ Scheduling of grading and construction to minimize soil exposure ☒ Retention of existing vegetation whenever feasible ☒ Seeding and mulching of disturbed areas ☒ Diversion of runoff away from disturbed and active fill areas ☒ Minimization of runoff velocities ☒ Designing drainageways and outlets to handle concentrated and increased flows ☒ Trapping of sediment on-site ☒ Inspection and maintenance of runoff control structures Note: The applicant should submit a copy of the facility's storm water pollution prevention plan (SWPPP) with the plan of operation. The SWPPP may address the items listed above, in addition to storm water or surface water monitoring for the facility.	✓			Section 8.16	
(c) Are the calculations required in pars. (d), (e) and (f) performed for the period in the landfill's development where the surface conditions and contributing acreage would result in the greatest runoff volume?	✓			Section 8.16	
(d) Are all temporary and permanent storm water control structures designed to accommodate peak flow rates from a 25 year, time of concentration storm event?	✓			Section 8.16	
(e) Are the storm water management features designed to accommodate the following: ☒ Temporary and permanent sediment controls are designed to settle the 0.015mm particle size for all storms up to and including the 25 year, 6 hour event? ☒ The sedimentation basin surface area is based upon the average rainfall intensity over the 25 year, 6 hour event? ☒ The principal spillway and outlet protection for the sedimentation basin is designed to pass a 25 year, time of concentration storm event? ☒ The emergency spillway for the sedimentation basin is designed to pass a 100 year, time of concentration event? ☒ The sedimentation basin dewatering structure is designed to drain the basin in less than 3 days ☐ A design analysis documenting compliance with the above is included	✓			Section 8.16	
(f) Is storm water diverted from active fill and borrow areas to sediment control structures?	✓			Section 8.16	
(g) Are the containment berms around active fill areas designed to comply with the following: ☒ Control and collect runoff from a 25 year-24 hour storm event ☒ Containment analysis is based upon the volume of liquid generated from areas with exposed waste and areas with daily cover ☐ Storm water in contact with active fill areas will be treated as leachate	✓			Section 8.16	

Facility Name: Vernon County Landfill

DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(h) Are storm water drainage ditches, structures and sedimentation basins designed to discharge along the existing drainage patterns capable of accepting anticipated flow volume?	✓			Section 8.16	
(i) Has an analysis been performed to determine the amount and velocity of runoff prior to landfill development and to document compliance with above requirement?	✓			Section 8.16	
(j) Does storm water diversion and construction at the landfill minimize impacts on adjacent property?	✓			Section 8.16	
(j) Do storm water management features comply with other applicable requirements such as those of, but not limited to, ch. NR 103 and ch. 30, Stats., permits? Note: The design should also comply with NR 151 storm water requirements.	✓			Section 8.16	
(2) MISCELLANEOUS.					
(a) Is a method of controlling any dust or windblown debris included in the design?	✓			Section 3.9	
(b) Is access restricted through fencing, natural barriers or other methods?	✓			Section 8.4	
(c) Are all access roads, including those in the active area, designed for all weather operation?	✓			Section 4.7, Section 8.3	
(d) Are all access roads used by highway vehicles designed with less than 10% grade?	✓			Section 4.7, Section 8.3	
Is the intersection of the landfill access road with an existing highway designed with sufficient sight distance and minimize traffic interference?			✓		
(e) intentionally left blank			✓		
(f) Is a minimum 100 foot separation distance between the fill limits and the adjacent property line, and a minimum 50 foot distance from landfill excavation or berm and the adjacent property line maintained (excluding storm waste diversion structures)?	✓			Section 3.5	
(g) Is the landfill designed such that final waste grades are reached as soon as possible and open refuse filling area is minimized?	✓			Section 8.17	
(h) Are the final slopes designed to be no less than 5% and no greater than 4H:1V, except for papermill sludge sites which may have a max.6H:1V final slope for papermill and wastewater treatment sludge landfills?	✓			Section 8.14, Drawing 26	
(i) Are a minimum of 2 leachate headwells proposed per major horizontal phase?	✓			Section 8.12	
(j) Is a weight scale supplied (if proposed as a municipal solid waste landfill)?	✓			Section 7.3.7	
(k) Is the landfill designed with properly protected, permanent horizontal and vertical control benchmarks, and are the elevations tied to USGS datum and horizontal control referenced to property boundary?	✓			Drawing 2	

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
NR 504.095 DESIGN CRITERIA FOR LANDFILLS THAT RECIRCULATE LEACHATE					
(1) GENERAL. Leachate recirculation systems shall be designed to meet the following requirements:					
(a) Is the MSW landfill designed with a composite liner and leachate collection system meeting the requirements of NR 504.06? If no, leachate recirculation may not be approved.	✓			Section 8.7, Section 8.8	
(b) Is the leachate recirculation limited to areas of the landfill where the leachate collection drainage blanket has a hydraulic conductivity of 1cm/sec or greater? Note: The department may approve leachate recirculation in existing cells with lower permeability leachate collection blankets, provided that the operator can demonstrate that the maximum leachate head on the liner can be maintained at less than 12 inches and that the recorded leachate head has not exceeded 12 inches in the past.	✓			Section 8.8.2.2	
(c) Is the leachate recirculation limited to areas of the landfill which are connected to the active gas extraction systems where the system is capable of collecting the additional gas expected? Note: Active gas extraction shall commence in those areas no later than the initiation of leachate recirculation.	✓			Section 8.8.1	
(d) Is the leachate recirculation distribution system more than 100 lateral feet from the exterior sideslope final grades?	✓			Section 8.8.1	
(e) Will there be a minimum depth of 20 feet of waste maintained between the landfill base and the lowest point of leachate distribution?	✓			Section 8.8.1	
(f) Do the operating controls and instructions for leachate recirculation address the following: ✓ All weather and seasons of operation ✓ Cessation of leachate recirculation upon discovery of seeps, excessive pressures within the waste mass, saturated conditions within the waste mass, inadequate shear strength of the waste mass or other conditions indicative of instability?	✓				
(2) SURFACE APPLICATION.					
(a) Is the leachate distribution system designed so no leachate is introduced into the waste in a manner that causes ponding or surface runoff of leachate (No open surface trenches or ponds)?	✓			Section 8.8.1	
(b) Is the leachate distribution system designed to minimize evaporation of the leachate and volatilization of compounds in leachate?	✓			Section 8.8.1	
(3) VERTICAL DISTRIBUTION SYSTEMS.			✓		
(a) Are the wells designed for leachate recirculation and gas extraction?					
(b) Is the well spacing based on the leachate flow rates, pumping characteristics, permeability of the waste mass, and ability of the waste to accept liquid without being pressurized?					

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(c) Are the leachate distribution wells designed with a surface seal to control odors and landfill gas?					
(d) Are the pumping pressures and pumping intervals for the wells designed to prevent surface emergence of leachate?					
(e) Is the leachate distribution system designed to achieve a uniform distribution of leachate throughout the zone of influence of the wells?					
(f) Are the leachate distribution wells designed to also extract landfill gas?					
(4) HORIZONTAL DISTRIBUTION SYSTEMS.			✓		
(a) Is the leachate distribution piping designed to distribute leachate consistently along its length?					
(b) Is the distribution system designed with a permeable bedding material capable of rapidly dissipating recirculated leachate into the waste mass?					
(c) Is the distribution system designed with bedding material capable of maintaining its structure and characteristics during the expected operation life of the system?					
(d) Is the distribution system designed to operate with specific distribution periods with landfill gas extracted in the interval between those distribution periods and to minimize uncontrolled landfill gas emissions?					
(e) Are the pumping pressures and pumping intervals for the wells designed to prevent surface emergence of leachate?					
NR 504.10 ALTERNATIVE DESIGN CRITERIA FOR LANDFILLS ACCEPTING HIGH VOLUME INDUSTRIAL WASTES.					
This section applies only to landfills designed primarily for high volume industrial waste, wood residue and minor amounts of other waste as approved by the Department. This section applies to all new landfills and to the expansion of existing landfills for which the plan of operation was approved after February 1, 1988.			✓		
(1) GENERAL.					
(a) Has the landfill been designed to either meet the requirements of NR 504.05 to 504.09 or has an alternative design been proposed which meets the following provisions?					
(b) Note: If the applicant does not completed construction of the first major phase of the landfill within 2 years from the date of the plan of operation approval, the applicant shall reapply for approval to construct. The department may require additional conditions or approval and require redesign of the landfill in accordance with state-of-the-art design criteria.					
(c) Does municipal waste which is generated by the process, such as manufacturing process packaging not exceed 10% by weight? Note: If yes, then the landfill may not be subject of the design requirements of s. NR 504.05(1). Household and plant waste not generated as a direct result of the manufacturing process such as office and cafeteria waste, may not be disposed of in a landfill which does not meet the requirements of s. NR 504.05(1).					

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
(2) DESIGN CAPACITY.					
Does the design capacity meet NR 504.05(3)?					
(3) DESIGN CRITERIA.					
Does the feasibility study demonstrate that the alternative design adequately protects the public health, welfare and the environment, and the design meets or exceeds the NR 504.04 location and performance standards? If no, then an alternative design may not be approved. Is the alternative design supported with the following types of information:					
(a) Landfill characteristics including regional and specific information on land use, geology, hydrology, hydrogeology and soils					
(b) Waste characteristics such as quantity and physical/chemical analysis of waste and leachate					
(c) Analysis of any design to control geologic/hydrogeologic conditions					
(d) Field demonstration data					
(e) Design and performance data for similarly designed and constructed landfills					
(f) Accepted scientific or engineering analysis or field studies, field plots, research, manufacturer's data or demonstrations					
NR 504.11 MINIMUM DESIGN AND CONSTRUCTION CRITERIA FOR LANDFILLS ACCEPTING RESIDUE PRODUCED BY BURNING MUNICIPAL SOLID WASTE.			✓		
(1) APPLICABILITY. This section applies to landfills designed for residue produced by the burning of municipal solid waste as approved by the department. This section applies to all new and existing landfills.					
(2) LANDFILL DESIGN CRITERIA FOR RESIDUE PRODUCED BY BURNING MUNICIPAL SOLID WASTE.					
(a) If the landfill has proposed to accept municipal solid waste combustor residue that tests below the NR 502.13(6)(g) limits, is it a composite lined monofill cell which follows the following criteria:					
___ Does the composite liner consist of a minimum 60 mil geomembrane overlying a minimum 4 foot thick compacted clay liner meeting NR 504.06 specifications?					
___ Is the monocell designed to separately sample and collect leachate from residue areas?					
___ If an alternate design is proposed, such as a double liner, does the design provide equivalent protection?					
(b) If the landfill is proposed to accept municipal solid waste combustor residue that tests above the limits in NR 502.13(6)(g), does the landfill design include a double composite lined monofill cell which meets the following criteria:					

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DESIGN & CONSTRUCTION CRITERIA REQUIREMENTS	COMPLETE?			LOCATION	COMMENTS
	Y	N	NA		
___ Is there a double composite liner with 2 separate composite liners each with a minimum 60 mil geomembrane liner overlying a minimum 4 foot compacted clay liner meeting NR 504.06 specifications?					
___ Is the composite liner separated by a minimum one foot (detection) layer of granular material?					
___ Are separate leachate collection systems designed above and between the composite liners and is separate leachate sampling and collection from the detection layer possible?					
(c) Note: All landfills which accept municipal solid waste combustor residue shall be approved by the department in accordance with s. NR 514.07 (5) prior to accepting each specific residue waste stream.					

Legal Note: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.